2021 Annual Report – Waste Resource Innovation Centre

ECA No. A170128 & 9496-9NFKJ9

City of Guelph

60678269

March 2022

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AECOM: 2015-04-13

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Executive Summary

The City of Guelph Solid Waste Transfer Station, Materials Recovery Facility (MRF) and Organic Waste Facility are adjacent facilities that operate under a combined Amended Provisional Certificate of Approval/Environmental Compliance Approval (C of A/ECA) issued by the Ministry of Environment, Conservation and Parks (MECP), dated February 10, 2011 (C of A No. A170128) and an amended ECA dated January 7, 2015 (ECA No. 9496-9NFKJ9).

The **Table A. Amended Provisional C of A (Waste Disposal Site) No. A170128** presents a summary of the 2021 Annual Report for the City of Guelph Waste Resource Innovation Centre. The C of A/ECA specifies annual reporting requirements. These have been outlined in the left-hand column below, while the right hand column provides a reference to the section of this report where the reader will find further details.

A. Amended Provisional C of A (Waste Disposal Site) No. A170128

C of A Annual Report Requirement (Condition N)	Report Reference and Summary
52. The City shall submit an annual report on the operation of the Site for the previous calendar year to the District Manager by March 31st of each year. This report will include the information required as follows: **(a) the information required by Condition 63(8) of the Certificate dealing with the Composting Site;** **63(8) By March 31st following the end of each operating year, the Owner shall prepare and submit to the District Manager, an Annual Report summarizing the operation of the Composting Site covering the previous calendar year. This Annual Report shall include, as a minimum, the following information:** **63(8)(a) A monthly mass balance of the Organic Waste received, processed and transferred from this composting site, including waste type, quantity, sources and/or disposal destinations;**	■ Table 2 (Section 2.1) provides details on the organic materials received, processed and transferred from the site. The compost facility received 31,349.6 tonnes of material. Of the materials received, source separated organic materials constituted 30,649.5 tonnes and amendment/mulch made up the remaining 700.1 tonnes. During 2021, the site accepted source separated organic material from the City of Guelph and the Region of Waterloo. Amendment material was received from the City of Guelph in the form of wood chips from the City of Guelph Parks and Recreation Department and the Region of Waterloo. A total of 7,045.5 tonnes of finished compost was removed from the facility in 2021. The finished compost was shipped to locations in Guelph, Huron County, Simcoe, Eramosa, Clinton and Blyth. The compost distribution/market for 2021 was focused on agricultural customers. This included large row crop farmers and a grain crop input supply company. A total of 760.2 tonnes of screening, residual compost waste and organic rejected material were shipped to the Transfer Station and then Waste Management Twin Creeks Landfill in Sarnia, Ontario.
63(8)(b) An annual summary mass balance of the organic waste, the wood waste, the waste wood and the amendment material, received, processed and transferred from this composting site, including waste type, quantity, sources, and/or disposal destination;	■ Table 2 (Section 2.1) provides details on the organic materials received, processed and transferred from the site including amendment material.
63(8)(c) An annual summary of any deficiencies, items of non-compliance or process aberrations that occurred at this composting site and any remedial/mitigative action taken to correct them;	■ As reported in Section 2.5, there were no deficiencies, items of non-compliance, or process aberrations in 2021.
63(8)(d) a descriptive summary of any spills, incidents or other emergency situations which have occurred at this composting site, any remedial measures taken and the measures taken to prevent future occurrences;	■ As reported in Section 2.2, no reportable spills occurred in 2021 at the composting site.
63(8)(e) A summary describing any rejected waste including quantity, waste type, reasons for rejection and origin of the rejected waste;	■ As reported in Section 2.2, there were 64.7 tonnes of rejected material from the organics plant due to contamination. The contaminated material usually consists of curbside recyclable collection (blue cart) material that is either inadvertently placed in with the organics (green cart) by the home owner or the blue cart material is inadvertently placed in the wrong area of the split box collection trucks. The rejected material was sent to the transfer station and then onto Twin Creeks landfill for final disposal.
63(8)(f) The quantity, by weight and volume of compost and residues produced and the quantity of compost and residues removed from the facility;	■ **Table 2** (Section 2.1) shows that 7,045.5 tonnes of finished compost was removed from the facility. 695.5 tonnes of screening and residual compost waste from the composting process were shipped to the Transfer Station and then the Waste Management Twin Creeks Landfill in Sarnia, Ontario or to various other locations.
63(8)(g) Any environmental and operational problems, that could negatively impact the environment, encountered during the operation of the composting site or identified during the facility inspections and any mitigative actions taken;	■ As reported in Section 2.2, there were no environmental or operational problems that could negatively impact the environment, encountered during the operation of the composting site or identified during the facility inspections in 2021. The facility is operating as designed.
63(8)(h) Any changes to the WRIC Environmental Emergency Plan, the Operations Manual or the Closure Plan that have been approved by the Director since the last Annual report;	■ As reported in Section 2.2, there were no changes to the, the Operations Manual or the Closure Plan since the last annual report. Waste Resource Innovation Centre Environmental Emergency Plan was updated in 2019 with new contact information.
63(8)(i) Any recommendations to minimize environmental impacts from the operation of the composting site and to improve the composting site operations and monitoring programs in this regard;	■ As discussed in Section 2.5, there were no deficiencies/non-compliance or environmental/operational issues related to the compost facility in 2021. The facility is operating as designed.
63(8)(j) A summary of any complaints received and the responses made, as required by the C of A (Air/Noise) for the composting site;	■ Section 2.3 discusses the 34 complaints received in 2021 at the Waste Resources Innovation Centre. The complaints and remedial actions were reported to the Ministry, and a response letter was provided to each complainant. One complaint from September 10, 2021, consisting of a slight to moderate odour that lasted between 1 and 30 seconds at the complaint location, was identified to be of a similar characteristic to the odour detected at the biofilter monitoring ports. None of the remaining complaints were confirmed to be attributed to the Waste Resource Innovation Centre.

C of A Annual Report Requirement (Condition N)	Report Reference and Summary
63(8)(k) A description of the compost distribution/markets;	■ As reported in Section 2.1, all compost produced at the site was shipped to locations in Guelph, Huron County, Simcoe, Eramosa, Clinton and Blyth in 2021. The compost distribution/market for 2021 was focused on agricultural customers. This included large row crop farmers and a grain crop input supply company. .
63(8)(l) Conclusions from the advanced pathogen testing as the results relate to the pasteurization temperature monitoring; and	■ Section 2.4 reports samples taken from the maturation hall of the compost stream indicate that all compost that has been shipped off the site has passed the conditions for a Class A compost under the CCME Guidelines and the conditions within the C of A/ECA. ■ Results from pathogen testing included in comprehensive laboratory analysis from third party accredited laboratory remain within allowed parameters or below detectable levels. ■ Temperature monitoring logs of the tunnels at the composting facility show that pasteurisation at 55 degrees C was maintained for 72 hours, as required.
63(8)(m) A condition-by-condition analysis of compliance with all Conditions of this Certificate.	■ Section 2.6 reports that based on a review of the 2021 information provided by the City, there are no non-compliance issues for 2021.
52(b) A monthly summary of the waste and/or recyclable materials received at the Site, including quantity, source and Ontario Regulation 347 waste classes;	■ Table 3 (Section 5.1) provides details of the incoming materials. 97,760 tonnes of material were received by the site. The compost facility received 31,349.6 tonnes of organics. Recyclables and mixed dry materials constituted 13,016 tonnes (13.3%) of the total materials received at the site. This included about 11,039 tonnes of paper products. There were 5,504 tonnes (5.6%) brush, leaves, yard waste and mixed organics received. Non-recyclable materials (mixed solid waste and organic rejected materials) constituted 47,892 tonnes (49%) of the total materials received at the site in 2021. ■ Recyclables accepted by the Waste Resource Innovation Centre originated mainly from the City of Guelph and the remaining sources from other areas in Ontario. The Regulation 347 waste classes received at the site are summarized on Table 2.
52(c) A monthly summary of wastes and/or recyclable materials processed at the Site, including quantity and Ontario Regulation 347 waste classes.	■ Table 4 (Section 5.2) provides details on processed waste at the site. There were 13,133 tonnes of marketable processed material was transferred off the site from the Waste Resource Innovation Centre (MRF/PDO) facility. 3,621.7 tonnes was mainly paper-and cardboard products.
52(d) A monthly summary of wastes and/or recyclable materials transferred off-Site, including quantity, destination, and Ontario Regulation 347 waste classes.	■ Table 4 (Section 5.2) provides details on the outgoing materials. Of the 50,691.4 tonnes of non-processed outgoing materials from the Transfer Station, 50,691.4 tonnes (100% of the outgoing materials) was sent to the Waste Management Twin Creeks Landfill in Lambton County. ■ Of the 75,195 tonnes of outgoing material, 13,133 tonnes (17.5%) is processed on-site through the Material Recovery facility (MRF) and 7,045.5 tonnes of finished compost was produced. 1,628.4 tonnes of residual compost waste and overs from the organic compost plant was generated in 2021. 50,691.4 tonnes of non-recyclable materials were shipped off-site from the transfer station to other destinations. In 2021, the MHSW facility received and diverted a total of about 199,081 L and 12,337 kg of municipal and household special wastes, in addition to 1,003 20 lb. propane tanks, 3,703 1-lb. propane cylinders and 7,630 (16,867 ft.) fluorescent tubes. ■ 13,132.7 tonnes of marketable processed material were transferred off the site from the Waste Resource Innovation Centre (MRF/PDO) facility. 3,621.7 tonnes (28%) were paper-based goods such as cardboard and newsprint, 5,606.3 tonnes (43%) was organics, 512.7 tonnes (4%) was plastics and the remaining 3,395.1 tonnes (26%) was other recyclable materials such as aluminum, steel cans, glass, tires and metal.
52(e) An annual summary of the analytical results for the groundwater and surface water monitoring program including an interpretation of the results and any remedial/mitigative action undertaken,	■ Section 8 discusses groundwater quality. Groundwater monitoring results indicate road salt effects at some up-gradient groundwater monitoring locations (5-96, 14b-01, 19b-08, 20b-08, 23b-12). These are related to off-site winter road salting of the adjacent major roadways. Road salt effects are detected in some on-site downgradient groundwater monitors (6b-96, 7 96, 11b-00, 13b-01, 15b-01, 17b-08, 19b-08). Monitors 5-96, 7-96 exceeded ODWS for sodium and/or chloride in 2021 as a result of road salt effects. There were no apparent leachate impacts observed in the groundwater at the site boundary. ■ There were no exceedances of the nitrate ODWS in 2021. Historically, elevated nitrate concentrations were prevalent across the site at all locations prior to development of the site and have shown a decreasing trend over the past several years. Elevated nitrates are most likely a result of surrounding and historic land use in the area and are not a result of site operations. ■ Exceedances of the iron ODWS occurred at many of the monitoring locations during the December 2011 and also continue to be noted in 2021. The cause of the overall increase in iron concentrations is unknown. These elevated iron concentrations will continue to be investigated further in future monitoring events. Aside from the sodium, chloride and iron

C of A Annual Report Requirement (Condition N)		Report Reference and Summary
		exceedances discussed above, there were no other exceedances of the Ontario Drinking Water Standards in 2021 for the groundwater monitors sampled for the site monitoring programs. ■ As the shallow outwash water quality is not affected by site operations, no effects to the deeper bedrock groundwater would be expected. No leachate effects were detected in the bedrock monitors sampled in 2021. ■ Section 8.5 discusses organic groundwater results. The 2021 organic sampling showed that there were detections of 2-Methylnaphthalene, bis(2-ethylhexyl), bromodichloromethane, chloroform, and dibromochloromethane at some of the on-site monitors. However, based on the historic detections of occasional low levels of VOC throughout the site in both upgradient and downgradient monitors, the 2021 VOC detections are not considered to be related to site operations. There are no sources of VOCs on the Waste Resource Innovation Centre or Transfer station property as waste is handled within the covered buildings, truck boxes are covered when outside (preventing contact between the waste and precipitation) and no waste processing occurs on-site. ■ Section 8.7 discusses the Guideline B-7 assessment for monitor nest 22-11, located along the western property boundary. The iron concentration at monitor 22a-11 exceeded Guideline B-7 limits during both 2020 monitoring event. As previously discussed, iron concentrations at some of the monitor locations have been unusually high since the December 2011 monitoring event. The elevated iron concentrations occurred in both upgradient and downgradient monitors and therefore, do not appear to be related to site operations. ■ Of the 11 sets of samples collected in 2021 at EPTS-01 (the existing background on-site surface water pond, East Pond), the PWQO for zinc was exceeded during all of the 2021 monitoring events. Zinc has consistently exceeded PWQO in the past at this location. All the leachate indicator parameters concentrations were within background overburden ranges. Surface water organic sampling in June 2021 showed a low concentration of chloroform at the background surface water station, EPTS-01. Low chloroform levels have historically occasionally been detected at this location. ■ Section 8.7 discusses surface water quality results. Monthly monitoring of the stormwater management pond in the northwest corner of the site was conducted, with samples collected at the discharge at the north end of the pond (TP1 (out)) on 12 occasions in 2021. SWM pond samples exceeded the PWQO for zinc, iron, total phosphorus and un-ionized ammonia during one or more 2021 sampling events. The elevated total phosphorus is a result of surrounding land use and not a result of operations at the site. Elevated zinc, total phosphorus and iron concentrations appear to be related to external factors since background surface water have also exceeded PWQO for these parameters. Metals are a common contaminant from roadway runoff. Elevated phosphorus is typical in rural and urbanized areas. No VOCs were detected at TP1(out) during June 2021. Low April 2019 VOC detections may have been related to the fire at the waste transfer station three days prior to this monitoring event. Water from fire fighting efforts was directed to the SWM Pond where TP1(out) is located. As expected, VOC concentrations quickly dissipated such that they were below the laboratory detection limits during the subsequent monitoring events later in 2019, 2020, and 2021. ■ c) As due diligence, the SW 1 (Stormwater Detention Area 2) was monitored but not sampled in 2021 as the water level in the detention pond was consistently below the trigger level of 0.46 m. No discharge was required from the Detention Pond 2 in 2021. ■ As previously discussed, the design and operation of the Waste Resource Innovation Centre and compost facility minimizes the potential for leachate generation from site activities.
52(f)	**An annual summary of any deficiencies, items of non-compliance or process aberrations that occurred and remedial/ mitigative action taken to correct them.**	■ Section 11 of the report briefly discusses site compliance. As reported by the City, there were no deficiencies or items of non-compliance in 2021.
52(g)	**A summary to any changes to the Engineer's Report and/or the Design and Operations Report that have been approved by the Director since the last annual report;**	■ As stated in Section 11, there have been no changes to the Engineer's Report or to the Design and Operations Report since the last annual report. There were no changes to the Waste Resource Innovation Centre Environmental Emergency Plan in 2021.
52(h)	**A summary of any changes to the Design and Operations Report Design and the WRIC Environmental Emergency Plan that were made in accordance with Condition 68(1) of this Certificate;**	■ As stated in Section 11, there have been no changes to the Engineer's Report since the last annual report. There were no changes to the Waste Resource Innovation Centre Environmental Emergency Contingency Plan in 2021.
52(i)	**A summary of any changes to the Design and Operations Report that have been approved by the Director since the last annual report;**	■ As stated in Section 11, there have been no changes to the Engineer's Report since the last annual report. The Design and Operations Report has been updated to include the new Public Drop Off.
52(j)	**Update on activities of the PLC.**	■ Section 9 summarizes the 2021 PLC activities, as provided by the City.

B. Amended ECA No. 9496-9NFKJ9

ECA Monitoring and Reporting (Condition 5)		Report Reference and Summary
5(1) **5(2)**	**The Owner shall implement a groundwater and surface water sampling program to ensure early detection of contaminants in the event that such contaminants escape the Waste Resources Innovation Centre site, as follows:** **Groundwater and surface water shall be sampled and analyzed for the following parameter suite (see Section 1.1 for table of parameters)**	■ The results of the groundwater monitoring program at the Waste Resource Innovation Centre is discussed in Section 8. There were no observable effects attributed to the Waste Resource Innovation Centre operations on the groundwater quality beneath the site. No effects were observed at the site boundaries. Road salt effects continue to be observed at monitoring locations both upgradient of the site and on-site. ■ The results of the surface water monitoring program are discussed in Section 8.7. SWM pond samples exceeded the PWQO for zinc, iron, total phosphorus during one or more 2021 sampling events. The elevated total phosphorus is a result of surrounding land use and not a result of operations at the site. Elevated zinc, total phosphorus and iron concentrations appear to be related to external factors since background surface water have also exceeded PWQO for these parameters. Metals are a common contaminant from roadway runoff. Elevated phosphorus is typical in rural and urbanized areas. No VOCs were detected at TP1 (out) during June 2021. Low April 2019 VOC detections may have been related to the fire at the waste transfer station three days prior to this monitoring event. Water from fire fighting efforts was directed to the SWM Pond where TP1(out) is located. As expected, VOC concentrations quickly dissipated such that they were below the laboratory detection limits during the subsequent monitoring events later in 2019, 2020, and 2021.
5(3)	**The surface water monitoring shall include obtaining grab samples at the discharge locations of the final surface water off the Waste Resources Innovation Centre site, for at least three (3) wet events per year (a wet event is defined as a minimum of 15 mm of rain in the previous 24 hours), and tested for Total Suspended Solids (mg/L), ant the results recorded. Two (2) of the events must occur within the May to September time period.**	■ Section 8.7.2 provides details on the three wet event samples collected from TP1(out) in June, July, and September 2021. ■ TSS concentrations from the three wet events ranged from 2 mg/L to 9 mg/L. ■ Discharge only occurred during the July 2021 rain event when the TSS concentrations was 4 mg/L.
5(4)	**The Owner shall annually review and update the groundwater and surface water sampling programs, designed to detect and quantify any impacts originating from the Waste Resources Innovation Centre site.**	■ As reported in Section 8.7.2, the results of the groundwater and surface water sampling program are reviewed annually with the results presented herein.
5(5)	**Sampling frequency and parameters for analysis may be adjusted upon the written approval of the Water Supervisor, from time to time, as groundwater and surface water information becomes available.**	■ As reported in Section 8.8, no changes to the current monitoring program is recommended at this time.
5(6)	**All groundwater monitoring wells which form part of any monitoring program shall be protected from damage. Any groundwater monitoring wells that are damaged shall be repaired or replaced forthwith or properly abandoned in accordance with Ontario Regulation 903.**	■ As reported in Section 6.1, groundwater monitors are inspected during each of the monitoring events and their condition recorded by field staff. If any monitor is found to be damaged or in need of maintenance, a work order is submitted for repairs and repairs are completed as soon as possible.
5(7)	**The Owner shall annually review and update, if required, the detailed maintenance schedules for the stormwater management facilities on the Waste Resources Innovation Centre site.**	■ As discussed in Section 4.1, The City undertakes daily inspections of the stormwater (SWM) facilities on site and completes maintenance, as needed. An annual inspection of the stormwater facilities was conducted by City staff in December 2021. The Ministry inspected the stormwater facilities in 2020, The inspection report is included in Appendix F. The Spill Plan was updated as per the recommendation in the Ministry inspection report
5(8)	**The Owner shall submit to the Water Supervisor, every year, a copy of the test results as per Condition 5, Subsection (2) and Subsection (3), above.**	■ As reported in Section 13, the Water Supervisor is provided a copy of the annual report each year, containing the test results.
5(9)	**The Owner shall submit to the Water Supervisor, an annual report on the groundwater and surface water sampling and monitoring program described herein, and shall include an interpretation of the results prepared by a qualified hydrogeologist, engineer or scientist, and shall identify any remedial/mitigative action taken.**	■ As reported in Section 13, the Water Supervisor is provided a copy of the annual report each year, which includes an interpretation of the groundwater and surface water results. ■ This report is prepared by a qualified professional geoscientist and reviewed by a professional engineer.

Table of Contents

Figures

Tables

Appendices

Selected Definitions

Note: additional definitions are also found in the site C of A/ECA, Appendix E

"Amendment material" means materials added to the Organic Waste to assist in the performance of the process and/or ameliorate the quality of the Marketable Product.

"Clean Wood" means wood that is not painted wood, treated wood or laminated wood. Clean Wood does not include wood waste or waste wood

"Compost" means the material produced by an aerobic composting process which can be used as soil amendment or for other similar uses, and which meets:

(i) the quality requirements for metals, non-biodegradable particulate matter, and organic chemicals contained in the most recent version of the Ministry of the Environment's "Interim Guidelines for the Production and Use of Aerobic Compost in Ontario", dated November, 2004; and,

(ii) the Category A quality criteria for sharp foreign matter, stability/maturity, and pathogen reduction contained in the Canadian Council of Ministers of the Environment's "Guidelines for Compost Quality" dated October, 2005.

"Contaminant" means the term as defined in the *Environmental Protection Act*.

"Food Waste" means all edible and non-edible food products including, but not limited to: baked goods, animal bones, cereal and grains, dairy products, coffee filters and grounds, dough, eggs and eggshells, fish and fish parts, flour, fruit and vegetables, herbs and spices, jams and jellies, mayonnaise and condiments, meat and meat products, nuts and nut shells, pasta, peanut butter, pizza, popcorn, pumpkins, shellfish, sugar, tea bags.

"Leaf and Yard Waste" includes, but is not limited to, leaves, grass clippings, brush and branches and tree limbs up to 10 cm (4 inches) in diameter, twigs, plants, hedge clippings, woody plants including vines, rose bushes and the like, flowers and weeds and other types of organic yard and garden waste that is collected by the City separately from the wet fraction, either at curbside or through City drop-off depots.

"Material Recovery Facility" means the material recovery facility located at the Waste Resource Innovation Centre.

“Organic Waste” means any compostable material delivered to the Facility either from sources outside the City’s geographical limits or from sources within the City’s geographical limits, which is delivered to the Facility for processing at the Facility. For certainty, Organic Waste includes SSO and Third-Party Organic Waste, but does not include Amendments or Leaf and Yard Waste provided by the City for use as an Amendment.

“**Overs**” means oversized particles that have been through the composting process and provide structure and porosity to the composting mix.

"Rejected Waste" means the load of incoming waste received at the Composting Site and deemed by Owner to contain waste that does not meet the incoming Organic Waste quality criteria set out in this Certificate or that cannot be Composted;

“Residual Compost Waste” means a type of residue created during the composting process.

“Residual Waste” means any solid non-hazardous waste resulting from the processing of organic waste accepted at the Facility by the Operator, and that requires disposal by the Operator.

“Source Separated Organics” or “SSO” means the components of the solid waste stream that are separated by residential households into the "Wet" fraction of the City’s "Wet-Dry+ program", and are separately collected by the City. SSO generally includes any organic material that is compostable, including but not limited to fruit and vegetable peelings, food scraps, meat, bones, fish and shell fish, pasta, eggs and shells, vegetable oil and fat, dairy products, pumpkins, and wood shavings. SSO also includes tissues and other soiled paper, and feces, ashes, and pet litter as described in the Certificates of Approval. For certainty, SSO does not include Leaf and Yard Waste unless it is collected as part of wet stream.

“Spill” has the meaning ascribed thereto under the *Environmental Protection Act*, R.S.O. 1990, c. E.19, as amended from time to time.

1. Introduction and Background

In June 2000, Guelph's City Council made the decision to seek future solid waste disposal capacity through an agreement with a landfill owner outside of the City's corporate boundaries. Since the potential disposal site was to be distant from Guelph, the City needed a Transfer Station to facilitate waste bulking from small collection vehicles into larger transport vehicles. The City constructed the Solid Waste Transfer Station adjacent to the existing Waste Resource Innovation Centre, formerly the Wet-Dry Recycling Centre. The Waste Resource Innovation Centre was designed as a composting and multi-material recovery operation for the County of Wellington and the City of Guelph. The 29.54 ha site is located at 110 Dunlop Drive in the southeast part of Guelph. **Figure 1** shows the location and layout of the Transfer Station and Waste Resource Innovation Centre.

The Transfer Station has been designed to manage up to 299 tonnes/day of waste, calculated on a weekly average (six days), including municipal, industrial, commercial, and institutional wastes. The Transfer Station began receiving waste on October 14, 2003.

The City carries out a number of waste management operations at the Waste Resources Innovation Centre. These operations include processing of recyclables from the City's "dry" waste stream, transfer of non-compostable materials and non-recyclable waste residues to disposal off-site, a public waste drop-off area, and a municipal hazardous special waste (MHSW) depot. The City's current composting operations have been active since 2011. Both the Transfer Station and Waste Resources Innovation Centre facility operate under a combined Ministry of the Environment Amended Provisional Certificate of Approval C of A/ECA) No. A170128, dated February 10, 2011 and amended ECA No. 9496-9NFKJ9, dated January 7, 2015.

Amended Provisional C of A/ECA #A170128, Notice No. 1, dated September 22, 2011, amended Condition 58(1) with respect to the composting operation to add item 58(1)(c) on cross-contamination prevention and to add supporting reference documents to Schedule A. Amended Provisional C of A/ECA, Notice No. 2, dated November 2, 2012, provided additions to Condition 54(1) regarding the service area, approved waste types, rates and storage. Amended Provisional C of A/ECA, Notice No. 3, dated January 24, 2013, was an amendment to condition 29(4) of the C of A/ECA that provided the Public Liaison Committee to serve as a forum for their mandate for the whole site and not just for the composting site. Notice No. 3 also expanded the site service area to include New York and Michigan State. Amendment to ECA #A170128, Notice No. 4, dated January 9, 2015, provided minor changes to the ECA (i.e., amended the pre-amble of the ECA and a few of the definitions, etc.) and removed the references to the groundwater and surface water monitoring program from the waste disposal site ECA #A170128 and transferred them to the Municipal and Private Sewage Works ECA #9496-9NFKJ9, issued January 7, 2015.

Figure 1: Groundwater Monitor Location Map

Notice No. 5, dated May 3, 2016, provided clarification on the definition of the Organic Waste Processing Facility (OWPF) and prohibits recyclable material from being stored in the former OWPF. These amendments are included in Appendix E.

A Public Drop Off (PDO) facility was added to the site in 2015. An MECP amendment was granted in support of this change and included an updated Design and Operations Report.

As part of the requirements to develop and design the Waste Resource Innovation Centre, a hydrogeological assessment was conducted in 1991[1]. Further groundwater sampling at the proposed site was completed in 1992, 1994 and 1995 prior to the construction of the site[2].

The main conclusions of these reports were:

a) Groundwater flow in the shallow subsurface is towards the northeast to the Correctional Centre pond and Clythe Creek.

b) Background groundwater quality in the area is considered hard with calcium, magnesium, and alkalinity the dominant ions. The concentrations of the other major ions (i.e., sodium, potassium, sulphate and chloride) were found for the most part to be low. The exception to this was the 1995 sample collected from monitor 5-91, which exhibited higher than background concentrations of sodium and chloride. The source of the sodium and chloride was considered unknown at that time. The only other parameter of concern was nitrate. This was found at consistently elevated levels at monitors 1a-91, 1b-91, 2b-91 and 3-91, from 1991 until locations 1a-91, 1b-91 and 3-91 were destroyed due to construction activities.

1. Jagger Hims Limited; Hydrogeological Assessment, Proposed Wet/Dry Facility, Guelph, Ontario; Report prepared for the City of Guelph, October 1991.
2. Jagger Hims Limited; Groundwater Monitoring Program; Guelph Wet/Dry Recycling Facility; Draft Report completed for the City of Guelph, September 1995.

1.1 Annual Reporting Requirements

Section N, Condition 52 of the Amended Provisional Certificate of Approval (Waste Disposal Site) states that:

Composting Site

52(a) the information required by Condition 63(8) of the Certificate dealing with the Composting Site;

63(8) By March 31st following the end of each operating year, the Owner shall prepare and submit to the District Manager, an Annual Report summarizing the operation of the Composting Site covering the previous calendar year. This Annual Report shall include, as a minimum, the following information:

63(8)(a) A monthly mass balance of the Organic Waste received, processed and transferred from this composting site, including waste type, quantity, sources and/or disposal destinations.

63(8)(b) An annual summary mass balance of the organic waste, the wood waste, the waste wood and the amendment material, received, processed and transferred from this composting site, including waste type, quantity, sources, and/or disposal destination.

63(8)(c) An annual summary of any deficiencies, items of non-compliance or process aberrations that occurred at this composting site and any remedial/mitigative action taken to correct them.

63(8)(d) A descriptive summary of any spills, incidents or other emergency situations which have occurred at this composting site, any remedial measures taken and the measures taken to prevent future occurrences.

63(8)(e) A summary describing any rejected waste including quantity, waste type, reasons for rejection and origin of the rejected waste.

63(8)(f) The quantity, by weight and volume of compost and residues produced and the quantity of compost and residues removed from the facility.

63(8)(g) Any environmental and operational problems, that could negatively impact the environment, encountered during the operation of the composting site or identified during the facility inspections and any mitigative actions taken.

63(8)(h) Any changes to the WRIC Environmental Emergency Plan, the Operations Manual or the Closure Plan that have been approved by the Director since the last Annual report.

63(8)(i) Any recommendations to minimize environmental impacts from the operation of the composting site and to improve the composting site operations and monitoring programs in this regard.

63(8)(j) A summary of any complaints received and the responses made, as required by the C of A (Air/Noise) for the composting site.

63(8)(k) A description of the compost distribution/markets.

63(8)(l) Conclusions from the advanced pathogen testing as the results relate to the pasteurization temperature monitoring.

63(8)(m) A condition-by-condition analysis of compliance with all Conditions of this Certificate.

Transfer/ Waste Resource Innovation Centre Site

The City shall submit an annual report on the operation of the Site for the previous calendar year to the District Manager by March 31st of each year. This report will include the information required as follows:

52(b) A monthly summary of the waste and/or recyclable materials received at the Site, including quantity, source and Ontario Regulation 347 waste classes.

52(c) A monthly summary of the waste and/or recyclable materials processed at the Site, including quantity and Ontario Regulation 347 waste classes.

52(d) A monthly summary of the waste and/or recyclable materials transferred at the off-Site, including quantity, destination and Ontario Regulation 347 waste classes.

52(e) An annual summary of the analytical results for the groundwater and surface water monitoring program including an interpretation of the results and any remedial/mitigative action undertaken.

52(f) An annual summary of any deficiencies, items of non-compliance or process aberrations that occurred and remedial and mitigative measures taken to correct them.

52(g) A summary of any changes to the Engineer's Report and/or Design and Operations Report that have been approved by the Director since the last annual report.

52(h) A summary of any changes to the Design and Operations Report Design and the WRIC Environmental Emergency Plan that were made in accordance with the information specified for a waste processing site as described in the most recent version of the Ministry publication "Guide for Applying for Approval of a Waste Disposal Site".

52(i) A summary of any changes to the Design and Operations Report that have been approved by the Director since the last annual report.

52(j) An update on the activities of the PLC.

Condition 5 on Monitoring and Reporting under amended ECA No. 9496-9NFKJ9, issued January 7, 2015, states that:

5(1) The Owner shall implement a groundwater and surface water sampling program to ensure early detection of contaminants in the event that such contaminants escape the Waste Resources Innovation Centre (WRIC) site, as follows:

5(2) Groundwater and surface water shall be sampled and analyzed for the following parameter suite:

Table 1: Parameters for Analysis

Analysis Groups	Parameters
Parameters *(sampled semi-annually in the spring and fall)*	■ Biological Oxygen Demand (BOD) ■ Chemical Oxygen Demand (COD) ■ Total Kjeldahl Nitrogen (TKN) ■ Ammonia as Nitrogen (NH3-N) ■ Total Phosphorus (Total P) ■ Total Sulphate (SO4) ■ Phenols ■ Nitrate (NO3) and Nitrite (NO2) Chloride (Cl) ■ Sodium (Na) ■ Calcium (ca) ■ Boron (B) ■ Total Iron (Fe) ■ Phosphorus (P) ■ Zinc (Zn)
General Parameters *(semi-annually)*	■ pH ■ Conductivity ■ Alkalinity ■ Magnesium (Mg) ■ Potassium (K)
Organics *(sampled annually)*	■ EPA 624, 625 (ATG 16+17+18) & ATG (19+20)
Field Parameters	■ pH, Conductivity, Temperature

5(3) The surface water monitoring shall include obtaining grab samples at the discharge locations of the final surface water off the Waste Resources Innovation Centre site, for at least three wet events per year (a wet event is defined as a minimum of 15 mm of rain in the previous 24 hours), and tested

for Total Suspended Solids (mg/L), ant the results recorded. Two of the events must occur within the May to September time period.

5(4) The Owner shall annually review and update the groundwater and surface water sampling programs, designed to detect and quantify any impacts originating from the Waste Resources Innovation Centre site.

5(5) Sampling frequency and parameters for analysis may be adjusted upon the written approval of the Water Supervisor, from time to time, as groundwater and surface water information becomes available.

5(6) All groundwater monitoring wells which form part of any monitoring program shall be protected from damage. Any groundwater monitoring wells that are damaged shall be repaired or replaced forthwith or properly abandoned in accordance with Ontario Regulation 903.

5(7) The Owner shall annually review and update, if required, the detailed maintenance schedules for the stormwater management facilities on the Waste Resources Innovation Centre (WRIC) site.

5(8) The Owner shall submit to the Water Supervisor, every year, a copy of the test results as per Condition 5, Subsection (2) and Subsection (3), above.

5(9) The Owner shall submit to the Water Supervisor, an annual report on the groundwater and surface water sampling and monitoring program described herein, and shall include an interpretation of the results prepared by a qualified hydrogeologist, engineer or scientist, and shall identify any remedial/mitigative action taken.

The current C of A/ECAs for the site are included in Appendix E.

Annual reports are submitted to the Ministry of the Environment, Conservation and Parks, MECP (formerly the Ministry of the Environment and Climate Change, MOECC), as required by the C of A/ECA. The last MECP review was completed on the 2014 Annual Monitoring Report (MECP Memorandums dated April 15, 2015 and August 13, 2015, included in Appendix F). These comments were addressed in the 2015 Annual Monitoring Report (AECOM, 2016). No further MECP review comments have been received to-date.

1.2 COVID-19

The Waste Resource Innovation Centre operations have been mostly unaffected by the COVID-19 pandemic and the City continued to provide services to residents and businesses in the local community, while strictly following COVID protocols.

2. Composting Facility

The original compost facility was shut down in 2006. The City commissioned a new compost facility design, which was completed by the summer of 2011. The composting facility is fully enclosed with all processing and finished product remaining indoors.

2.1 Material Received, Processed and Transferred

As per Section N, Condition 63(8) (a) and (b), **Table 2** presents a summary of the waste volumes received, processed and transferred from the site. 31,349.6 tonnes of material were received by the composting facility. Of the materials received, source separated organic materials constituted 30,649.5 tonnes (amendment/mulch made up 700.1 tonnes). During 2021, the site accepted organic material from the City of Guelph and the Region of Waterloo. Amendment material was received from the City of Guelph or in the form of wood chips from the City of Guelph Parks and Recreation Department and the Region of Waterloo.

Table 2: 2021 Monthly Summary of Incoming and Outgoing Material, Composting Facility

Incoming Material	Jan Tonnes	Feb Tonnes	March Tonnes	Apr Tonnes	May Tonnes	June Tonnes	July Tonnes	Aug Tonnes	Sept Tonnes	Oct Tonnes	Nov Tonnes	Dec Tonnes	Total YR
Mixed Organics	2564.4	1,972.2	2,592.2	2,651.9	2,736.7	2,706.2	2,564.0	2,655.0	2,860.9	2,488.0	2,453.0	2,405.0	30,649.5
Paper Fiber Sludge													0.0
Brush													0.0
Ammendmant/Mulch	64.6	96.3	114.5	97.1	29.4	120.9	22.3	48.7	43.3	23.4	39.7	0.0	700.1
Total Month	2,629.0	2,068.5	2,706.7	2,749.0	2,766.1	2,827.1	2,586.3	2,703.7	2,904.2	2,511.4	2,492.7	2,405.0	31,349.6

Outgoing Mixed Waste	Jan Tonnes	Feb Tonnes	March Tonnes	Apr Tonnes	May Tonnes	June Tonnes	July Tonnes	Aug Tonnes	Sept Tonnes	Oct Tonnes	Nov Tonnes	Dec Tonnes	Total YR
Finished Compost	0.0	1,044.2	721.4	543.8	623.2	728.5	363.3	981.0	398.2	526.3	363.9	751.6	7,045.5
Overs	63.5	32.1	70.8	102.4	0.0	102.8	347.8	537.8	31.6	0.0	0.0	0.0	1,288.7
Screening Waste	34.6	22.6	38.3	34.3	36.3	26.8	44.0	4.8	33.0	21.2	27.3	32.6	355.8
Residual Compost Waste	43.3	20.5	46.8	11.3	33.2	33.9	24.9	0.0	41.6	19.7	31.6	32.9	339.7
Organic Rejected Load		5.7	3.7	4.8	3.0	34.9	8.6	3.9					64.7
Total Month	141.4	1,119.4	877.3	691.8	692.7	892.0	780.0	1,523.6	504.4	567.2	422.8	817.1	9,094.4

Notes: Overs = oversized particles that have been through the composting process and provide structure and porosity to the composting mix.

A total of 7,045.5 tonnes of finished compost was removed from the facility in 2021. The compost distribution/market for 2021 was focused on agricultural customers (including turf, lawns, mulch, corn, apples, grains, soybeans, cherries, berries, nuts and oilseeds applications). Customers are within a two hour radius of the Guelph Compost Facility and either require third-party hauling or have their own trucks. A total of 760.2 tonnes of screening, residual compost and organic rejected material from the composting process were shipped to the Transfer Station and then to the Waste Management Twin Creeks Landfill in Sarnia, Ontario.

2.2 Deficiencies / Non-Compliance and Environmental / Operational Issues

On November 29, 2021, an arc flash occurred in the electrical room and resulted in loss of electrical power and damage to components of the SCADA system. The system was returned to operation with some data lost from the day of the event. Repairs on the SCADA system took place between November 29, 2021 and the end of 2021. The majority of data has been logged by SCADA but periodic loss of automated control occurred in December, which required systems to be operated manually, including ventilation control. As a result, there were instances of loss of negative pressure and excess air flow to the biofilter. There were no odour complaints during this period. Automated operations are back online as of the end of December with minor SCADA repairs outstanding. There were no other environmental or operational problems that could negatively impact the environment, encountered during the operation of the composting site or identified during the facility inspections in 2021. The facility is operating as designed.

No reportable spills occurred in 2021 at the composting site.

There were 64.7 tonnes of rejected material from the organics plant due to contamination. The contaminated material consists of curbside recyclable collection (blue cart) material that is either inadvertently placed in with the organics (green cart) by the home owner or the blue cart material is inadvertently placed in the wrong area of the split box collection trucks. The rejected material was sent to the transfer station for final disposal.

There were no changes to the Waste Resource Innovation Centre Environmental Emergency Plan or the Closure Plan since the last annual report. The compost facility operated without any major incidents in 2021. Public Complaints

City staff received 34 odour complaints in 2021. These complaints were investigated by City management staff which included, a visit to the complainant’s location by the City Environmental Protection Officers, follow-up investigation at the Site with supervisors, data check with the organics facility contractor, and, in the event that an odour source at the site was identified that could be potentially attributable to the complaint, completion of any necessary remedial measures.

The MECP was provided with a written report of the complaint investigation findings. Each complainant was provided with a formal response. One complaint from September 10, 2021, consisting of a slight to moderate odour that lasted between one (1) and 30 seconds at the complaint location, was identified to be of a similar characteristic to the odour detected at the biofilter monitoring ports. None of the remaining complaints were confirmed to be attributed to the Waste Resource Innovation Centre .

2.3 Enhanced Pathogen Testing and Operations Summary

Samples taken from the maturation hall of the compost stream indicate that all compost that has been shipped off the site has passed the conditions for a Class AA or A[3] compost under the CCME[4] Guidelines and the conditions within the ECA. Results from pathogen testing included in comprehensive laboratory analysis from third party accredited laboratory remain within allowed parameters or below detectable levels (BDL).

To reduce the health risks of pathogenic organisms, pasteurization continued to be monitored to ensure that 55°C was maintained for a minimum 72 hours using in-vessel composting methods. The compost material goes through a series of tunnels to get to its finished state. There are seven tunnels at the facility. When material is in a tunnel the temperature in each of those tunnels is measured every five minutes and the logs are stored within a supervisory control and data acquisition (SCADA) system. The operator provides a weekly report which contains a snap shot of the tunnel temperatures. The Operator also takes readings of the curing piles that are maturing in the maturation building. The spreadsheet for the weekly readings of the compost temperatures and all the weekly reports for the snapshots of tunnel temperatures are available upon request. Temperature monitoring logs of the tunnels at the composting facility show that pasteurisation at 55°C was maintained for 72 hours.

2.4 Site Operation Recommendations

There were no confirmed deficiencies/non-compliance or environmental/operational issues related to the compost facility in 2021 as per condition 63(8)(c) and 52(f). The facility is operating as designed.

3. Category A = Unrestricted use. Compost that can be used in any application (i.e., agricultural, residential gardens, horticultural operations, nursery industry, other businesses. AA type of compost is more restrictive with regard to contamination by foreign matter.
4. CCME = Canadian Council of Ministers of the Environment, 2005: Guidelines for Compost Quality, PN 1340.

2.5 Compliance with the Conditions of the Certificate of Approval

Section N, 52(a) refers to reporting requirements associated with the Composting site. Condition 63 (8)(m) of this Section requires:

> A condition-by-condition analysis of compliance with all Conditions of this Certificate.

Based on a review of the 2021 information provided by the City, there are no non-compliance issues for 2021.

The City provided the following statement with respect to this condition:

> The Deputy CAO of Infrastructure, Development and Enterprise Services, the General Manager of Environmental Services and the Division Manager of Solid Waste Resources continue to put a very high priority on compliance with applicable laws. Staff training continues to be provided both in-house and by external providers, and included inspections, reporting, due diligence, environmental regulations, competent person, contingency plans, emergency procedures, ECA conditions, spills, TDGA, laboratory packing, site specific Health and Safety and other relevant topics.

3. Municipal Hazardous and Special Waste (MHSW) Operations

The Municipal Hazardous Special Waste (MHSW) screening procedures and acceptance criteria has been fully discussed in the 2015 Annual Report (AECOM, 2016). As required by the City, all MHSW employees must be trained in WHMIS, TDG, Spills Response, Competent Person, and First Aid.

The Annual Review for 2021, has shown that all operations at the Municipal Hazardous and Special Waste Transfer Station were done in accordance with Conditions 41, 42, 43 and 44 of the ECA. Only wastes outlined in the ECA, 42(a), were collected and transferred and the site did not store more than 15 tonnes of materials. The City ensured that a competent person was on duty at all times during operating hours and inspections were completed daily. As per the requirement of Condition 43(f), a fire and explosion prevention inspection was carried out in 2021 which included checking all fire extinguishers on site and revising the fire safety plan such that Conditions 43(d) and 43(e) were met.

4. Waste Transfer Station Operations

4.1 Facility Inspection and Routine Maintenance

The following information was reported by the City of Guelph. The facility is inspected on an ongoing basis by site employees. Corrective maintenance is carried out as required. There were no environmental or operational problems reported during 2021.

A log of all security and grounds inspections are recorded daily. Routine maintenance is conducted at the site that includes litter pick-up, dust control, rodent control and clean-up of external roads within 1 km of the facility. The compactor is cleaned and inspected monthly when in use. Inspection of the inside floor drains, oil and grit separator, etc., are conducted weekly. The floor drain in the loading ramp is pumped and cleaned as required. Maintenance was conducted on the holding tanks, floor drains and oil and grit separator as required. The overhead doors are oiled monthly. All preventative maintenance performed on equipment are filed under the equipment number (hard copy) as well as recorded electronically in the Oracle WAM program to indicate that the required maintenance has been completed.

A log book recording the daily inspection of the detention ponds, ditches and facility inspections is kept on-site. Daily inspections were recorded in 2021. The City undertakes daily inspections of the stormwater (SWM) facilities on site and completes maintenance, as needed. City has confirmed that maintenance schedules for the SWM facilities on the Waste Resource Innovation Centre site are reviewed annually and updated as needed (Condition 5(7)). An annual inspection of the stormwater facilities was conducted by City staff in December 2021. The Ministry conducted an inspection of the storm facilities in 2020, the report of which is included in **Appendix F**.

4.2 Contaminant Sources

4.2.1 Site Design and Operations

To determine if the site is having an impact on the ground and surface water in the area, it is important to examine what are the potential sources of impact. The site has been designed to minimize the possible sources of impacts and limit the risk of their emission to the environment, as discussed below.

Waste is dumped from incoming collection vehicles onto an indoor tipping floor located within the transfer building. The transfer building is a steel framed, metal clad building with a reinforced, surface-hardened slab-on-grade floor. The tipping floor is curbed such that liquid discharges onto the floor cannot readily flow off the floor to the building

exterior. It is drained by floor drains and routed through an oil-water separator, with the provision to divert flows to holding tanks prior to reaching the pumping station through the sanitary sewer. Spill cleanup materials (e.g., sorbents) are kept on hand and any liquid spills on the tipping floor are cleaned up immediately. Washing of spilled materials into the floor drain system is avoided to the greatest degree possible. In the event of any potential for leachate or liquid discharge from the building, the shut-off valve for the stormwater management pond will be closed to prevent any off-site discharge.

No waste processing is undertaken in the Transfer Station, with the exception of removal of recyclable material that arrives in incoming wastes (i.e., metal, wood, cardboard). Truck boxes (both incoming waste and transfers out) are tarped when outside of the transfer building to prevent odour and dust emissions as well as to prevent contact between the waste and precipitation that could potentially produce impacted runoff.

The Transfer Station building and the scale house are serviced with a connection to the City sanitary sewer. Domestic sewage from the washrooms in the transfer building and the scale house are discharged directly to the sewage pumping station. The stormwater management pond has a valved connection to the pumping station, which will permit any stormwater that becomes impacted to be discharged to the sanitary sewer system. The site is graded such that all runoff drains to the stormwater management pond. As all waste handling occurs within the Transfer Station building, runoff from the site will be initially considered to be unimpacted.

Ditches are located on both sides of the driveway to collect road runoff and to convey upstream runoff to the pond. A culvert conveys flow from the ditch on the west side of the driveway to the ditch on the east side and ultimately to the pond. MECP approved dust suppressant and road salt for the internal paved areas may be used occasionally.

A Public Drop Off (PDO) facility was added to the site in 2015. There have been no changes to the Engineer’s Report since the last annual report.

5. Incoming and Outgoing Waste and/or Recyclables

5.1 Summary of Incoming Materials

As per Section N, Condition 52(b) of the amended ECA **Table 3** nis a monthly summary of the incoming materials received at the site during 2021, based on data recorded by City staff.

As shown on **Table 3,** 97,760.5 tonnes of material were received by the site. The compost facility received 31,349.6 tonnes of organics. Recyclables and mixed dry materials constituted 13,016 tonnes (13.3%)[5] of the total materials received at the site. This included about 11,039 tonnes of paper products[6].

Table 3: 2021 Monthly Summary of Incoming Material

Transfer Station Incoming Material

Incoming Material	Jan Tonnes	Feb Tonnes	March Tonnes	Apr Tonnes	May Tonnes	June Tonnes	July Tonnes	Aug Tonnes	Sept Tonnes	Oct Tonnes	Nov Tonnes	Dec Tonnes	Total YR
Mixed Solid Waste	3,127.0	2,852.0	4,170.0	4,459.0	4,541.0	4,464.0	4,166.0	4,237.0	4,209.0	4,241.0	4,117.0	3,309.0	47,892.0
Mixed Glass Residue	33.0	36.0	48.0	49.0	53.0	61.0	49.0	24.0	1.0	34.0	33.0	42.0	463.0
MRF Residue	123.4	108.3	128.1	124.7	115.8	115.8	121.6	96.5	104.6	97.9	93.6	126.1	1,356.4
													0.0
													0.0
													0.0
Single Stream - Loose													0.0
Mixed Reclables													0.0
													0.0
													0.0
Residual Compost Waste	43.3	20.5	46.8	11.3	33.2	33.9	24.9	0.0	41.6	19.7	31.6	32.9	339.7
													0.0
Screening Waste	34.6	22.6	38.3	34.3	36.3	26.8	44.0	4.8	33.0	21.2	27.3	32.6	355.8
													0.0
Leaves													0.0
Organic Rejected Load		5.7	3.7	4.8	3.0	34.9	8.6	3.9					64.7
Occ - Loose													0.0
Yardwaste													0.0
Mixed Papers													0.0
Asphalt Shingles Non Seg	1.8	1.4	4.0	17.6	32.3	20.6	22.7	48.6	107.1	71.9	28.5	29.9	386.5
Brush													0.0
													0.0
													0.0
													0.0
													0.0
													0.0
Overs													0.0
Total Month	3,363.1	3,046.5	4,438.9	4,700.7	4,814.6	4,757.0	4,436.8	4,414.8	4,496.3	4,485.7	4,331.0	3,572.5	50,858.1

5. Paper incoming (11,039 tonnes)+ plastic incoming (0 tonnes)+ other recyclable incoming to the Transfer Station and the WRIC (1,977 tonnes) = 13,016 tonnes
6. Incoming mixed papers (165.6 tonnes) + OCC baled (0 tonnes) + OCC loose (1,133.5 tonnes) + OWP Fine-Loose (222.3 tonnes)+ ONP#8 bales (0 tonnes) + OWP fine loose (0 tonnes) + single stream loose (9,315.3 tonnes) = 11,038.7 tonnes

MRF Recycling /PDO Facility Incoming Material

Incoming Material	Jan Tonnes	Feb Tonnes	March Tonnes	Apr Tonnes	May Tonnes	June Tonnes	July Tonnes	Aug Tonnes	Sept Tonnes	Oct Tonnes	Nov Tonnes	Dec Tonnes	Total YR
Aluminum - Loose													0.0
Brush	0.1	0.9	9.5	10.7	15.9	18.8	10.4	22.0	9.7	9.8	14.0	5.6	127.4
Clothing													0.0
Containers	9.1	7.6	9.9	13.2	13.4	14.5	11.7	14.5	10.9	12.3	12.8	13.4	143.3
Electronics													0.0
Empty Oil Containers													0.0
HDPE #2													0.0
Leaves											8.8		8.8
Mixed Glass													0.0
Mixed Papers	10.5	10.7	21.5	13.5	11.3	16.5	11.7	14.6	12.0	11.7	14.8	16.7	165.6
Mixed Plastics													0.0
Mixed Recyclables													0.0
Non-Ferrous Metal													0.0
OCC - Baled													0.0
OCC - Loose	112.1	86.4	133.4	95.6	88.3	118.7	111.7	134.5	104.0	87.3	132.4	131.1	1,335.5
ONP#6 Baled													0.0
ONP#6 Loose													0.0
ONP#8 Bales													0.0
ONP#8 Loose													0.0
OWP/Fine - loose	23.4	24.0	24.3	14.6	13.6	9.8	19.7	14.5	14.3	13.4	24.0	26.7	222.3
Plastic Film - PDO Bin													0.0
PET #1													0.0
Polycoat/Tetra Pak/Cartons													0.0
Scrap Metal													0.0
Single Stream Loose	795.5	694.8	817.8	806.3	778.9	736.5	770.8	729.2	807.9	754.0	794.1	829.5	9,315.3
Shingles	4.9	4.1	13.9	63.3	98.6	117.0	77.4	70.5	92.6	77.1	74.7	20.2	714.3
Drywall	6.8	6.4	6.9	20.0	20.2	31.7	24.2	14.7	20.5	18.3	18.4	5.3	193.4
Rubble/Brick/Toilets	11.6	13.1	26.8	154.4	61.5	45.5	58.7	27.8	37.3	24.1	24.2	14.4	499.4
Clean Wood	1.0	2.0	2.1	1.3	1.2	3.0	8.6	5.2	1.6	4.9	1.8	6.9	39.6
Tires													0.0
Yardwaste	20.7	6.0	214.6	690.9	790.6	575.8	491.4	435.7	441.0	666.6	946.6	87.6	5,367.5
Total Month	995.7	856.0	1,280.7	1,883.8	1,893.5	1,687.8	1,596.3	1,483.2	1,551.8	1,679.5	2,066.6	1,157.4	18,132.4

Organics Compost Facility Incoming Material

Incoming Material	Jan Tonnes	Feb Tonnes	March Tonnes	Apr Tonnes	May Tonnes	June Tonnes	July Tonnes	Aug Tonnes	Sept Tonnes	Oct Tonnes	Nov Tonnes	Dec Tonnes	Total YR
Mixed Organics	2564.4	1,972.2	2,592.2	2,651.9	2,736.7	2,706.2	2,564.0	2,655.0	2,860.9	2,488.0	2,453.0	2,405.0	30,649.5
Paper Fiber Sludge													0.0
Brush													0.0
Ammendmant/Mulch	64.6	96.3	114.5	97.1	29.4	120.9	22.3	48.7	43.3	23.4	39.7	0.0	700.1
Total Month	2,629.0	2,068.5	2,706.7	2,749.0	2,766.1	2,827.1	2,586.3	2,703.7	2,904.2	2,511.4	2,492.7	2,405.0	31,349.6

Facility Totals	100,340.1
Residue from MRF and Organic Pla	2,579.6
Overall Site Total	97,760.5

Notes: All volumes in tonnes
MRF = Materials Recovery Facility
PDO = Public Drop Off
Single Stream = all recyclable products mixed together (bottles, cans, paper, cardboard, etc.)
OCC = Old Corrugated Cardboard
OWP = Office Waste Paper (also known as Fine paper)
Overs or residual compost waste = a type of residue created during the composting process.
Overall Site Total = (Transfer Station Annual Tonnage + WRIC Annul Tonnage + Compost Facility Annual Tonnage) - (Transfer Station Residue from MRF and Organics)

There were 5,504 tonnes[7] (5.6%) brush, leaves, yard waste and mixed organics received. Non-recyclable materials (mixed solid waste and organic rejected materials) constituted 47,956.7892 tonnes (49%) of the total materials received at the site in 2021. 39.6 tonnes of clean wood were accepted at the MRF Recycling /PDO Facility.

7. Incoming mixed organics (0 tonnes) + leaves (8.8 tonnes) + yard waste (5,367.5 tonnes) + brush (127.4 tonnes) = 5,503.7 tonnes

The on-site Municipal Hazardous Special Waste (MHSW) depot serves residents of the City of Guelph. The depot accepted 19,099 drop offs of materials during 2021. A monthly summary of the 2021 drop off numbers are shown on the Table 4.

Table 4: Monthly Summary

Public	Drop Offs
January	933
February	860
March	1788
April	1681
May	2017
June	1,883
July	1,874
August	1,838
September	1,764
October	1,690
November	1,642
December	1,129
Totals	**19,099**

Incoming MHSW is sent to hazardous waste haulers for disposal or recycling. The City's Paint Plus Re-Use Program was conducted between April 12 and October 9, 2021, accepting 3,411 L and 347 kg of materials from 279 clients. A monthly summary of the amounts of MHSW (separated by waste class) received at the site for the Paint Plus Re-Use Program for 2021 are tabulated below.

Table 5: Monthly Summary of the Amounts of MHSW (separated by waste class)

Material/Month	Apr	May	Jun	Jul	Aug	Sept	Oct	Total
Paints and coatings Non-aerosol; #145 (L)	261	418	413	544	533	419	180	2,768
Paints and coatings Aerosol; # 331(kg)	11	30	54	31	16	34	14	190
Solvents # 213 (L)	11	12	8	24	19	5	4	83
Antifreeze (L)	1	16	7	3	8	5	3	43
Propane Cylinders (kg)		2						2
Cleaners/Detergents #148 (L)	6	22	24	16	17	32	19	136
Car products #213 (L)	28	20	16	31	30	28	15	168
Non-paint aerosols #331 (kg)	14	11	19	8	19	20	4	95
Motor Oil (L)	38	39	67	14	14	23	18	213
Plaster/cement/Grout (kg)	7	4	8	5	13	11	12	60
Client Count	**26**	**49**	**56**	**50**	**51**	**35**	**12**	**279**

A total of about 199,081 L and 12,337 kg of municipal and household special wastes[8] were received in 2021. In addition, 1,003 20-lb. propane tanks, 3,703 1-lb. propane cylinders and 7,630 (16,867 ft.) fluorescent tubes were received in 2021. All materials accepted at the MHSW depot are re-used, recycled or shipped off-site for disposal.

As shown on **Table 3**, the source of the bulk of the materials received was primarily mixed solid waste of domestic origin. Recyclables accepted by the MRF/PDO originated mainly from the City of Guelph and the remaining sources from other areas in Ontario. Materials accepted at the Transfer Station were mainly from the City of Guelph, consisting mainly of mixed solid waste. The Transfer Station can accept waste from anywhere in Ontario, New York and Michigan States as long as it is within the acceptable daily tonnage limit.

There were no rejected and no suspect loads received during 2021.

5.2 Summary of Wastes/Recyclables Processed and Outgoing

Materials that are accepted by the site are either processed (composted), diverted to be re-used or sent to the Waste Transfer Station for disposal. Section N, Condition 52(c) requires monthly reporting of processed materials from the site, which are presented on **Table 6**. Of the 75,195 tonnes of outgoing material, 13,133 tonnes (17.5%)[9] is processed on-site through the Material Recovery facility (MRF) and 7,045.5 tonnes of finished compost was produced. 1,628.4 tonnes of residual compost waste and overs from the organic compost plant was generated in 2021. 50,691.4 tonnes of non-recyclable materials were shipped off-site from the transfer station to other destinations. In 2021, the MHSW facility received and diverted a total of about 199,081 L and 12,337 kg of municipal and household special wastes, in addition to 1,003 20 lb. propane tanks, 3,703 1-lb. propane cylinders and 7,630 (16,867 ft.) fluorescent tubes.

8. Litres of cooking oil, MEK peroxide and mercury and kilograms of sharps, batteries (household), fire extinguishers, compressed gas, oxygen (welding), expanding foam
9. Total of 17,988.8 tonnes outgoing from the WRIC – 463 tonnes mixed glass residue – 1,356.4 tonnes residue from processing – 3,036.6 tonnes mixed solid waste (baled) shipped to Twin Creeks Landfill = 13,132.7 tonnes.

Table 6: 2021 Monthly Summary of Outgoing Materials

Transfer Station Outgoing Material

Outgoing Mixed Waste	Jan Tonnes	Feb Tonnes	March Tonnes	Apr Tonnes	May Tonnes	June Tonnes	July Tonnes	Aug Tonnes	Sept Tonnes	Oct Tonnes	Nov Tonnes	Dec Tonnes	Total YR
Mixed Solid Waste	3,191.0	3,062.4	4,259.7	4,868.7	4,720.0	4,911.7	4,333.5	4,524.4	4,547.0	4,367.0	4,385.0	3,521.0	50,691.4
Single Stream (returned to MRF)													0.0
Mixed Recyclables (Single Stream)													0.0
C & D													0.0
													0.0
													0.0
													0.0
													0.0
Total Month	3,191.0	3,062.4	4,259.7	4,868.7	4,720.0	4,911.7	4,333.5	4,524.4	4,547.0	4,367.0	4,385.0	3,521.0	50,691.4

MRF Recycling /PDO Facility Outgoing Material

Outgoing Mixed Waste	Jan Tonnes	Feb Tonnes	March Tonnes	Apr Tonnes	May Tonnes	June Tonnes	July Tonnes	Aug Tonnes	Sept Tonnes	Oct Tonnes	Nov Tonnes	Dec Tonnes	Total YR
Shingles			47.5	67.2	66.4	129.9	67.1	95.7	65.7	31.5	123.2		694.3
Clean Wood	14.5				10.5		12.1		10.9	11.7			59.8
Drywall		26.4		28.8	37.1	19.1	44.7		25.2	44.5		21.8	247.6
Concrete, Rubble			18.0	216.6	68.1	36.1	58.3	55.3	43.9		41.7	23.4	561.4
Empty Oil Containers													0.0
Mixed Glass Residue	33.0	36.0	48.0	49.0	53.0	61.0	49.0	24.0	1.0	34.0	33.0	42.0	463.0
Aluminum	24.2	5.2	17.6	5.5	22.2	2.7	27.7	26.7	5.1	24.2	19.7	6.8	187.6
HDPE#2 - BALED		16.8				16.3		9.2	9.9	19.5		18.8	90.5
Mixed Glass	76.9	45.8	64.0	46.7	84.8	61.9	33.2	38.7	66.1	73.6	46.0	70.2	707.9
Mixed Paper								115.0	155.9	195.0	217.4	218.4	901.7
Mixed Recyclables													0.0
Baled MSW from MRF	268.5	316.5	350.7	355.3	284.1	231.0	197.0	228.2	192.9	221.1	164.7	226.7	3,036.6
Non Ferrous Metal				1.2		1.1	0.7	1.0		1.3	1.3	1.4	8.0
OCC	239.9	221.6	195.6	194.4	237.0	153.0	239.8	231.1	206.0	265.2	167.5	137.4	2,488.4
ONP #6 Baled													0.0
ONP #8 Baled													0.0
ONP#7 Baled													0.0
OWP/Fine Paper	37.1	18.6	17.9	46.6	0.0	17.3	17.7	17.4	0.0	18.6	19.8	20.6	231.6
PET #1	37.8	19.3	37.8	37.4	35.5	36.3	19.6	39.2	39.8	40.6	40.2	38.8	422.3
PLASTIC FILM - BALED													0.0
Polycoat/Tetra Pak													0.0
Steel Cans Baled	20.1	20.0	38.3	20.2	28.1	38.5		40.2	19.3	41.7	19.4	20.1	305.9
Residue (from processing)	123.4	108.3	128.1	124.7	115.8	115.8	121.6	96.5	104.6	97.9	93.6	126.1	1,356.4
Tubs and Lids								6.5	9.2				15.7
Single Stream Baled													0.0
Scrap Metal	57.9	17.2	30.4	54.7	15.4	58.5	34.2	32.3	44.0	46.3	24.8	30.4	445.8
Electronics	23.4	13.3	17.7	0.0	2.6	7.4	15.3	6.8	12.4	6.9	19.8	16.9	142.5
Clothing	1.0	0.9	1.8	1.5	3.0	1.7	2.0	1.3	1.5	1.1	1.6	1.4	18.7
Brush													0.0
Yard Waste	56.4	0.0	216.5	765.2	674.9	686.2	499.8	412.1	460.3	670.0	1,024.2	137.7	5,603.3
Total Month	1,014.2	865.8	1,229.9	2,014.9	1,738.5	1,673.7	1,439.7	1,477.2	1,473.5	1,844.7	2,057.9	1,158.9	17,988.8

Organics Compost Facility Outgoing Material

Outgoing Mixed Waste	Jan Tonnes	Feb Tonnes	March Tonnes	Apr Tonnes	May Tonnes	June Tonnes	July Tonnes	Aug Tonnes	Sept Tonnes	Oct Tonnes	Nov Tonnes	Dec Tonnes	Total YR
Finished Compost	0.0	1,044.2	721.4	543.8	623.2	728.5	363.3	981.0	398.2	526.3	363.9	751.6	7,045.5
Overs	63.5	32.1	70.8	102.4	0.0	102.8	347.8	537.8	31.6	0.0	0.0	0.0	1,288.7
Screening Waste	34.6	22.6	38.3	34.3	36.3	26.8	44.0	4.8	33.0	21.2	27.3	32.6	355.8
Residual Compost Waste	43.3	20.5	46.8	11.3	33.2	33.9	24.9	0.0	41.6	19.7	31.6	32.9	339.7
Organic Rejected Load		5.7	3.7	4.8	3.0	34.9	8.6	3.9					64.7
Total Month	141.4	1,119.4	877.3	691.8	692.7	892.0	780.0	1,523.6	504.4	567.2	422.8	817.1	9,094.4

Facility Totals	77,774.6
MRF & Organic Residue to Site Tran	2,579.6
Overall Site Total	75,195.0

For 2021, we have based the incoming, outgoing and processed quantities on the 2021 weigh scale readings. Outbound residual compost waste from the organics facility (340 tonnes) was included in the outbound tonnage from the transfer station. **Table 7** is an estimated reconciliation of the incoming and outgoing materials and materials processed from the site in 2021.

Table 7: Summary of Incoming, Outgoing and Processed Quantities

2021	Inbound Tonnage	Outbound Tonnage	Remaining On-site in process	Difference Between Inbound and Outbound Tonnage plus tonnage remaining on-site
Transfer Station	50,858	50,691		167
MRF Recycling/PDO Facility	18,132	17,989		144
Compost Facility	31,350	9,094	8,500	13,642
2021 Overall Site Total	**100,340**	**77,775**		**13,952**

There is a difference of about 13,952 tonnes between incoming and outgoing wastes/materials calculated for 2021, attributed to moisture loss and margin of error. Materials received at the organics compost facility are much heavier due to moisture retention compared to when it leaves the site in a processed, dry and degraded state. The City estimates that there is approximately 8,500 tonnes at any point in time processing in the compost facility (tunnels, mat hall and overs). Taking this in consideration, there is a moisture loss of approximately 13,000 tonnes due to evaporation from within the organic waste, which explains the difference between the weights.

Table 6 shows a monthly summary of the outgoing materials shipped off-site during 2021 as per Section N, Condition 52(d) of the amended ECA. Of the 50,691.4 tonnes of non-processed outgoing materials from the Transfer Station, 50,691.4 tonnes (100% of the outgoing materials) were sent to the Waste Management Twin Creeks Landfill in Lambton County.

In 2021, 13,132.7 tonnes of marketable processed material were transferred off the site from the Waste Resource Innovation Centre (MRF/PDO) facility. 3,621.7 tonnes (28%) were paper-based goods such as cardboard and newsprint, 5,606.3 tonnes (43%) was organics, 512.7 tonnes (4%) was plastics and the remaining 3,395.1 tonnes (26%) was other recyclable materials such as aluminum, steel cans, glass, tires and metal. As reflected in the volumes above, the majority of the marketable materials sold were paper products.

The Waste Resource Innovation Centre achieved a 42% overall diversion rate[10] in 2021.

Outgoing municipal and household hazardous waste materials were manifested to Photech Environmental, Thorold (the waste removal contractor for 2021) and disposed of by the companies identified in **Table 8** for recycling and re-use.

10. Diversion rate = Material to the landfill (50,691.4 tonnes outbound from transfer station + 4,856 tonnes outbound residue and baled MSW from MRF + 760.2 tonnes screening, residual and rejected from organics facility = 56,307.7 tonnes). Overall material inbound to the site (97,760.5 tonnes). Therefore, diverted amount 97,760.5 tonnes – 56,307.7 tonnes = 41,452.8 tonnes; (41,452.8 tonnes/97,760.5 tonnes) x 100 = 42.4%

Table 8: Waste Receivers

Waste Types	List of Intended Receivers
Paints	■ Photech Environmental Solutions Inc.
Oil Filters	■ Safety Kleen, Breslau, ON
Bulk Oil/Antifreeze	■ Safety Kleen, Breslau, ON
Pesticides	■ Clean Harbours, Thorold, ON
Pharmaceuticals	■ Phase Separation Solutions
Oxidizers/Acids/Bases	■ Stablex Canada Inc., Quebec
Pathological Wastes/Syringes	■ Stericycle, Toronto, ON
Car Batteries	■ Benmet Steel & Metal
Fluorescent Tubes/Compact Fluorescent Lights (cfls)	■ Greentec
Household Batteries/Mercury	■ Raw Materials Corp.
Propane Tanks	■ Simcoe Energy & Technical Services
Aerosols	■ Peintures Recuperees Du Quebec
Organics/Flammables	■ Newalta Industrial Services Inc., ON

Destinations/buyers for dry recyclable processed materials are listed in **Table 9**.

Table 9: Major Buyers of Dry Recyclable Processed Materials

Material Type	Destinations/Major Buyers
Mixed Solid Waste	■ Twin Creeks Landfill, Watford
Bagged Yard Waste and Brush	■ Try Recycling
PET Bottles (#1 plastics)	■ ReMM, Canadian Plastics, GFL Environmental
HDPE (#2 plastics)	■ GFL, Canadian Plastics, Pnewko Brothers
Mixed Plastics(#4,5,7)	■ GFL, Canadian Plastics,
Aluminum Cans	■ Triple M Metals, Ram Iron and Metals, the Beer Store
Corrugated Cardboard	■ ReMM, Continental Grading, GFL Environmental
Newsprint	■ Continental Paper Grading, GFL Environmental, ReMM
Steel Cans	■ Triple M Metals RAM Iron and Metal
Polycoat: Tetra Pak & Milk Cartons	■ Continental Paper Grading
Mixed Glass	■ Nexcycle
Scrap Metal/White Goods	■ Triple M Metals, Ben- Met
Electronics	■ Greentec
Used Clothing	■ Canadian Diabetes Society
Shingles	■ GFL
Clean Wood (lumber)	■ Budget Environmental Disposal Ltd.
Drywall	■ New West Gypsum
Concrete/Brick/Rubble/Toilets	■ D&J Lockhart
Finished Compost	■ Guelph, Huron County, Simcoe, Eramosa, Clinton and Blyth

6. Groundwater and Surface Water Monitoring Program

6.1 Groundwater Monitoring Program

Groundwater levels are measured at all monitoring locations on a quarterly basis each year. During 2021, groundwater level measurements were conducted on; April 27, June 1, September 14 and December 1. As per Condition 5 of the ECA #9496-9NFKJ9, groundwater sampling was conducted on a semi-annual basis in the spring and fall in 2021; in June (dry period, late spring) and in December (wet period, late fall). Each of the 2021 sampling events included analyses for leachate indicator parameters, general chemistry and organics. **Table 10** and **Table 11** summarize the groundwater monitoring program and analytical parameters, respectively.

Table 10: Groundwater Monitoring Program

Location	April	June	September	December
13a-01	W	S	W	S
13b-01	W	S	W	S
14a-01	W	S	W	S
14b-01	W	S	W	S
15a-01	W	S	W	S
15b-01	W	S	W	S
16a-08	W	S	W	S
16b-08	W	S	W	S
17a-08	W	S	W	S
17b-08	W	S	W	S
18a-14*	W	S	W	S
18b-14	W	S	W	S
19a-08	W	S	W	S
19b-08	W	S	W	S
20a-08	W	S	W	S
20b-08	W	S	W	S
21-08	W	S	W	S
22a-11	W	S	W	S
22b-11	W	S	W	S
23a-12	W	S	W	S
23b-12	W	S	W	S

Notes: W = Water Levels Only / S = Sampling and Water Levels
1 = BH18-08 was replaced in 2014 therefore was re-named 18-14
2 = BH12-00 was replaced with BH21-13

Table 11: Analytical Parameter List

Analysis Groups	Parameters
Leachate Indicator Parameters	■ Biological Oxygen Demand (BOD) ■ Chemical Oxygen Demand (COD) ■ Total Kjeldahl Nitrogen (TKN) ■ Ammonia as Nitrogen (NH3-N) ■ Total Phosphorus (Total P) ■ Total Suspended Solids (TSS) for surface water and leachate only ■ Total Sulphate (SO4) ■ Phenols ■ Chloride (Cl) ■ Sodium (Na) ■ Calcium (Ca) ■ Boron (B) ■ Total Iron (Fe) ■ Phosphorus (P) ■ Zinc (Zn) ■ Nitrate (NO3) and Nitrite (NO2)
General Parameters	■ pH ■ Conductivity ■ Alkalinity ■ Magnesium (Mg) ■ Potassium (K)
Field Parameters	■ pH ■ Conductivity ■ Temperature
Organics	■ EPA 624,625 (ATG 16+17+18 & ATG 19+20)

The organic compound parameter list for the ATG MISA Groups are show in **Table 12**.

Groundwater monitoring was conducted at all locations in June and December 2021. The results of the groundwater monitoring are discussed in Sections 8.4 to 8.7.

Groundwater monitors are inspected during each of the monitoring events and their condition recorded by field staff. If any monitor is found to be damaged or in need of maintenance, a work order is submitted for repairs and repairs are completed as soon as possible. Despite attempts to protect the well casings during the demolition of the Subor building, BH12A-00 and 12B-00 were damaged. Both monitors were subsequently decommissioned by a licenced well driller and replacement monitors BH21A-13 and BH21B-13 were installed approximate 40 meters to the southwest.

Table 12: Organic Compound Parameters

Misa Group 16	Misa Group 19	Misa Group 17	Misa Group 18	Misa Group 20
■ 1,1,2,2-Tetrachloroethane ■ 1,1,2-Trichloroethane ■ 1,1-Dichloroethane ■ 1,1-Dichloroethylene ■ 1,2-Dichlorobenzene ■ 1,2-Dichloroethane ■ 1,2-Dichloropropane ■ 1,3-Dichlorobenzene ■ 1,4-Dichlorobenzene ■ Bromodichloromethane ■ Bromoform ■ Bromomethane ■ Carbon Tetrachloride ■ Chlorobenzene ■ Chloroform ■ Chloromethane ■ Cis-1,3-Dichloropropylene ■ Dibromochloromethane ■ 1,2-Dibromoethane ■ Methylene Chloride ■ Tetrachloroethylene ■ trans-1,2-Dichloroethylene ■ Trans-1,3-Dichloropropylene ■ Trichloroethylene ■ Trichlorofluoromethane ■ Vinyl chloride	■ Acenaphthene ■ 5-Nitroacenaphthene ■ Acenaphthylene ■ Anthracene ■ Benzo(a)anthracene ■ Benzo(a)Pyrene ■ Benzo(b)Fluoranthene ■ Benzo(g,h,i)perylene ■ Benzo(k)Fluoranthene ■ Biphenyl ■ Camphene ■ 1-Chloronaphthalene ■ 2-Chloronaphthalene ■ Chrysene ■ Dibenzo(a,h)Anthracene ■ Fluoranthene ■ Fluorene ■ Indeno(1,2,3-cd)Pyrene ■ Indole ■ 1-Methylnaphthalene ■ 2-Methylnaphthalene ■ Naphthalene ■ Perylene ■ Phenanthrene ■ Pyrene ■ Benzyl Butyl Phthalate ■ bis(2-ethylhexyl)Phthalate ■ Di-N-butylPhthalate ■ Di-N-octylPhthalate ■ 4-Bromophenyl phenyl Ether ■ 4-Chlorophenyl Phenyl Ether ■ bis(2-chloroisopropyl)Ether ■ bis(2-Chloroethyl)Ether ■ Diphenyl ether ■ 2,4-Dinitrotoluene ■ 2,6-Dinitrotoluene ■ bis(2-chloroethoxy)Methane ■ Diphenylamine ■ N-Nitrosodiphenylamine ■ N-Nitrosodi-N-propylamine	■ Benzene ■ Ethylbenzene ■ Styrene ■ Toluene ■ o-Xylene ■ m-Xylene and p-Xylene	■ Acrolein ■ Acrylonitrile	■ 2,3,4,5-Tetrachlorophenol ■ 2,3,4,6-Tetrachlorophenol ■ 2,3,5,6-Tetrachlorophenol ■ 2,3,4-Trichlorophenol ■ 2,3,5-Trichlorophenol ■ 2,4,5-Trichlorophenol ■ 2,4,6-Trichlorophenol ■ 2,4-Dimethylphenol ■ 2,4-Dinitrophenol ■2,4-Dichlorophenol ■ 2,6-Dichlorophenol ■ 4,6-Dinitro-o-Cresol ■ 2-Chlorophenol ■ 4-Chloro-3-methylphenol ■ 4-Nitrophenol ■ m-,p-Cresol ■ o-Cresol ■ Pentachlorophenol ■ Phenol

6.2 Surface Water Monitoring Program

The surface water monitoring program for the site is outlined in the ECA in Conditions 5 (2) (parameter list) and Condition 5 (3) of ECA #9496-9NFKJ9, for the final off-site surface water station (stormwater management pond - TP1(Out)) and in the Follow-up Response to Ministry of the Environment Comments on the Surface Water Monitoring Program and Proposed Action Plan, dated December 3, 2013 (Appendix E) for the Wet/Dry property. These monitoring programs are discussed below.

As requested by the MECP, a revised surface monitoring program was recommended for the Waste Resource Innovation Centre in December 2013. A summary of the response to the MECP, including the revised monitoring are provided in Section 8.9. On March 6, 2014, the City met with the MECP to discuss the Public Drop off facility (PDO) application. It was agreed that sampling at the Waste Resource Innovation Centre Detention Pond 1 (SW 2 and SW 3) would be discontinued. Detention Pond 2 (SW1) would only be sampled once the levels in the pond reached 0.46 m above the pond invert and that the SWM pond (TP1(out)) would continue to be sampled monthly. The pond was dry in 2021 with the exception of September 8, 2021 when the pond level was measured at 0.25 m, as this was below the 0.46 m trigger no sample was collected. No discharge occurred in 2021. The results of the surface water monitoring are discussed in Section 8.8.

Surface water sampling is undertaken on a monthly basis in the East pond (SWM) for the parameters (excluding organics) shown in Table 1. Organic sampling of the East pond surface water station was conducted on June 29, 2021. During each month, sampling was undertaken with the exception of February when thick ice prevented sampling. Measurements of discharge, surface water runoff events and overall conditions of the detention ponds (e.g., dry, or stagnant water) is documented on a weekly basis throughout each month. One surface water station in the SWM pond was monitored by the City staff in 2021; TP1 (out), located at the discharge at the north end of the pond. 2021 monthly inorganic monitoring was conducted at TP1(out) in January and from March to December (11 events). TP1(out) was not sampled in February due to ice/snow cover. Organic sampling was conducted at TP1(out) on June 9. As per condition 5 (3), TP1(out) surface water sampling is also to include at least three wet events per year (as defined by 15 mm of rain in the previous 24 hours) of which two must occur within May to September for Total Suspended Solids (TSS). This sampling was completed during the June 9, July 9, and September 8, 2021 monitoring events. There were no wet events in May and August.

The existing surface water pond (“East Pond” in **Figure 1**) was sampled in January and from March to December (for inorganic parameters shown on Table 1). The East Pond

was not sampled in February due to ice/snow cover. The East Pond setting is similar to the other on-site ponds (influenced by road salting) though it is within a different catchment area. As suggested by the MECP, surface water quality from the samples collected from the in the East Pond (designated EPTS-01) can be considered as background surface water quality as it is upstream of both facilities[11] and is used as comparison to the on-site surface water features.

A ditch located between the stormwater management pond and the East Pond is designed to receive pond overflow and direct it in a northwesterly direction beneath Dunlop Drive.

11. Memorandum from Lynnette Latulippe (MOECC) to Bill Shields (City of Guelph), Re: Annual Monitoring Report – 2009 Guelph Wet-Dry Recycling Centre and Waste Transfer Station, dated February 7, 2011.

7. Leachate Quality

7.1 Leachate Indicators

To determine the potential leachate quality that may be generated from the site, the leachate quality from the City of Guelph closed Eastview Road Landfill was examined. Prior to closure in 2003, this landfill accepted a similar mix of waste as the Transfer Station. Groundwater monitoring has been routinely conducted on this site since 1991. Leachate quality is measured by a series of groundwater monitors in the waste and in the outwash layer beneath the waste. In general, the leachate quality is characterized by elevated concentrations of chloride, boron, phenols (critical leachate parameters), sodium, potassium, magnesium, iron, manganese, ammonia and alkalinity (leachate indicator parameters). Though monitoring continues at the site, leachate quality up to 2009 was only considered since leachate strength is expected to decrease over time with closure of the landfill. Table 13 provides a summary of the historic leachate concentrations (1997 to 2009) for the leachate monitors.

Table 13: Summary of Leachate Quality from the Waste Monitors, Eastview Landfill

Parameter Groups	Parameters	Avg.	Min.	Max.
General	■ pH	7.68	7.09	8.63
General	■ Conductivity (µS)	14,364	3,880	21,500
General	■ Alkalinity (mg/L)	6,195	2,900	9,050
General	■ Hardness (mg/L)	2,161	1,010	2,900
Critical Indicators	■ Chloride (mg/L)	1,841	101	2,660
Critical Indicators	■ Boron (mg/L)	22.8	6.22	47
Critical Indicators	■ Phenol (µg/L)	100	0.72	830
Leachate Indicators	■ Calcium (mg/L)	96	33	221
Leachate Indicators	■ Sodium (mg/L)	1,468	424	2,300
Leachate Indicators	■ Magnesium (mg/L)	468	144	661
Leachate Indicators	■ Potassium (mg/L)	794	149	1,410
Leachate Indicators	■ Iron (mg/L)	11	1.1	41.4
Leachate Indicators	■ Manganese (mg/L)	0.10	0.027	0.688
Leachate Indicators	■ Ammonia (mg/L)	583	0.05	1,200

With regard to the site, downgradient water quality is compared to background water quality for the critical leachate indicator parameters, as identified above, to determine potential impacts from site operations.

The site operation is not expected to generate any significant quantities of leachate because all waste handling operations are conducted in an indoor environment. The

Design and Operations plan incorporates a number of features to protect the groundwater and surface water resources. This includes features such as a completely contained waste tipping floor and collection system and operating procedures that ensure that waste is handled indoors in a closed environment and is not stored on-site for any length of time. Nevertheless, it is still appropriate to examine water quality at the site for indicators of leachate affects to confirm that all of the safeguards are functioning.

7.2 Petroleum Indicators

The site operations do not involve the use, storage or handling of significant quantities of potential contaminants, other than machine fuel/lubricants. If these are handled with normal, reasonable precaution (according to the regulations) then the risk of groundwater contamination is very low. Established procedures for spills response and contingency are in place. BTEX analysis results are examined to determine if there is any indication of hydrocarbon contamination. Downgradient organic water quality is discussed in Section 8.5.

8. Groundwater, Leachate and Surface Water

A ground and surface water monitoring program is conducted at the site as outlined in Section 3.

8.1 Groundwater Elevation and Flow Directions

The ECA requires collection of water levels four times per year. Groundwater levels were collected in April, June, September and December during 2021. Groundwater elevations were measured at 18 locations that included a total of 32 monitors. The monitors are outlined in **Table 14** with the geological unit they are measuring. Groundwater elevations are appended. Hydrographs for each location are presented in Appendix A.

Table 14: Monitoring Wells and Target Units

Monitor	Geological Unit	Groundwater Zone
5-96	Dolostone Bedrock	Water Table/Bedrock
6a-96	Dolostone Bedrock	Bedrock
6b-96	Sandy Outwash	Water Table
7-96	Sandy Outwash	Water Table
8-96	Dolostone Bedrock	Water Table/Bedrock
9-96	Sandy Outwash	Water Table
10-00[1]	Dolostone Bedrock	Bedrock
11a-01[1]	Dolostone Bedrock	Bedrock
11b-00[1]	Gravelly Outwash	Water Table
12a-00/21-13A[2]	Dolostone Bedrock	Bedrock
12b-00/21-13B[2]	Gravelly Outwash	Water Table
13a-01[3]	Dolostone Bedrock	Bedrock
13b-01[3]	Gravelly Outwash	Water Table
14a-01[3]	Dolostone Bedrock	Bedrock
14b-01[3]	Gravelly Outwash	Water Table
15a-01[3]	Dolostone Bedrock	Bedrock
15b-01[3]	Gravelly Outwash	Water Table
16a-08[3]	Dolostone Bedrock	Bedrock
16b-08[3]	Gravelly Outwash	Water Table
17a-08[3]	Dolostone Bedrock	Bedrock
17b-08[3]	Gravelly Outwash	Water Table
18a-08/18a-14[3]	Dolostone Bedrock	Bedrock
18b-08/18b-14[3]	Gravelly Outwash	Water Table
19a-08[3]	Dolostone Bedrock	Bedrock
19b-08[3]	Gravelly Outwash	Water Table
20a-08[3]	Dolostone Bedrock	Bedrock

Monitor	Geological Unit	Groundwater Zone
20b-08[3]	Gravelly Outwash	Water Table
21-08	Dolostone Bedrock	Water Table/Bedrock
22a-11 [3]	Dolostone Bedrock	Bedrock
22b-11 [3]	Gravelly Outwash	Water Table
23a-12	Dolostone Bedrock	Bedrock
23b-12	Gravelly Outwash	Water Table

Notes: (1) Locations recommended by MECP.
(2) 12a-00 replaced 3-97; 21-13 replaces 12-00
(3) Locations in Transfer Station Area.

The bedrock groundwater flow is discussed first as the understanding of the geology controlling this flow is important to the shallow water table flow. In general, the groundwater flow is similar to previous years (**Figure 2**). Groundwater flow is generally from southwest to northeast (bedrock high) and northeast to southwest (from Watson Road) coming into the site from both directions. It is expected that flow would ultimately merge and be directed northerly based on the assessment of the bedrock surface topography, which suggests that the bedrock is deepening to the north. This is important as previous hydrogeological assessments in the area suggest that the bedrock low observed in this area is a former paleo river valley (incised bedrock low) that trends to the north. Therefore, it would be expected that the groundwater flow would follow this feature. The 2008 monitoring nests (bedrock and overburden) were placed to the east of the facility (BH18-08, BH19-08 and BH20-08) to confirm the geology and groundwater flow in this area. Southeast of the Transfer Station, the bedrock elevation is generally highest at BH20-08, sloping to the northwest towards the paleo river valley. A more detailed assessment of the geology in the area incorporating the 2008 borehole data was provided in the 2009 Annual report (AECOM, 2010), which confirms that there is a pronounced incised bedrock low that trends through the site to the north. The addition of the BH23-12 location on Stone Road, also suggest that the flow in the incised bedrock low is generally to the north.

In general, the shallow groundwater flow beneath the site in 2021 is similar to previous years (**Figure 3**) though flows have been refined and confirmed based on the groundwater elevation information from the monitors installed in 2008 and the updated geological model assessment in 2009. Shallow groundwater flow in the sandy outwash is expected to follow the bedrock topography and be similar to the bedrock groundwater flow. Overall, the shallow flow is similar, directed into the site from the bedrock high on the southwest area of the site and from along Watson Road. It is also expected that flow would ultimately merge and be directed northerly within the alignment of the incised bedrock low. The 2008 drilling also identified a bedrock high (similar to the high to the west) southeast of the site in the vicinity of BH20a-08, between which the bedrock trends.

Figure 2: Bedrock Groundwater Flow (April 2020)

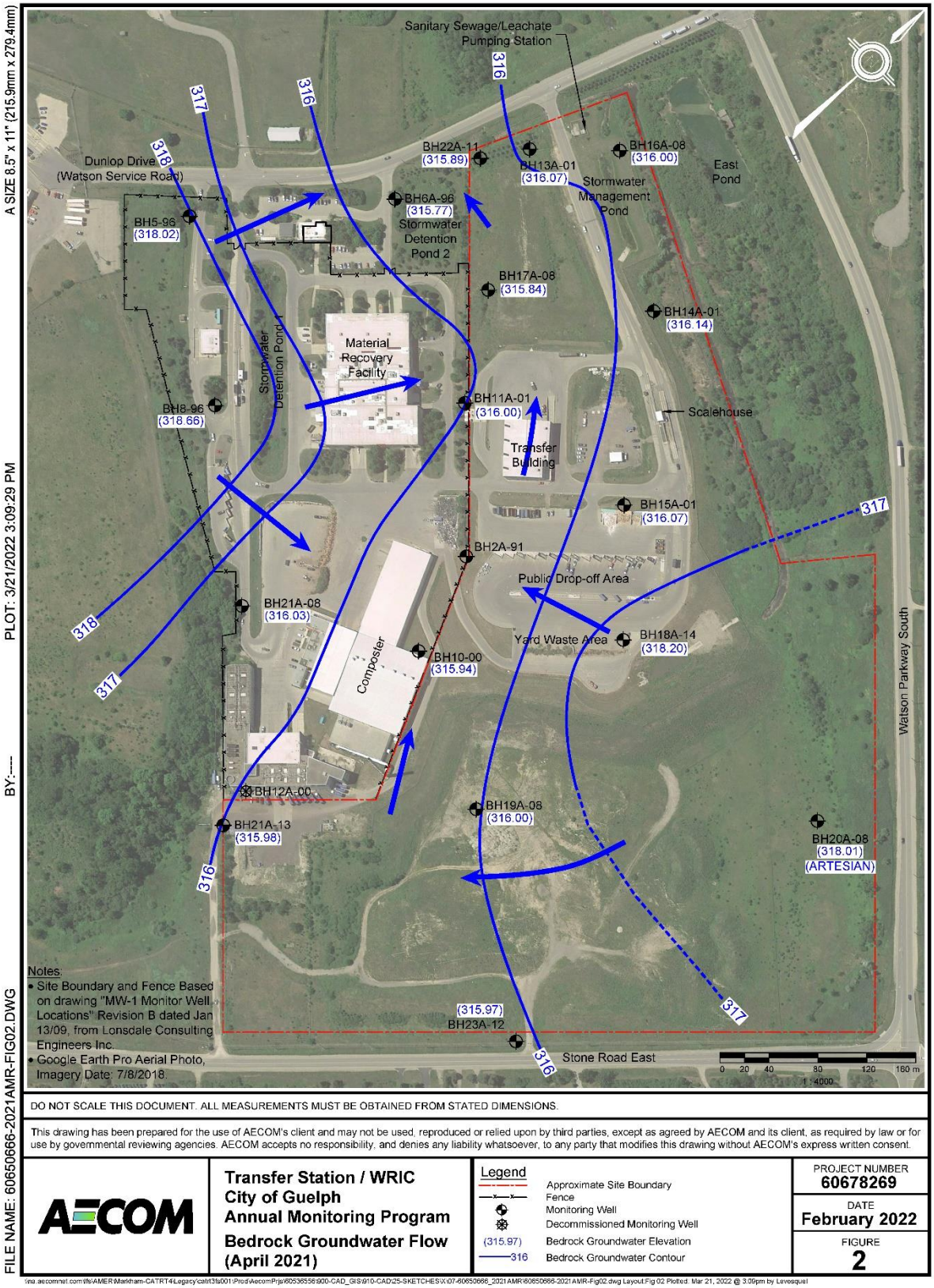
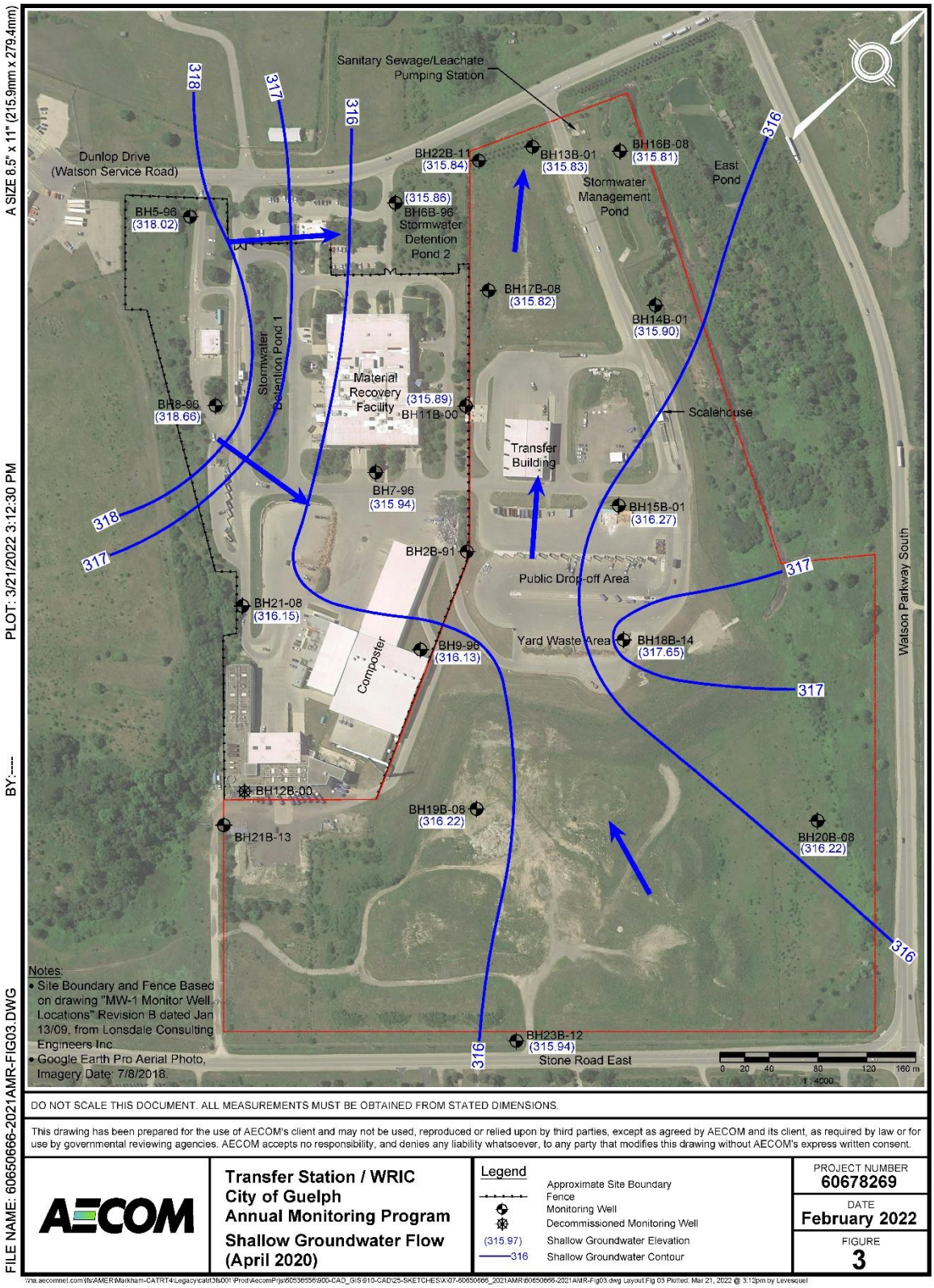


Figure 3: Shallow Groundwater Flow (April 2020)



The shallow water table elevation is generally similar to BH19b-08 (BH19b-08 and BH23b-12 show variance between generally less than 0.08 m, with a high of 0.19 m in April) in the southern area of the site. The slight difference is most likely related to the actual positioning in the bedrock low as the new location intercepted the bedrock at a deeper elevation than at BH19 indicating that BH19 is most likely higher up on the edge of the bedrock low. Though this is the case, the overall trend of the bedrock low is to the northwest.

8.2 Groundwater Monitoring

8.2.1 Transfer Station Area

The original monitoring program for the site included three overburden monitors (in outwash materials) 13b-01, 14b-01 and 15b-01 and three bedrock monitors 13a-01, 14a-01 and 15a-01. The MECP completed a review of the 2004 and 2005 Annual Monitoring reports for the Eastview Landfill and the Transfer Station. The MECP recommended installation of additional monitoring locations to better address the geological setting with respect to the groundwater flow. Based on the MECP review comments, six monitoring nest locations (BH16-08 to BH21-08) were completed in 2008, at the locations shown on **Figures 1** to **3**. These monitors consist of overburden outwash (16b-08, 17b-08, 18b-08, 19b-08, 20b-08) and bedrock monitors (16a-08, 17a-08, 18a-08, 19a-08, 20a-08, 21-08). These monitors were incorporated into the routine monitoring program in 2008. Based on the confirmation of groundwater flow at the site, the MECP recommended that a new monitoring location be established at the northerly boundary to serve as a Guideline B7 (RUP) boundary compliance point. This location was completed in 2011 and consists of a deep bedrock and shallow overburden outwash monitor (22a-11 and 22b-11). A further location along Stone Road was completed in the summer of 2012, as recommended to the MECP, to better assess the potential effects, if any, from the soils that had been stored on site. This location also consists of a deep bedrock and shallow overburden outwash monitor (23a-12 and 23b-12).

8.2.2 Waste Resource Innovation Centre

Baseline groundwater monitoring was conducted from 1991 to 1995, prior to construction at the Waste Resource Innovation Centre site (monitor locations 1a-91, 1b-91, 2a-91, 2b-91, 3-91 and 5-91). Monitoring of the groundwater at the Waste Resource Innovation Centre Facility commenced in April 1996 at the remaining monitoring locations that were not destroyed during construction (**Figure 1**). In late 1996, replacements for the monitors that were destroyed were completed and added to the program. The present monitoring program, initiated in 1999 after MECP approval, is twice per year (June and December).

The City commenced construction of the Public Drop off (PDO) area in the late summer of 2014 (**Figures 1** to **3**). Monitoring nests BH18-08a/b (within the pad area) and BH2-91a/b (on the berm between the Wet/Dry and transfer properties) were found to be within the construction area. The MECP was contacted to discuss the decommissioning and need for replacement of these monitoring nests. It was decided that monitoring nest 18-08 would be decommissioned and re-located just to the south of the PDO pad, between the pad and the new pond.

As for BH2-91, this location was the only one with a deep monitor in the till. Water quality had generally remained similar since about 1991 in the deep till and shallow groundwater (when sampled as it generally had very little water). A slight change (around 2011) in quality did occur in the deep monitor at the time of construction of the compost facility, which may suggest that the monitor was compromised. This was an old monitor installation (1991) and probably only had a surface seal and seal above sand pack. Although this was the case, based on the overall long term historical water quality and the difficulty in sampling the shallow well, it was recommended that this location was to be decommissioned and not replaced. The MECP hydrogeologist, confirmed through e-mail correspondence on September 8, 2014 that he was in agreement with the re-location of monitoring nest 18 as well as the elimination of BH2a/b-91 from the current monitoring program.

Monitoring nest BH2a/b-91 and 18-08 (consisting of bedrock monitor 18a-08 and water table monitor 18b-08) were decommissioned in September 2014 as per O. Reg. 903 to accommodate expansion of the Public Drop off (PDO) pad. A new monitoring nest (18a-14 and 18b-14) was installed by the City in September 2014 with a mud-rotary drill rig and screened to the same depth/within the same formations as 18a-08 and 18b-08. These new monitors were located about 15 m northeast of the former 18-08 location, just off the PDO pad and were incorporated into the monitoring program for the site.

Despite attempts to protect the well casings, BH12A-00 and 12B-00 were damaged during the course of demolition of the Subor building. Both monitors were subsequently decommissioned by a licenced well driller and replacement monitors BH21A-13 and BH21B-13 were installed approximate 40 meters to the southwest. All work was completed in accordance with O.Reg. 903.

8.2.3 Groundwater Quality

Groundwater sampling was conducted for the site in June and December 2021. Groundwater quality results are appended.

8.2.3.1 Background Outwash Water Quality

Background outwash groundwater quality was historically measured at locations 14 and 15 on the adjacent eastern property. Location 15 is now considered a downgradient location due to the construction of the compost pad and PDO area to the south. Groundwater flow is directed towards the site from these areas. Monitors BH18b-14, BH19b-08 and BH20b-08, located southeast of the Transfer Station and 16b-08, located north of the Transfer Station are also representative of background outwash conditions based on the groundwater flow patterns in this area. Water quality for the indicator parameters are summarized in **Table 15**.

Table 15: Background Outwash Water Quality

Monitor #	For Comparison	Alkalinity (ppm)	Chloride (ppm)	Sodium (ppm)	Calcium (ppm)	Magnesium (ppm)	Potassium (ppm)
14b-01	Historical Range	267 - 460	22.3 - 360	0.1 - 250	0.2 - 280	0.05 - 80	0.2 - 2.9
14b-01	2021 Average	455	180	190	110	20.50	1.55
16b-08	2008-2020 Range	300 - 597	10 - 260	20 - 150	89 - 170	26 - 51	1.1 - 3.1
16b-08	2021 Average	310.0	86.00	84.00	120.00	32.00	2.80
18b-08	2008-2014 Range*	260 - 424	8 - 19	6.2 - 270	29 - 65	12 - 26	0.73 – 5.5
18b-14	2015 - 2020 Range	180 - 250	19 - 210	4.6 - 180	11 - 88	3.1 - 28	1 - 2.5
18b-14	2021 Average	225.0	70.50	62.45	56.50	17.20	2.35
19b-08	2008-2020 Range	289 - 700	7 - 64	110 - 480	23 - 100	10 - 34	4.5 - 12
19b-08	2021 Average	470	32	165	78	26	8.95
20b-08	2008-2020 Range	235 - 360	7 - 170	3.5 - 97	78 - 125	25 - 41	1.1 - 3.3
20b-08	2021 Average	315.0	115.00	50.05	55.00	14.51	1.6
23b-12	2012-2020 Range	320 - 400	110 - 270	79 - 200	96 - 380	26 - 150	1.8 - 5.4
23b-12	2021 Average	345	155	105	105	28	2.30

Note: Historical Ranges include all data up to and including 2020, except where specified.
*Only three historic samples were collected from monitor 18b-08: March 2008, June 2011 and May 2014

Monitors 18b-08/14, 19b-08, 20b-08 and 23b-12 have chemistry generally similar to monitor 14b-01, located northeast of the Waste Resource Innovation Centre though a few parameters at 19b-08 were notably higher than the other overburden background monitors. Monitor 19b-08 showed elevated concentrations of alkalinity, sodium and potassium. Sulphate concentrations at 19b-08, which were previously elevated prior to 2013, continued to decrease to 67 mg/L in December 2021 but is still slightly elevated compared to the other overburden background monitors which were generally between 12 mg/L (18b-14) and 61 mg/L (14b-01) but similar to 20b-08 (68 mg/L). Alkalinity appeared to be showing a slight increasing trend over time at 19b-08 but concentrations have stabilized and declined since about 2015. Elevated iron previously noted at this location and related to the drilling mud that is still present in the monitor is decreasing and has stabilized such that it is at an average concentration of 1.25 mg/L in 2021. The 2020 results from 18b-14 show elevated concentrations for conductivity, potassium,

sodium, chloride and calcium compared to historic results from 18b-08/18b-14; however each of these parameters was noted to have returned to historical levels in 2021 with the exception of calcium which remained elevated in the June sampling and decreased in the December event. Elevated 2020 concentrations of alkalinity, calcium and magnesium compared to historic concentrations at this location continued to be observed in 2021 at 20b-08. Since 20b-08, 19b-08 and 18b-14 are upgradient of the site, the elevated concentrations are not a result of site activities. Monitor 18b-14 is now located at the eastern edge of the recently completed PDO and yard waste area. Concentrations at most of the background monitors were generally similar to previous years with some parameters at a few locations slightly higher or lower than historic ranges due natural variability.

Elevated iron at 14b-01, 16b-08, 19b-08 and 20b-08 were noted since December 2011 but decreased in 2013 with the iron concentrations at these monitors below the laboratory detection limits in December 2013. However, the 2015 iron at 14b-01, 19b-08 and 20b-08 again showed elevated concentrations (averages of 22 mg/L, 3.4 mg/L and 4.1 mg/L, respectively). In 2021, iron concentration at 14b-01, 16b-08, 19b-08 and 20b-08 remained elevated compared to pre-2011 concentrations when iron was generally below the laboratory detection limits but were not as high as 2012 concentrations. The cause of the increase in iron concentrations is unknown. As these elevated concentrations were apparent in the background monitors, it is concluded that they are not a result of site operations.

The 2021 parameter concentrations at monitor 14b-01 were within the historic range of concentrations at this monitor for both sampling events, with no trends noted. Previous 2014 elevated concentrations of magnesium, TKN, calcium and phosphorus have returned to concentrations similar to historic concentrations since 2015. Zinc concentrations, which were generally elevated at concentrations of more than 1 mg/L between 2011 and 2016 have decreased to an average of 0.24 mg/L in 2021, which is similar to pre-2011 concentrations. COD concentrations at 14b-01 were showing a decreasing trend since high concentrations were detected in 2003-2004 but have been variable in recent years. The COD concentrations have fluctuated between less than 4 mg/L to 46 mg/L since 2012. The average 2021 indicator parameter concentration at monitor 14b-01 were lower than the average 2020 concentrations.

Monitor 16b-08 is located near the northwest corner of the of the Transfer Station area by the stormwater management pond. Indicator parameter concentrations are within the range of concentrations for the other background overburden monitors. The 2021 parameter concentrations at monitor 16b-08 are within their historic ranges. This location appears to exhibit a seasonal increase in road salt effects (based on chloride and sodium concentrations).

8.2.3.2 Background Bedrock Water Quality

Background bedrock groundwater quality is measured at locations 5-96 (northwest) and 8-96 (west) on the bedrock high along the western portion of the Waste Resource Innovation Centre C site from where groundwater flows into the immediate area of the Waste Resource Innovation Centre . As well, groundwater quality in the bedrock below the site was measured at location 6a-96, 14a-01, 16a-08, 18a-08/18a-14, 19a-08 and 20a-08, as well as the upgradient monitor 23a-12. Background bedrock groundwater quality is typically hard with more elevated concentrations of the major ions, most noticeably alkalinity and calcium. These types of concentrations are associated with dolostone, which is made up of calcium and magnesium carbonate. The average concentrations of these parameters observed in 2021 along with the historical ranges at these locations are provided below.

Also, provided in **Table 16** are the 2021 averages from the downgradient bedrock Waste Resource Innovation Centre site monitors (10-00, 11a-00) and Solid Waste Transfer Station area bedrock monitors (13a-01, 15a-01, 17a-08, 22a-11).

The average 2021 indicator parameter concentrations fall within the historical ranges at the background locations, with the following exceptions.

The 2021 average concentration of sodium and chloride at background monitor 5-96 continue to show significant road salt impacts as they have previously. The average 2021 sodium and chloride concentrations at 5-96 were 530 mg/L and 825 mg/L. Prior to 2003, concentration were less than 264 mg/L and 474 mg/L respectively. The effects are found to generally be seasonal with the dry weather (June) sampling period usually showing higher sodium and chloride concentrations as compared to the wet weather sampling periods. As well, there have been historical road salt effects observed at location 6a-96 and 8-96. Sodium and chloride at monitor 5-96 are above the ODWS. Sodium and chloride are elevated (but within ODWS) at monitor 6a-96. The elevated sodium and chloride concentrations at monitors 5-96 and 6a-96 are due to road salt impacts. Magnesium and potassium have been showing a slight decreasing trend at 5-96 though these concentrations have stabilized in recent years. The monitor 5-96 average 2021 magnesium concentration is lower than the historic minimum concentration. Pre-2006 average magnesium and potassium concentrations were about 31.3 mg/L and 5.6 mg/L, decreasing to about 26.8 mg/L and 4.5 mg/L between 2006 and 2015, to 243 mg/L and 4.2 mg/L in 2021.

The average calcium concentration of 98 mg/L at background monitor 8-96 is within the historic range of 87 mg/L to 123 mg/L. Calcium has shown a slow decreasing trend over time from an average of 106 mg/L up to 2004 to an average of 95 mg/L from 2005 to 2015 and an average of 92 mg/L from 2016 to 2021.

Table 16: Background Bedrock water Quality

Location	Monitor Number	For Comparison	Alkalinity (ppm)	Chloride (ppm)	Sodium (ppm)	Calcium (ppm)	Magnesium (ppm)	Potassium (ppm)
Background	**5-96**	Historical Range[1]	278 - 380	112 - 474	71.9 - 263	83.7 - 134	24.2 - 38.4	3.9 - 6
Background	**5-96**	2021 Average	310	825[2]	530[2]	110	23	4.20
Background	**8-96**	Historical Range	264 - 356	37.2 - 332	17.6 - 171	87 - 123	30 - 43.4	1.73 - 3.1
Background	**8-96**	2021 Average	295	170	92	98	34	2.35
Background	**14a-01**	Historical Range - 2019	215 - 263	4.8 - 28	9.1 - 29	63.5 - 86	22.4 - 29	0.97 - 2
Background	**14a-01**	2021 Average	245	26	26	75	25	1.15
Background	**16a-08**	2008-2019 Range	220 - 270	28 - 100	1.9 - 48	73 - 120	24 - 30	1.7 - 3.6
Background	**16a-08**	2021 Average	230	29.5	2.05	79.5	26.5	1.75
Background	**18a-08/18a-14**	2008-2020 Range	210 - 260	3.2 - 81	4.2 - 120	12 - 84	2.4 - 29	0.99 - 1.8
Background	**18a-08/18a-14**	2021 Average	255	220	167.45	67	17.65	2.90
Background	**19a-08**	2008-2020 Range	230 - 260	27 - 79	12 - 47	94 - 110	32 - 37	1.2 - 1.9
Background	**19a-08**	2021 Average	250	79	34.50	100	34	1.55
Background	**20a-08**	2008-2020 Range	236 - 262	15 - 37	3.9 - 56	72 - 88	26 - 31	0.99 - 1.8
Background	**20a-08**	2021 Average	255	21	4.7	89	28	1.2
Background	**21-08**	2008-2020 Range	260 - 320	4 - 54	6.9 - 34	71 - 87	23 - 32	0.78 - 1.2
Background	**21-08**	2021 Average	295	18.5	14.50	80	26	1.10
Background	**23a-12**	2012-2020 Range	230 - 250	24 - 31	11 - 15	84 - 97	28 - 34	0.95 - 1.3
Background	**23a-12**	2021 Average	245	30.5	13.5	85.5	29	1.2
Downgradient	**6a-96**	Historical Range	206 - 420	140 - 345	70 - 176	89 - 158	23 - 42	2 - 16.4
Downgradient	**6a-96**	2021 Average	270	155[2]	90[2]	113	30	2.3
Downgradient	**10-00**	Historical Range	230 - 267	17 - 44.9	7.7 - 14	79 - 95.1	27 - 32	1 - 2
Downgradient	**10-00**	2021 Average	243	32	12	89.7	29	1.2
Downgradient	**11a-00**	Historical Range	220 - 263	4 - 24	4.3 - 25.9	62 - 83.2	23 - 28	1 - 3
Downgradient	**11a-00**	2021 Average	235	21	6.1	73.5	26.5	1.7
Downgradient	**13a-01**	Historical Range	240 - 272	83.9 - 111	38 - 51	90 - 112	31 - 38.8	2 - 2.9
Downgradient	**13a-01**	2021 Average	250	120	50	99	34.5	2.7
Downgradient	**15a-01**	Historical Range	220 - 271	42 - 390	7.7 - 160	88 - 160	29 - 45	1 - 2
Downgradient	**15a-01**	2020 Average	250	153	96	110	32.3	1.5
Downgradient	**17a-08**	2008-2020 Range	220 - 300	27 - 110	10 - 110	64 - 100	18 - 32	0.92 - 2.2
Downgradient	**17a-08**	2021 Average	310	86	67	103	22	.92
Downgradient	**22a-11**	2011-2020 Range	212 - 260	47 - 130	15 - 78	88 - 110	20 - 36	1.3 - 2.3
Downgradient	**22a-11**	2021 Average	245	79.5	31	100	33.5	1.5

Note: 1. Historical Ranges only include data from 1997 up to 2003 due to continued increasing chloride and sodium values after 2003.
2. Road salt impact.
Historical Ranges include all data up to and including 2019 except where specified.

The average 2021 concentrations of leachate indicator parameters alkalinity, chloride, sodium and calcium at background monitor 14a-01 were elevated compared to the historic range of concentrations in 2020; therefore, the historical range has not been updated to include 2020 data. The 2021 concentrations of these four parameters are all within the historical range for this monitor.

Background monitor 18a-14 showed variable leachate indicator concentrations in June 2019 with some parameters showing higher than historic concentrations (total phosphorus, sodium, chloride, iron) and some showing lower than historic concentrations (magnesium, nitrate). These parameter concentrations returned to pre-June 2019 ranges during the 2020 monitoring events. However, chloride and sodium concentration were again elevated in 2021. As monitor 18a-14 is a background location, site activities did not cause this change.

Downgradient monitor 17a-08 showed higher than historic parameter concentration in 2020 and 2021 calcium. Total phosphorus, alkalinity, chloride, sodium, iron, zinc and nitrate concentrations, which peaked in 2019, remained elevated in 2021 compared to pre-2019 levels.

Elevated iron concentrations were observed starting in 2011 in several monitors across the site (background and downgradient) and still persist at most locations in 2021 though generally decreasing. Downgradient monitor 6a-96 showed an elevated iron concentration of 1.7 mg/L in December 2021 compared to the previous maximum iron concentration of 0.22 mg/L in December 2019 and 0.78 mg/L in June 2020. No other trends or unusual concentrations were noted at this location. As has been concluded previously these iron concentrations are not related to site operations.

When the water quality from the monitors located along the eastern boundary of the W Waste Resource Innovation Centre RIC (10-00, 11a-00) and in the Transfer Station area (13a-01, 14a-01, 15a-01, 16a-08, 17a-08) are compared to the historical monitors to the west, there is a difference in bedrock water quality observed. With the exception of alkalinity, the concentrations of the major ions are generally lower indicating a less mineralized water. This difference in water quality is attributed to the bedrock units they are completed in. As stated earlier, there is a bedrock high to the west of the site. This high is dominated by the dolostone units of the Guelph Formation. The bedrock topography dips steeply from this high, across the Waste Resource Innovation Centre site, towards a deeply incised bedrock valley low. This valley cuts into the underlying Gasport Formation (formerly the Amabel). Monitors are installed in this formation or at the contact of this formation at the eastern boundary of the Waste Resource Innovation Centre facility. Overall, water quality from this lower formation is found to be less mineralized, which is confirmed by sampling of these monitors.

8.3 Downgradient Groundwater Quality

8.3.1 Shallow Outwash Groundwater Quality

Monitors along the eastern property boundary of the Waste Resource Innovation Centre and within the paleo-valley in this same area are downgradient of site operations based on shallow groundwater flows (**Figure 3**). **Table 17** compares downgradient water quality at monitors 6b-96, 7-96, 9-96, 11b-00, 13b-01, 15b-01, 17b-08 and 22b-11 to the Ontario Drinking Water Standards (ODWS), leachate quality (from the Closed Eastview Road Landfill) and background outwash water quality from monitors BH14b-01, 16b-08, 18b-14, 19b-08, 20b-08 and 23b-12.

Background monitor 18b-14 was installed in September 2014 to replace 18b-08. 18b-08 was sampled on three occasions. 18b-14 has been sampled on 12 occasions. Several parameters during the June 2019 event showed higher (alkalinity, sulphate, calcium, zinc, nitrate) or lower (sodium, chloride, iron) concentrations compared to historic results. At the time, it was expected that variations in parameter concentrations were due to the limited dataset and are a result of natural variability or may be due to mud used during the drilling process, which is slowly cleaning out. However, during 2020, average leachate indicator parameter concentrations of alkalinity, chloride, sodium and potassium exceeded historic maximums with conductivity also showing high concentrations. Though this location is hydraulically upgradient from site operations, it is located at the periphery of the yard waste area and may be influenced by these activities. In 2021 however the leachate indicators were similar to other background monitors, indicating no impacts. Due to the uncharacteristic concentrations in 2020 these values have been excluded from the historical range for 18b-14 Further monitoring results from this location will be assessed to examine possible influences from the yard waste area.

As shown in **Table 17**, indicator parameter concentrations observed in the background and downgradient outwash monitors on the site are considerably lower than typical leachate concentrations from the closed Eastview Road Landfill, except for calcium, which has background and downgradient concentrations similar to the Eastview Landfill. Sodium and chloride concentrations at 11b-00 had shown a subtle increasing trend over the years' at this location, peaking in 2014 at concentrations of 220 mg/L and 290 mg/L but have now generally shown a decline, since this time. 17b-08 has shown variable chloride concentrations over time but is generally showing a downward trend with an average concentration of 382 mg/L from 2008 to 2012 to an average concentration of 37 mg/L in 2021. Similarly, the 2021 sodium concentrations of 20 mg/L and 27 mg/L were much lower than the historic minimum concentration of 79 mg/L in December 2018. The 17b-08 calcium concentrations in 2021 averaged 82 mg/L, which is lower than the historic (excluding 2020) minimum of 85 mg/L. Other leachate indicator parameter concentrations are within background outwash ranges for the Transfer Station indicating no impacts.

Table 17: Shallow Outwash Groundwater Quality

Location	Monitor Number	For Comparison	Critical Leachate Indicators Boron (mg/L)	Critical Leachate Indicators Phenols (µg/L)	Critical Leachate Indicators Alkalinity (mg/L)	Critical Leachate Indicators Chloride (mg/L)	Other Leachate Indicators Sodium (mg/L)	Other Leachate Indicators Calcium (mg/L)	Other Leachate Indicators Magnesium (mg/L)	Other Leachate Indicators Potassium (mg/L)
Leachate	-	ODWS	5.0		30 – 500	250	200			
Leachate	-	Historical Range (1997-2009)	6.22 – 47	0.72 – 830	2,900 – 9,050	101 – 2,660	424 – 2,300	33 – 221	144 – 661	149 – 1,410
Leachate	-	Average (1997-2009)	22.8	100	6,195	1,841	1,468	96	468	794
Downgradient	6b-96	Historical Range	0.018 - 0.078	0.72 - 11	246 - 412	68 - 815	53.1 - 467	68 - 217	16 - 47	3.9 - 18
Downgradient	6b-96	2021 Average	0.021	0.001	273.3	130	99	84	20	2.70
Downgradient	9-96	Historical Range	0.01 - 0.063	0.72 - 4	84 - 348	3.7 - 83.7	1.48 - 34	26 - 100	4.8 - 34	0.3 - 17
Downgradient	9-96	2021 Average	0.031	0.001	103	7.5	10.9	34	5.7	7.2
Downgradient	7-96	Historical Range	0.03 - 0.102	0.72 - 12	224 - 390	54.3 - 397	28.7 - 212	95.1 - 226	26 - 52.7	7.6 - 27
Downgradient	7-96	2021 Average	0.046	0.001	393	233	203	103	24.7	7.8
Downgradient	11b-00	Historical Range	0.04 - 1.9	1 - 7	185 - 330	47 - 290	26.8 - 220	44 - 110	10 - 30	1 - 2.2
Downgradient	11b-00	2021 Average	0.078	0.001	270	47	56.5	71.5	15.5	1.2
Downgradient	13b-01	Historical Range	0.01 - 0.1	1 - 12	230 - 506	7 - 200	2 - 110	75 - 160	24 - 45	1 - 2.5
Downgradient	13b-01	2021 Average	0.02	0.001	315	95	58.5	106.5	24.5	1.9
Downgradient	15b-01	Historical Range	0.01 - 0.18	1 - 110	130 - 544	4 - 580	2 - 450	66 - 210	3 - 53	0.89 - 29
Downgradient	15b-01	2021 Average	0.045	0.001	203	75	55	96	5.9	4.6
Downgradient	17b-08	2008-2019 Range	0.015 - 0.03	1 - 1.7	240 - 357	35 - 620	16 - 330	84 - 190	19 - 48	0.91 - 3.1
Downgradient	17b-08	2021 Average	0.026	0.001	240	37	23.5	82	28.5	1.6
Downgradient	22b-11	Range 2011-2019	0.013 - 0.031	1 - 1	230 - 350	33 - 180	13 - 110	84 - 140	18 - 32	1.1 - 2.1
Downgradient	22b-11	2021 Average	0.021	0.001	345	89.5	66	110	23.5	1.75
Background	14b-01	Historical Range	0.01 - 0.05	1 - 13	267 - 460	22.3 - 360	0.1 - 250	0.2 - 280	0.05 - 80	0.2 - 2.9
Background	14b-01	2021 Average	0.022	0.001	455	180	190	110	20.5	1.55
Background	16b-08	2008-2019 Range	0.01 - 0.047	1 - 5	300 - 597	10 - 260	20 - 150	89 - 170	26 - 51	1.1 - 3.1
Background	16b-08	2021 Average	0.024	0.001	310	86	84	120	32	2.8
Background	18b-08	2008-2014 Range(1)	0.01 – 0.10	< 1	260 - 424	8 - 19	6.2 - 270	29 - 65	12 - 26	0.73 – 5.5
Background	18b-14	2014 -2019 Range	0.01 - 0.03	1 - 1	180 - 250	19 - 210	4.6 - 180	11 - 88	3.1 - 28	1 - 2.5
Background	18b-14	2021 Average	0.016	0.001	225	70.5	62.45	56.5	17.2	2.35
Background	19b-08	2008-2020 Range	0.066 - 0.27	1 - 1	289 - 700	7 - 64	110 - 480	23 - 100	10 - 34	4.5 - 12
Background	19b-08	2021 Average	0.086	0.001	470	32	165	78	26	8.95
Background	20b-08	2008-2020 Range	0.01 - 0.018	1 - 8.9	235 - 360	7 - 170	3.5 - 97	78 - 125	25 - 41	1.1 - 3.3
Background	20b-08	2021 Average	0.276	0.001	315	115	50	55	14.51	16.30
Background	23b-12	2012-2020 Range	0.038 - 0.71	1 - 1	320 - 400	110 - 270	79 - 200	96 - 380	26 - 150	1.8 - 5.4
Background	23b-12	2021 Average	0.120	0.001	345	155	105	105	28	2.3

Note: Historical Ranges includes all data up to and including 2020, except where specified.
ODWS = Ontario Drinking Water Standards
(1) Only three historic samples have been collected from 18b-08; March 2008, June 2011 and May 2014.

At Monitor 9-96 potassium concentrations had been showing an increasing trend but have stabilized in recent years. The 9-96 potassium concentrations were generally less than 1 mg/L up to 2005. From 2006 to 2011, the potassium concentrations were stable, averaging 1.2 mg/L. Potassium concentrations at 9-96 started to increase from a 2012-2013 average of 4.5 mg/L to a 2014-2019 average of 9.4 mg/L, then have continued to slowly decrease in 2020 and 2021. Alkalinity, magnesium and calcium concentrations have decreased and stabilized in recent years. Alkalinity concentrations from 1997 to 2008 averaged 242 mg/L and peaked in 2009 at a concentration of 348 mg/L. Since 2012, alkalinity concentrations have stabilized and are lower than pre-2009 concentrations, less than 150 mg/L. Magnesium and calcium concentrations at 9-96 showed similar concentration patterns as potassium. Magnesium and calcium both showed gradual concentration increases peaking in 2009 and then decreasing to concentrations lower than pre-2009 from 2012 to 2020 with both showing stable concentrations since 2012. This location is downgradient and adjacent to the compost facility. The compost facility was constructed and became operational in 2012, around the same time that the above concentration changes occurred. All compost operations are fully enclosed so these changes are not due to site operations.

Though nitrate concentrations at monitor 7-96 historically had regularly exceeded the ODWS prior to 2013, they were within ODWS in recent years' with 2021 concentrations of 4.42 mg/L and 2.99 mg/L. Elevated nitrate has occurred historically, including prior to the start-up of the Waste Resource Innovation Centre facility and is most likely a result of past land use. There were no exceedances of ODWS for the shallow groundwater monitors in 2021 for the parameters tested, except for chloride at 7-96 and iron (previously discussed). Alkalinity was slightly above historical levels in 2021 however still below ODWS.

At 13b-01, both sodium and chloride have shown increasing trends since 2004, peaking in 2008 and then slowly declining. However, since about 2017 through to 2021, concentrations have been variable for both parameters with low June concentrations and higher December concentrations. Elevated sodium and chloride concentrations are likely due to road salt effects as this monitor is located adjacent to the access road to the Transfer Station and Dunlop Road. Since indicator parameter concentrations at monitor 13b-01 remain within background concentrations, it has been concluded that there are no leachate impacts.

Parameter concentrations at 15b-01 have historically been variable, affected by activities in the vicinity. Monitor 15b-01 had previously been considered an upgradient background location due to its location east of the Waste Resource Innovation Centre and south of the Transfer Station. However, in the mid-2000s, a large paved pad was constructed southeast of this monitor location. The pad was sloped such that surface

water runoff was captured by a catch basin located near the middle of the pad and directed to the storm sewer. This pad was originally intended for storage of leaf compost but was being used to store construction and demolition material (roofing shingles, clean wood, drywall, rubble). The overall change in water quality at this location, at that time may be due to a combination of road runoff impacts from the Transfer Station access road to the northwest, a reduction of infiltration (and therefore, dilution) with the installation of the paved pad as well as the road salt from the south, as observed in the background monitors and now the more recent construction activities in the area. Construction activities in the vicinity of this location appears to have affected the groundwater quality, starting in late 2015. Changes in this area have included installation of a drainage ditch/culvert beneath internal access entrance to this area, installation of a permanent water line adjacent to the monitor location and placement of bin storage on the pad adjacent to the monitors to hold construction waste like drywall and wood.

Construction of a trench excavated very close to location 15 resulted in a spike in several parameters (potassium, sulphate, sodium, chloride, conductivity, COD, boron, nitrate) in December 2015 to June 2016 at 15b-01. During the December 2019 monitoring event, City field staff noted an odour to the monitor water, similar to rotten eggs / sewage. As a result additional sampling was conducted at this location for an expanded list of parameters, including sulphates and microbiology. Microbiology results at 15B-01 continue to be elevated, and below detection in 15A-01. Investigation to confirm the continued applicability of sampling 15B-01 and to confirm the pathway of impacts are ongoing, however they are not interpreted to be related to the waste operations and so are reported separately.

We conclude from this assessment, there have been no leachate impacts to the shallow groundwater in the vicinity of the site as a result of site operations in 2021.

8.3.2 Downgradient Bedrock Groundwater Quality

The interpreted bedrock groundwater flow directions (**Figure 2**) indicate that monitors 6a-96, 10-00, 11a-01, 13a-01, 15a-01, 17a-08 and 22a-11 are downgradient of the active site area, within or on the edge of the paleo-valley trending through the site.

The bedrock groundwater quality was compared to Ontario Drinking Water Standards (ODWS), as applicable. Sodium and chloride exceed ODWS at background bedrock monitor 5-96 due to road salt effects. Monitor 15a-01 exceeded the chloride ODWS in June 2018, June 2019 and June 2020, possibly due to influences from installation of a water line in the immediate area. There are no other exceedances of ODWS in 2021 for the bedrock groundwater monitors for the parameters tested (except for iron, previously discussed).

As the shallow outwash water quality is not affected by site operations, no effects to the deeper bedrock groundwater would be expected nor observed.

8.4 Groundwater Organics Results

Groundwater monitors were analyzed for organics during the December 2021 monitoring event at monitoring locations 6, 11, 13, 14, 15, 17, 18, 19, 20, 21, 22 and 23.

Some low-level detections of organics were reported across the site in 2021 included 2-Methylnaphthalene, bis(2-ethylhexyl), bromodichloromethane, chloroform, and dibromochloromethane. It is noted that 21-13A and 21-13B had detection of one or more of benzene, toluene, ethylbenzene, xylenes; collectively known as BTEX. Although above background criteria the BTEX concentrations remain quite low. This is a newly installed monitor and therefore we recommend at this time they simply be monitored to determine if detections persist. None of the VOC concentrations detected exceeded ODWS, where applicable. No other organics were detected at any of the monitors that are part of the Waste Resource Innovation Centre and Transfer Station monitoring program in 2021.

Historically, there have been occasional low-level detections of organics at both upgradient and downgradient monitors. Because the detection limits for organic compounds are very low, it is not unusual to have sporadic low level organic detections at sites where organic samples are frequently collected. The presence of persistent organics at one location combined with elevated indicator parameter concentrations and/or increasing trend in parameter concentrations would trigger more intense scrutiny of water quality results. This has not been the case for the organic detections at this site.

8.5 General Groundwater Quality Discussion

Overall, the groundwater chemistry during 2021 was similar to previous years.

In 2007, nitrate and nitrite analysis were re-instated into the routine monitoring program for both the sites as per the MECP’s recommendations. Historically, nitrates were included in the monitoring program but were removed since elevated nitrate concentrations were prevalent across the site at all locations prior to development of the site. Shallow background monitors 1b-91, 6b-96 and 7-96 historically had shown elevated nitrate concentrations in the early 1990s (up to 32 mg/L at 1b-91) and late 1990s (up to 53.5 mg/L at 7-96) indicating that the elevated nitrates were present prior to the commencement of facility operations due to historical land use. Concentrations of nitrate have significantly decreased since this time and are generally found at much lower levels reflecting current surrounding land use in the area. There were no exceedances of the nitrate ODWS in 2021.

Monitors 5-96, and 7-96 exceeded ODWS for sodium and/or chloride in 2021 as a result of road salt effects. 15b-14 exceeded the sodium and chloride ODWS in December 2020 and 15a-14 exceeded the chloride ODWS in June 2020, which may be related to a sanitary back up at the adjacent oil/grit separator. 15b-14 did not exceed the ODWS or sodium or chloride in 2021. In 2021, elevated iron concentrations exceeding ODWS were again detected at most monitors at the site which was first observed in late 2011. These elevated iron concentrations will continue to be evaluated further in future monitoring events. There were no other exceedances of the Ontario Drinking Water Standards in 2021.

As observed in the past, sporadic low-level detections of organics were observed in both upgradient and downgradient monitors across the site in 2021. Because the detection limits for organic compounds are very low, it is not unusual to have sporadic low level organic detections at sites where organic samples are frequently collected. These occasional detections do not appear to be related to site operations. The new monitors at 21-13 also had low level detections of BTEX parameters however as only one sample has been collected from this monitor, further sampling is required to confirm the validity of thee results. The presence of persistent organics at one location combined with elevated indicator parameter concentrations and/or an increasing trend in parameter concentrations would trigger more intense scrutiny of water quality results. In previous monitoring reports, we had recommended discontinuation of the organic sampling from the groundwater monitoring program for all historical locations. In the MECP review of the 2009 Annual Monitoring report (Groundwater Review), the reviewer did not support the discontinuation of the organic groundwater sampling program since an impact assessment with respect to the requirements of Guideline B-7 had not yet been completed. As recommended, organic sampling events should include a trip blank and a field blank collected with each organic monitoring event for QA/QC purposes.

In conclusion, there were no observable effects attributed to the Waste Resource Innovation Centre operations on the groundwater quality beneath the site. No effects were observed at the site boundaries. Road salt effects continue to be observed at monitoring locations both upgradient of the site and on-site.

8.6 Guideline B-7 Assessment

MECP Guideline B-7 (formerly Policy 15-08 referred to as the Reasonable Use Policy) applies the reasonable use approach to groundwater quality management at waste management sites. Guideline B-7 describes acceptable levels of contaminants in the groundwater at site boundaries, based on the Ontario Drinking Water Standards (ODWS) and natural background conditions, with respect to the protection of drinking water. In addition, it is used to determine whether any remedial action is warranted. The

Guideline B7 limits were calculated using the formula outlined in the MECP's Procedure B-7-1 (MOEE 1994a and 1994b).

The basic methodology to assess groundwater quality in relation to Guideline B7 limits (reasonable use guidelines), is to compare the shallow and bedrock downgradient groundwater quality to the calculated maximum concentrations. The leachate indicator parameters used in the assessment are either health related or aesthetic parameters specified in the ODWS. Based on the MECP reasonable use approach from Guideline B-7, the maximum concentrations (**Cm**) allowed at the site boundaries are calculated from the drinking water quality criteria (**Cr)** and background concentrations (**Cb**) based on the formula provided in Procedure B-7-1. Guideline B7 allows for some incremental impact to occur on the neighbouring property, relative to background. Input for a given chemical parameter includes the background concentration, the Ontario Drinking Water Standards (MOE, 2003), and a safety factor that was established by the MECP based on human health and aesthetic considerations.

As part of the MECP review on the 2009 Annual Monitoring report, it was recommended that Guideline B-7 be applied to this site as the geological model and groundwater flow have been confirmed, which is generally north-easterly. Monitor 22a-11 (bedrock) and 22b-11 (overburden) were installed at the downgradient northwestern property boundary adjacent to Dunlop Drive to be utilized for an impact assessment with respect to the requirements of Guideline B-7[12]. As recommended by the MECP reviewer[13], the number of monitors considered for calculation of the median background concentrations was expanded to include the more recent monitors. The median historic concentrations from background overburden monitors 12b-00, 14b-01, 16b-08, 18b-08, 19b-08, 20b-08 and 23b-12 and from background bedrock monitors 5-96, 8-86, 14a-01, 16a-08, 18a-08, 19a-08, 20a-08 and 23a-12 were used to calculate the maximum concentration levels presented in **Table 18** and **Table 19**, respectively.

$$C_m = C_b + F \times (C_{ODWS} - C_b)$$

where, C_m is the maximum concentration,
C_b is the median background concentration,
C_{ODWS} is the maximum concentration (dependant on water use),
F is a constant – 0.5 mg/L for aesthetic parameters, 0.25 mg/L for health-related parameters.

12. Memorandum from Lynnette Latulippe (MOECC) to Bill Shields (City of Guelph), Re: Annual Monitoring Report – 2009 Guelph Wet-Dry Recycling Centre and Waste Transfer Station Groundwater Review, dated February 7, 2011.
13. Memorandum from Abdul Quyum (MOECC) to Kevin Noll (MOECC), Re: Annual Monitoring Report – 2012 Guelph Wet-Dry Recycling Centre and Waste Transfer Station, Guelph, Ontario, dated April 25, 2013.

Table 18: Guideline B-7 Calculated Maximum Parameter Concentrations – Overburden

Parameter	Cb	F	CODWS	Cm
Nitrate (mg/L)	0.42	0.25	10	2.82
Boron (mg/L)	0.023	0.25	5	1.27
Sodium (mg/L)	88.5	0.5	200	144
Chloride (mg/L)	91.7	0.5	250	171
Sulphate (mg/L)	48.5	0.5	500	274
Iron (mg/L)	0.94	0.5	0.3	0.30

Note: (1) The iron Cm is calculated to be 0.62 mg/L but is limited to the ODWS of 0.30 mg/L

Note that monitors 5-96, 8-86, 14b-01 and 19b-08 show elevated sodium and chloride concentrations due to road salt impacts, however, these conditions are representative of the background conditions of these areas.

Table 19: Guideline B-7 Calculated Maximum Parameter Concentrations – Bedrock

Parameter	Median Background Concentration	Constant F	Maximum Concentration (dependant on water use)	Maximum Concentration
Nitrate (mg/L)	0.28	0.25	10	2.71
Boron (mg/L)	0.02	0.25	5	1.27
Sodium (mg/L)	26	0.5	200	113
Chloride (mg/L)	37.2	0.5	250	144
Sulphate (mg/L)	46	0.5	500	273
Iron (mg/L)	0.06	0.5	0.3	0.18

Maximum allowable concentrations (C_m) are compared to the 2021 groundwater quality results from location 22-11 in **Table 20**.

Bold, italicized concentrations in **Table 20** exceed Guideline B-7 limits. The iron concentration at monitor 22a-11 exceeded Guideline B-7 limits during both 2021 monitoring events. As previously discussed, iron concentrations at some of the monitor locations have been unusually high since the December 2011 monitoring event. These elevated iron concentrations occurred in both upgradient and downgradient monitors and therefore, do not appear to be related to site operations. No other indicator parameters appear to be elevated indicating that this location is not impacted by site operations.

Strictly speaking, Guideline B-7 is in place to assess groundwater impacts leaving the site for protection of downgradient users. Although, there are no downgradient well users as the surrounding area is municipally serviced, the guideline B-7 assessment is still required to address if any potential remedial efforts may be required related to the facility.

Table 20: Summary of 2020 MECP Guideline B-7 (Reasonable Use) Calculations at the Northwest Boundary

Heath or Aesthetic Parameters	Parameters	Overburden Maximum Concentration (mg/L)	Overburden Monitor 22b-11 June 2020 (mg/L)	Overburden Monitor 22b-11 December 2020 (mg/L)	Bedrock Maximum Concentration (mg/L)	Bedrock Monitor 22a-11 June 2020 (mg/L)	Bedrock Monitor 22a-11 December 2020 (mg/L)
Health Related Parameters	Nitrate	2.82	0.77	0.34	2.71	0.21	0.11
Health Related Parameters	Boron	1.27	0.012	0.021	1.27	0.025	0.029
Aesthetic Parameters	Sodium	144	77	55	113	30	32
Aesthetic Parameters	Chloride	171	120	59	144	79	80
Aesthetic Parameters	Sulphate	274	56	33	273	87	90
Aesthetic Parameters	Iron	0.30	0.03	0.12	0.18	***0.73***	***6.4***

8.7 Surface Water Monitoring

8.7.1 Transfer Station Area

In 2021 monthly inorganic surface water sampling of the stormwater management pond (SWM) for the parameters shown on **Table 1** occurred when water was present. The SWM pond was routinely checked during 2021. When water was present, samples were collected at the discharge at the north end of the pond (TP1 (out) on **Figure 1**) on a monthly basis. TP1 (out) was sampled in January and from March to December.

City field staff make note of discharge conditions at the surface water stations at the time of sample collection. Below is a summary of the discharge conditions observed at TP1 (out).

Table 21: Sampling Conditions at TP1(Out)

Month	Discharge Events	Conditions	Sampling Date
January	No Discharge	Layer of ice on top. Had to break ice. Water clear.	27-Jan-21
February	-	Ice too thick to break, unable to sample.	-
March	No Discharge	Ice / water mix. Clear.	10-Mar-21
April	No Discharge	clear	27-Apr-21
May	No Discharge	no rain all month. Pond dry	25-May-21
June	No Discharge	15 mm rain event sampling.	09-Jun-21
July	Discharge	15 mm rain event sampling. Water clear.	09-Jul-21
August	No Discharge	Water clear	26-Aug-21
September	No Discharge	15 mm rain event sampling. Water clear.	08-Sep-21
October	No Discharge	Water clear	21-Oct-21
November	No Discharge	Water clear	17-Nov-21
December	No Discharge	Water clear	16-Dec-21

In the MECP review comments of the 2013 annual report, the MECP acknowledged that sampling the SWM pond when it is not flowing does not provide useful information. AECOM advised field staff to continue to monitor surface water levels monthly to note conditions but only collect samples during discharging conditions. City staff continued to collect the monthly samples at TP1 (out) during 2021 though no discharge occurred during ten of the eleven sampling events.

As now required under the current amended ECA, surface water samples are to be collected under rain event of greater than 15 mm three times per year, for TSS, of which two must be between May and September. Rain event sampling at TP1 (out) was conducted in June, July, and September 2021. Full samples including TSS where collected during all sampling events.

The existing on-site surface water pond (“East Pond” on **Figure 1**) is also included in the monitoring program. Water quality from the East Pond is considered representative of background surface water quality as it does not receive any inputs from the facilities. It

was recommended in the 2011 annual monitoring report that the monitoring frequency of the East Pond be increased to monthly to coincide with those occasions when samples are collected from the on-site SWM ponds. If no samples are collected from the any of the SWM pond locations, no sample from the East Pond for that month is required. East Pond surface water samples (designated EPTS-01) were collected in January and from March to December. The 2021 surface water results for the leachate indicator parameters are tabulated below, and the testing results are presented in Appendix C.

Surface water results were compared to Provincial Water Quality Objectives (PWQO), background surface water quality (EPTS-01) and background overburden water quality. At EPTS-01, the PWQO for zinc was exceeded during all 11 of the monitoring events in 2021. Zinc has consistently exceeded PWQO in the past at this location. Total Phosphorus also exceeded the PWQO in September and October, which it has occasionally historically. There were no other exceedances of PWQO at EPTS 01 in 2021. 2021 chloride concentrations remained low, with concentrations between 47 mg/L and 75 mg/L. The 2021 October and December alkalinity concentrations 300 mg/L were slightly higher than the maximum historic alkalinity concentration of 290 mg/L. All other parameter concentrations (including indicator parameters) were within the range of background surface water concentrations at EPTS-01.

Table 22: Transfer Station Surface Water Quality

Location	Date	Critical Leachate Indicators			Other Leachate Indicators				
		Boron (ppm)	*Phenols (ppm)*	*Chloride (ppm)*	*Alkalinity (ppm)*	*Sodium (ppm)*	*Calcium (ppm)*	*Magnesium (ppm)*	*Potassium (ppm)*
PWQO/		0.2	0.001	-	-	-	-	-	-
Background Overburden(1)		0.005 - 0.063	<0.001 - 0.013	2 - 360	84 – 460	0.1 - 250	0.2 - 280	0.05 - 80	0.2 - 17
Background Overburden(2)		<0.01 - 0.71	<0.001 - 0.005	1 - 270	21 – 700	6.2 - 480	23 - 380	10 - 150	0.73 - 12
TP1(out)	27-Jan-21	0.033	<0.001	1000	370	670	160	17	15
	10-Mar-21	0.01	<0.001	71	42	40	12	1.4	1.2
	27-Apr-21	0.038	<0.001	180	130	120	73	6.4	4.5
	25-May-21	0.031	<0.001	45	120	40	62	3.8	3.2
	09-Jun-21	0.04	<0.001	24	110	16	51	4.7	3.6
	09-Jul-21	0.041	<0.001	18	110	15	52	3.9	1.8
	26-Aug-21	0.051	<0.001	32	160	25	84	5.9	2
	08-Sep-21	0.035	<0.001	11	57	8.5	32	2.9	2.1
	21-Oct-21	0.045	<0.001	42	210	38	82	9.7	4
	17-Nov-21	0.037	<0.001	29	130	23	57	5.4	3.4
	16-Dec-21	0.03	<0.001	130	210	99	85	9.4	2.2
	Historic Range	<0.01 - 0.11	<0.001 - 0.019	4.8 - 250	4.5 – 1300	5.4 - 820	16 - 160	0.8 - 29	0.97 - 45
EPTS-01	27-Jan-21	0.017	<0.001	63	270	31	95	24	1.7
	10-Mar-21	0.013	<0.001	71	270	36	87	23	1.8
	27-Apr-21	0.014	<0.001	75	260	36	84	23	1.4
	25-May-21	0.016	<0.001	62	270	35	82	22	1.3
	09-Jun-21	0.017	<0.001	67	250	37	74	22	1.3
	09-Jul-21	0.015	<0.001	72	270	42	81	23	1.6
	26-Aug-21	0.016	<0.001	64	270	39	86	23	1.5
	08-Sep-21	0.017	<0.001	63	270	38	88	23	1.6
	21-Oct-21	0.017	<0.001	61	300	38	92	24	1.7
	17-Nov-21	0.033	<0.001	47	290	31	91	23	1.7
	16-Dec-21	0.016	<0.001	58	300	40	90	23	1.6
	Historic Range	<0.01 - 0.19	<0.001 - 0.0052	23 - 334	19 - 290	13 - 120	16 - 160	3.5 - 27	1 – 3.1

Note: (1) Range of background overburden water quality from 1997 to 2019 for monitors 2b-91, 9-96 and 14b-01.
(2) Range of background overburden water quality from 2008-2019 for monitors 12b-00, 16b-08, 18b-08, 19b-08, 20b-08 and 23b-12

For the SWM pond samples at TP1 (out), the PWQO was exceeded for total phosphorus for all 12 of the events in 2021, iron for four monitoring events, zinc for one event and un-ionized ammonia for four monitoring events. The PWQO for total phosphorus, iron, phenols and zinc have routinely to occasionally been exceeded at this location in the past. The elevated total phosphorus is a result of former surrounding land use and not a result of operations at the site. Elevated zinc, total phosphorus and iron concentrations appear to be related to external factors since background surface water have also exceeded PWQO for these parameters. Metals are a common contaminant from roadway runoff. Elevated phosphorus is typical in rural and urbanized areas. Except for January chloride and sodium, all 2021 indicator parameter concentrations were within overburden background ranges and within historic concentration observed at this location. The January 2021 TP1(out) chloride concentration was 1000 mg/L compared to the maximum historic background overburden of 360 mg/L and maximum historic for this location of 250 mg/L. The January 2021 TP1(out) sodium concentration was 670 mg/L compared to the maximum historic background overburden of 820 mg/L and maximum historic for this location of 820 mg/L. Considering this higher chloride concentration is also associated with elevated sodium and therefore maybe related to road salt impacts. Comparing the water quality at TP1 (out) to EPTS-01 per sampling event, TP1 (out) concentrations were variable; lower than background EPTS-01 concentrations for zinc (all events); but higher for boron (10 of the 11 events), potassium (eight events), chloride (three events), sodium (five events), and calcium and alkalinity (one event each) and lower than background EPTS-01 for all events for magnesium. Baseline water quality information collected prior to building the Waste Resource Innovation Centre had historically shown elevated total phosphorus concentrations and occasional elevated phenols, sodium, magnesium and potassium concentrations. Therefore, the elevated parameter results appear to be due to the effects of former land use and not a result of operations at the site. Elevated parameter concentrations are not attributed to the site operations as site handling and maintenance practices would deter potential surface water influences. The SWM Pond shows slightly elevated sodium and chloride concentrations suggesting road salt influences from the adjacent access road.

Discharge occurred during the July 2021 monitoring event. During this event, the TSS at TP1 (out) was 2 mg/L. TSS concentrations at TP1 (out) in the remaining months where samples were collected were between 1 mg/L and 13 mg/L, when there was no discharge. EPTS-01 TSS concentrations were generally higher compared to TP1 (out) ranging from less than the laboratory detection limit to 6 mg/L, with the January sample being unusually high at 45 mg/L.

Organic samples were collected from the TP1 (out) and EPTS-01 surface water locations in June 2021. Chloroform (0.46 μg/L) was detected at EPTS-01 in June 2021.

There is no PWQO for chloroform. Low concentrations of chloroform (less than 2.3 μg/L) have previously been detected at this location during 15 sampling events since 2004. As these detections are at the background surface water station, they are not related to site operations.

No organics were detected at TP1 (out) 2021. Low 2019 detections of several VOCs during the April 2019 monitoring event appear to have been related to the fire at the waste transfer station on April 13, 2019. Water from fire fighting efforts was directed to the SWM Pond where TP(out) is located. As confirmed by the July 2019, 2020, and 2021 organic results, VOC concentrations have quickly dissipated such that they were below the laboratory detection limits during the subsequent monitoring events. Historically, except for one detection of bis(2-ethylhexyl)phthalate at a concentration of 2.9 ug/L in 2018 and a detection of Dimethyl Phthalate at a concentration of 2 ug/L in 2006, no other VOC's have been detected at TP(out) in the past.

8.7.2 Waste Resource Innovation Centre

Monitoring of surface water at the Waste Resource Innovation Centre commenced in March 1996. As required in the former C of A/ECA, this monitoring was to be on a monthly basis for a short parameter list and on a quarterly basis for the full leachate parameter list (updated in 1999). Amended ECA No. 9496-9NFKJ9 required semi-annual (spring and fall) sampling of leachate indicator and general parameters, as well as annual inorganics sampling. There were two surface water sampling stations at the site, designated as SW 1 located at the off-site discharge point in Stormwater Detention Area 2 and SW 2 located in the Stormwater Detention Area 1 (**Figure 1**). Surface water runoff from the site is directed to a series of on-site stormwater catch basins. Excess water from Stormwater Detention Area 1 flows to Stormwater Detention Area 2 where it would ultimately discharge via a pond outlet structure in the northwest portion of the pond to the York-Watson Stormwater Detention Area.

On March 6, 2014, the City met with the MECP to discuss the Public Drop Off facility (PDO) application and observed the stormwater ponds on Waste Resource Innovation Centre . It was agreed that sampling at the Waste Resource Innovation Centre Detention Pond (SW 2 and SW 3) would be discontinued. Detention Pond 2 (SW 1) would only be sampled once the levels in the pond reached 0.46 m above the pond invert and that the SWM pond (TP1 (out)) would continue to be sampled monthly though TP1 could be discontinued. These changes to the surface water monitoring were confirmed by the MECP through e-mail on March 17, 2014. As a result, sampling was discontinued at SW 2 and SW 3 in March 2014.

Surface water monitoring of the staff gauge in Detention Pond 2 is still undertaken on a monthly basis at SW 1 only, and if water levels exceed the target of 0.46 m sampling is

completed to assess the water quality in the pond should discharge be required. SW 1 was not sampled in 2021 since the water level in the detention pond was less than the 0.46 m target throughout the year. During the September 2021 monitoring event, the pond level was 0.25 m following a 15 mm rain event. Detention Pond 2 was dry during the remainder of the year. Detailed recordings on discharge and overall conditions (such as dry or stagnant water) are undertaken.

As discussed in Section 8.7.1, in accordance with Condition 5(3) of amended ECA No. 9496-9NFKJ9, grab samples at the TP1(out) discharge location for the site were collected three times in 2021 (June, July, and September) following a 15 mm rain event and analyzed for TSS. TSS concentrations during the three rain events ranged from 2 mg/L to 9 mg/L. Discharge only occurred during the July rain event when the TSS concentration was 4 mg/L. The results of the surface water (and groundwater) sampling are reviewed annually and reported in the annual monitoring report with recommendations provided to the City, as per Condition 5(4) of the amended ECA.

Below is a discussion of the surface water monitoring at station SW 1 during 2021. **Table 23** briefly outlines the surface water monitoring events for the past year at SW1.

Table 23: Conditions at SW1

Month	Discharge Events	Conditions	Sampling Date
January	None	Below target (no water) – Not sampled	27-Jan-21
February	None	Below target (no water) – Not sampled	
March	None	Below target (no water) – Not sampled	10-Mar-21
April	None	Below target (no water) – Not sampled	27-Apr-21
May	None	Below target (no water) – Not sampled	25-May-21
June	None	Below target (no water) – Not sampled	09-Jun-21
July	None	Below target (no water) – Not sampled	09-Jul-21
August	None	Below target (no water) – Not sampled	26-Aug-21
September	None	Water level is 0.25 m, not sampled	08-Sep-21
October	None	Below target (no water) – Not sampled	21-Oct-21
November	None	Below target (no water) – Not sampled	17-Nov-21
December	None	Below target (no water) – Not sampled	16-Dec-21

East Pond water quality serves as background surface water quality for comparison purposes. There is no baseline surface water analysis (prior to site operations), so any impacts due to runoff from the Waste Resource Innovation Centre would be difficult to determine at the discharge point SW 1, due to the potential for other sources of non-facility impacts. These sources include runoff from the surrounding lands and road systems.

The MECP surface water specialist provided comments on the 2013 and 2014 annual reports[14]. One of the comments was with respect to recent exceedances of the phenol PWQO at the detention pond locations. The MECP surface water reviewer commented that since AECOM notes that any water collected in the detention ponds quickly infiltrates into the groundwater, the MECP Geoscientist should assess phenol concentrations in the subsurface. Since the number of exceedances is increasing, the source of the phenols should be evaluated, and if there is a source, monitoring and treatment are recommended. AECOM responded[15] that we would respond to comments that may be provided by the MECP Geoscientist with regard to this item though no comments were forthcoming from the MECP hydrogeologist with respect to this item[16]. Related to this item, in the body of the memorandum, the surface water reviewer notes that she disagrees with AECOM's interpretation that aside from some irregular occurrences of parameters above PWQOs, there does not appear to be a problem with surface water quality results resulting from the facility and uses phenols as an example where the majority of the samples in the detention ponds were above the PWQO and the number of exceedances was greater than other years. While it is true that the number of exceedances of phenols in the detention ponds was more than in previous years, at that time, they are still low. Regarding the review of the 2014 annual report, the MECP surface water reviewer concedes that there is a low probability in terms of an off-site impact given the low phenol concentrations and frequency of discharge events. In 2021, phenols were at or less than the laboratory method detection limit during all 12 monitoring events at EPTS-01 and at TP1 (out). It should be noted that the operational practices of the site (indoor composting and waste handling, no on-site waste processing, etc.) deter surface water influences from site operation as acknowledged by the surface water reviewer within the body of the memorandum.

14. Memorandum from Krista Chomicki (MOECC) to Kevin Noll (MOECC), Re: 2013 Guelph Waste Resource Centre – City of Guelph, dated April 8, 2014. Memorandum from Craig Fowler (MOE) to Keven Noll (MOE); Re: Guelph Waste Resource Innovation Centre – 2014 AMR, dated August 13, 2015.
15. AECOM Letter to Bill Shields (City of Guelph); Re: Response to MOE Surface Water Review Comments. 2013 Annual Report – Solid Waste Transfer Station & Wet-Dry Recycling Centre, C of A/ECA (Waste Disposal Site) No. A170128, dated May 30, 2014.
16. Memorandum from Abdul Quyum (MOECC) to Kevin Noll (MOECC), Re: Annual Monitoring Report – 2013, Guelph Wet-Dry Recycling Centre and Waste Transfer Station, Guelph Ontario, dated April 23, 2014. Memorandum from Abdul Quyum (MOECC) to Kevin Noll (MOECC), Re: 2014 Annual Monitoring Report Guelph Wet-Dry Recycling Centre and Waste Transfer Station, Guelph, Ontario, dated April 15, 2015.

8.8 Adequacy of Program and Proposed Changes

In conclusion, monitors 5-96 and 7-96 exceeded ODWS for sodium and/or chloride in 2021 as a result of road salt effects.

There were detections included 2-Methylnaphthalene, bis(2-ethylhexyl), bromodichloromethane, chloroform, and dibromochloromethane at a few monitors during 2021. However, based on the historic detections of occasional low levels of VOC throughout the site in both upgradient and downgradient monitors, the 2020 VOC detections are not considered to be a result site operations. 21-13A and 21-13B had detections of one or more of benzene, toluene, ethylbenzene and/or xylenes (BTEX). Although above background criteria the BTEX concentrations remain quite low. This is a newly installed monitor and therefore we recommend at this time they simply be monitored to determine if detections persist.

The MECP recommended installation of a well nest along the downgradient property boundary to be utilized for impact assessment with respect to the requirements of Guideline B-7[17]. Monitoring nest 22-11 with a bedrock and overburden monitor was installed in November 2011 and the Guideline B-7 analysis was completed. The iron concentration at 22a-11 exceeded Guideline B-7 limits during both sampling events. As previously discussed, iron concentrations at some of the monitor locations have been unusually high since the December 2011 monitoring event. The elevated iron concentrations occurred in both upgradient and downgradient monitors and therefore, do not appear to be related to site operations.

In previous monitoring reports, we had recommended discontinuation of the organic sampling from the groundwater monitoring program for all historical locations. In the MECP review of the 2009 Annual Monitoring report (Groundwater Review), the reviewer did not support the discontinuation of the organic groundwater sampling program since an impact assessment with respect to the requirements of Guideline B-7 had not yet been completed. This Guideline B-7 assessment was completed (discussed above) and found that there were no impacts at the western downgradient site boundary as a result of site operations therefore, we request removal of the organic sampling from the groundwater monitoring program. Further, increased sampling for organics (twice per year) in 2012, 2013 and 2014, as a result of the dirt stock pile and addition of location 23-12, was completed by the City to better assess any potential contributions from the stock pile. These data indicated that sporadic hits of organics occur across the site (upgradient and downgradient), which are not related to any on-site activity and were most likely related to

17. Memorandum from Lynnette Latulippe (MOECC) to Bill Shields (City of Guelph), Re: Annual Monitoring Report – 2009 Guelph Wet-Dry Recycling Centre and Waste Transfer Station Groundwater Review, dated February 7, 2011.

surrounding land use. At of the end of 2013, all contaminated soils along with the majority of the stock pile have been removed from the site. Groundwater organic sampling was completed in May in 2014. The groundwater reviewer did not comment on removal of organics from the groundwater program in his review of the 2014 annual monitoring report. We continue to recommend the discontinuation of the organic groundwater sampling program as historical data has consistently shown that low concentrations of organics not related to the site. However, until organic sampling is discontinued, future organic sampling should include a trip and field blank for QA/QC purposes.

The East Pond setting is similar to the other on-site ponds (influenced by road salting and within similar overburden soils) though it is within a different catchment area. The East Pond will continue to be used as a background surface water station for water quality from the on-site surface water features. Monthly surface water samples were collected from the East Pond in 2021, when possible. As agreed by the MECP, the Detention Pond 2 (SW 1) would only be sampled once the levels in the pond reached 0.46 m above the pond invert and the SWM pond (TP1 (out)) continued to be sampled monthly. SW 1 was monitored in 2021 but not sampled as the trigger of 0.46 m above pond invert was not met. No discharge was required from the Detention Pond 2 in 2021. If no samples are collected from the SWM pond location (TP1 (out)), no sample from the East Pond for that month is required, however, samples were collected at both surface water locations in January and from March to December.

The 2021 surface water monitoring program shows that there have been no leachate effects to the SWM pond as a result of site operations. The 2021 SWM Pond results from TP1 (out) showed variable results with some indicator parameter concentrations exceeding background surface water concentrations at EPTS-01 and some TP1(out) concentrations lower than EPTS-01. The TP1(out) January chloride concentration was higher than the maximum historic chloride concentration for this location and higher than historic background overburden concentrations. Other parameter concentrations at TP1 (out) were within historic concentrations for this location and within background overburden concentrations. Elevated concentrations are not attributed to the site as site handling and maintenance practices would deter potential surface water impacts. Occasional elevated sodium and chloride concentrations suggest road salt influences from the adjacent access road. No organics were detected at TP1(out) or the background surface water station, EPTS-01 in June. VOC detections at TP(out) in April 2019 appear to be related to the fire at the transfer station that occurred three days prior to the April 2019 sampling event. As expected, these VOC concentrations have quickly dissipated such that they are below the laboratory detection limits during subsequent monitoring events. Historically, only low levels of a few organics have occasionally been detected in the surface water samples. As previously discussed, the site design and operations minimizes the potential for leachate generation from site activities.

9. Public Liaison Committee (PLC) Activities

The following is a summary of the PLC activities in 2021, as provided by the City.

The Public Liaison Committee (PLC) continues to support the work of the Waste Resource Innovation Centre site ensuring that the Site meets application standards and is actively engaging citizens from the local community. The City ensured that the meetings were held on a quarterly basis. PLC meetings were held on a quarterly basis on January 21, March 25, June 24, and September 23, 2021.

One new member was appointed to the PLC in 2021.

As standing items, the City reviews operations at the organic waste processing facility, any spills or fires that have taken place on the site, and any odour complaints that have been received between PLC meetings. Various other non-standing items were discussed during the 2021 PLC meetings, including an update on how the Waste Resource Innovation Centre is continuing to operate during the pandemic.

Copies of the Minutes and Agenda for the PLC meetings are available at https://guelph.ca/city-hall/boards-and-committees/organics-public-liaison-committee/.

The City would like to thank all PLC members for their efforts and dedication.

10. Environmental Management System – ISO 14001 Certification Progress

Solid Waste Resources (SWR) has implemented an Environmental Management System (EMS) that is led by a cross-functional team involving representatives from top management, supervisors and technical staff. The steering committee continues to meet on a quarterly basis to assess the continuing suitability, adequacy and effectiveness of the EMS; and to take actions on opportunities for improvement identified over the course of the year.

The purpose of the EMS is to assist Solid Waste Resources to consistently achieve:

- what is intended from each of our processes and programs;
- the commitments of our environmental policy, and
- continual improvement.

The Environmental Policy established for the EMS describes the following commitments: to our protection of the environment and prevention of pollution, fulfillment of our compliance obligations and continual improvement.

The first annual internal EMS audit took place in August 2020 to evaluate how well the EMS is integrated into SWR's organization and its various processes and programs. One non-conformity was identified related to the control of documented information, and corrective actions are ongoing to address the non-conformity. Related to this non-conformity, opportunities have been identified to better integrate the EMS into existing documents, forms, records and environmental performance monitoring/reporting.

Next steps for the EMS involve:

- refining the EMS to reflect SWR's organization, business processes and programs,
- integrate the EMS into existing documents, forms, records, and environmental performance monitoring/reporting, and
- preparing for the third-party certification to take place.

10.1 Emergency Management Training and Test Exercise

In December 2021, Solid Waste Resources held an annual emergency management training and test exercise. It involved different perspectives from various roles and responsibilities at

Solid Waste Resources. The training event presented an overview of Emergency Management Ontario's programs for improved resiliency in emergency situations and the requirements for emergency training and testing activities under the Emergency Management and Civil Protection Act and as included in the ISO 14001:2015 Environmental management systems standard.

The test exercise presented a scenario where a plane crashed into the MHSW building, resulting in a fire, explosion, and spill. Discussions were held with each of the scenario injects on what the proper courses of action were. A record is retained in the form of an After Action Report summarizing the discussions and identified opportunities for improvement.

In spring 2020, pandemic response plans were tested through the COVID-19 pandemic experienced by all. Improvements were made over the course of the year to reflect the ongoing situation and changing conditions. As identified through many other organizations, the previous pandemic plans did not sufficiently describe the level of detail and the various considerations for pandemic response. These have been updated over the course of 2020 and 2021 to reflect public health guidance and contingency plans specific to the operation. Changes are ongoing as the pandemic continues.

11. Waste Resource Innovation Centre Contingency Plans

The City has detailed contingency plans in place for the site prepared by the Environmental Services Department, Solid Waste Resources. The 2008 Emergency and Contingency Plan and the 2006 Contingency Plan documents (Waste Resource Innovation Centre Contingency Programs, Waste Resource Innovation Centre Business Continuity Plan, Waste Resource Innovation Centre Emergency Plan, Waste Resource Innovation Centre Fire Safety Plan) were reviewed by AECOM.

The pertinent items identified by the ECA are summarized below.

11.1 Spills

The Waste Resource Innovation Centre has a Spills Handling and Reporting procedure in place. This procedure applies to all areas, employees and contractors at the Waste Resource Innovation Centre. The procedure defines spills: minor, major, moderate and hazardous materials. The Spills procedure then outlines how to clean up a minor spill and who must be notified in the case of moderate or major spills.

In the event of a minor spill, the plan indicates that appropriate personal protective equipment should be worn and absorbents used to soak up the spill. Absorbed material should be transported to the Transfer Station for disposal.

The plan also covers procedures to follow in the event of a moderate or major spill. The City of Guelph Operations Department, the Environmental Protection Officer at the Wastewater Treatment Plant and the MOECC Spills Action Centre must be notified, also in the event of a major spill, the Fire Department, Police, Operations Department, or City of Guelph Emergency Operations Control Group may need to be notified. The plan indicates that all necessary steps should be taken to eliminate possible ignition sources and prevent the spill from leaving the area or entering a watercourse. The plan notes that an Employee Incident Report must be completed once the cleanup is underway. Finally, the plan provides sources of additional information and applicable legislation and references.

A Spill Contingency and Pollution Prevention Plan has also been developed for the site. This plan was updated in March 2020 as per the Ministry inspection report action item.

11.2 Fire or Similar Emergency

The Waste Resource Innovation Centre has comprehensive plans in place in case of fire or similar emergency documented in the Waste Resource Innovation Centre Fire

Safety Plan and the Waste Resource Innovation Centre Emergency Plan. The Fire Safety Plan includes site mapping, floor plans for each of the on-site buildings (including locations of fire alarms and extinguishers), procedures to be followed in the event of a fire/emergency, staff responsibilities and contacts in the event of a fire/emergency, procedures for fire drills, prevention and monitoring equipment maintenance.

The Emergency Plan includes many of the elements incorporated into the Fire Safety Plan plus emergency communications procedures, locations of emergency supplies, emergency equipment information and procedures related to specific emergency situations. The original Fire Safety Plan was reviewed and approved by the City Fire Department. The Fire Safety Plan is reviewed annually and the site inspected annually by the City Fire Prevention Officer.

11.3 Composting Facilities

The Organic Waste Processing Facility has been operating since September 2011. There is a 2012 contingency plan that now includes the organic waste processing facility, approved in late 2011.

11.4 Power or Equipment Failure

Procedures related to power failure are discussed in the Emergency and Contingency Plan and the Waste Resource Innovation Centre Emergency Plan. In the event of a minor power outage, a portable generator is available at the closed Eastview Road Landfill site. There is currently no contract for a company to supply the Waste Resource Innovation Centre with a generator in the event of a major power outage. However, arrangements are in place for an outside power generation unit for the Waste Resource Innovation Centre Administration Building if it is being used as an Operations Control Centre. If electricity is unavailable for more than a 24-hour period, the Waste Resource Innovation Centre would be required to re-direct waste materials. Emergency procedures have also been assessed for on-site facilities should the power failure be accompanied by flood or freezing conditions.

Procedures as a result of loss of on-site facilities are addressed in the Emergency and Contingency Plan as well as the Waste Resource Innovation Centre Business Continuity Plan. Recommended procedures associated with the loss of each of the facilities are documented. Ultimately, management will assess the course of action to restore the facilities and re-gain normal operations. A new generator has been installed at the Organic Waste Processing Facility.

11.5 Odour

Twice daily odour monitoring is conducted by qualified Solid Waste Resources (SWR) staff. Odour complaints from the public are investigated through the SWR Environmental Complaint Investigation Procedure in compliance with Condition 46 of the ECA. Control measures may include closing doors, cleaning up standing water and/or spills, other housekeeping measures, making changes to the processes or removal of the odour source to the landfill. If the odour persists, a portion of the operation or the entire site may be closed until the issue is resolved.

11.6 Aircraft Hazards/Bird Control

The Guelph Air Park is located within three km of the site. The most obvious aircraft hazard, as it relates to the operation of the Waste Resource Innovation Centre, is the nuisance bird population. Daily monitoring of the number of birds occurs as part of the site inspections. A maximum number of birds on-site was determined in the bird hazard evaluation referred to in the ECA. Continual housekeeping measures, such as litter pick up around the site, at the yard waste pile and compost area, occur at the site to deter the attraction of birds and vermin. Should nuisance birds become an issue at the site, trained birds-of-prey or other mitigative measures will be considered. If necessary, the site operations may cease until the issue is resolved.

Dust, steam, smoke or any airborne vapour may pose an aircraft hazard due to decreased visibility. Operations are conducted in a manner to minimize emissions.

11.7 Un-Authorized Waste

Non-compliant materials are rejected at the scale house prior to entering the site. If un-authorized, hazardous or inappropriate waste is inadvertently accepted, the material will be loaded back on the vehicle (if it has not left the site) or the material will be placed in the appropriate bin for removal by MHW staff where the material is then shipped off-site by a licensed hauler to an appropriate disposal site. The waste will be transported off-site as soon as arrangements can be made with a certified disposal company. If possible, the vehicle that brought the non-compliant materials will be charged for the disposal fee.

11.8 Groundwater/Surface Water Contamination

The site and operational procedures are designed such that there will be minimal impacts on the environment. In the event of a surface water impact, the on-site SWM detention ponds have valves that can stop off-site flow. A Spills Contingency Plan

(discussed in Section 11.1) is in place to handle spills. Dry and wet waste received and handled at the site is conducted in indoor covered areas with impermeable floor surfaces and materials stored outside are covered such that impacted runoff is not generated.

Nevertheless, should water quality results suggest that there are impacts to the ground or surface water, the monitor locations/surface water stations will be re-sampled within a reasonable period of time to confirm results. As well, the area immediately adjacent and upgradient of the impacted location will be inspected for possible contaminant sources. Equipment and floor drains may also be inspected to determine if repairs are required. These repairs will be completed immediately. Should the repairs be such that normal operation is not possible, this portion of the operation will be shut down until maintenance is complete. If the contamination is a result of failure in the infrastructure that cannot be repaired under normal maintenance procedures, a remedial plan will be developed to prevent further impacts.

11.9 Quality/Fungal Contamination

If issues arise regarding air quality or fungal contamination, the appropriate qualified professional will be contracted to investigate the cause and recommend remedial measures. Remedial measures may include a change/alteration of operations or suspension of operations in the affected area(s).

All staff receive and are trained on the procedures contained within the Waste Resource Innovation Centre Emergency Plan and Waste Resource Innovation Centre Fire Safety Plan. The Waste Resource Innovation Centre IC Business Continuity Plan is for use only by City Management staff due to personal information within the document. Contingency Plans are available at the Waste Resource Innovation Centre for review by the Ministry.

12. Current Health & Safety Program & Staff Training Program

The Corporation of the City of Guelph and the department of Solid Waste Resources are guided by their Corporate Values and are committed to maintaining the Health and Safety of every individual: employees, contactors, volunteers and visitors.

Health, safety and environmental legislative requirements for compliance, is maintained with corporate and departmental resources. The City of Guelph has set compliant standards focusing on systematic continuous improvement in their safety management system.

At Solid Waste Resources there are *two* dedicated expert positions supporting health and safety and environmental compliance: *Health & Safety Specialist* and *Environmental Management System Specialist.*

The functions of these positions include, but are not limited to, the following:

12.1 Safety Management System

Implementation of the City of Guelph's Health and Safety Policy Statement and Policies.

Analyze, design and implement Departmental Health & Safety Compliance program components with the necessary frame work to help all responsible parties attain accountability for their employees and their own responsibilities defined under the Occupational Health and Safety Act. Reduce health and safety risks to the lowest possible level through a comprehensive and continuous improvement safety management system that systematically identifies hazards and prescribes controls through risk assessment and risk mitigation.

Schedule internal/external audits.

Update divisional policies, procedures and Standard Operating Procedures.

12.2 Health, Safety & Environmental Compliance

Ensure compliance with applicable laws and legislation.

Liaise with regulatory or government officials to ensure that all related supporting documentation is accurate and regulatory response deadlines are met.

Solicits, co-ordinates, and consolidates staff, and peer input on legislative and regulation changes, and changes to certificates, permits and licenses.

Transfer applicable information and knowledge by; communicating and supporting employees, supervisors and managers to manage work; while ensuring due diligence in every aspect of their job relating to the operation.

12.3 Loss Control Activities

Continuously update Job Hazard Analysis, risk assessments work with the Divisional Manager, Departmental Managers, Supervisors and Lead hands to identify job hazards and eliminate, reduce and/or control risks on site and in the performance of the work.

Investigate and determine contributing factors for all accidents and/or incidents through root cause analysis techniques and recommend prevention or corrective strategies to eliminate their re-occurrence.

12.4 Training Activities

Research, review, develop, prepare and deliver or procure safety training (that meets the legislated safety program standards) identified through the safety training needs analysis completed for each job title and each area of Solid Waste Resources.

Ensure the site personnel and all of their employees are competent by legal definition under the Occupational Health and Safety Act and are able to comply with their individual responsibilities to ensure the safety of every individual in or about this site.

Are knowledgeable of all identified site and process hazards and the prescribed controls used to mitigate the risks and have the training, knowledge, skill and ability to work in a safe and compliant manner.

Are able to identify health and safety hazards and understand their responsibilities under the Occupational Health and safety Act for reporting hazards and prescribing and/or using controls to mitigate the hazard and protect the health and safety of everyone in or about the worksite.

12.5 Records Management

Maintain accurate up to date records to clearly demonstrate due diligence and compliance in the event that complaints, inspections or accidents are investigated by the Ministry of Labour.

12.6 Policies/ Procedures/Plans /Programs

Develop, administer, maintain and update all departmental Health &Safety, safety related documentation with regard to policies, procedures, plans, and programs.

Monitor Health &Safety policy and procedures to assist the Solid Waste Resource Management Team in ensuring staff compliance.

12.7 Auditing

Monitors compliance and verify effectiveness of Develop, administer and report on safety audits to promote legislative compliance and due diligence.

Identify the opportunities for continuous safety improvements through gap audits.

13. Summary of Site Operational Changes and Compliance

Based on review of available records by the City and by an annual inspection by AECOM, the City is in compliance to amended provisional C of A No. A170128 and amended ECA No. 9496-9NFKJ9. As reported by the City, there were no deficiencies or items of non-compliance in 2021. There were no environmental or operational problems that could negatively impact the environment, encountered during the operation of the composting site or identified during the facility inspections in 2020. The facility is operating as designed. The Water Supervisor is provided a copy of the annual report each year (ECA No. 9496-9NFKJ9, Condition 5(8) and 5(9)).

There have been no changes to the Engineer's Report[18] since the last annual report. The Design and Operations Report[19] was updated in 2010 to include the Public Drop Off.

18. Engineer's Report for the City of Guelph Waste Recycling Innovation Centre prepared by Golder Associates dated July 20, 2010.
19. The Design and Operations Report for the City of Guelph Material Recovery Facility prepared by Golder Associates, dated January 12, 2010. The Design and Operations Report for the City of Guelph Waste Transfer Station prepared by Golder Associates, dated January 12, 2010. The Design and Operations Report for the City of Guelph WRIC Public Drop Off and Municipal Hazardous and Special Waste Facilities prepared by Golder Associates, dated January 12, 2010.

14. Conclusions

The site operations at the Waste Resource Innovation Centre do not appear to have any negative impacts on the ground and surface water quality in the vicinity of the site.

The following conclusions are provided based on the findings of the 2021 program:

14.1 Composting Site

a) The total tonnage of source separated organic waste received at the composting site in 2021 was 30,649.5 tonnes.

b) A total tonnage of 7,045.5 tonnes of finished compost was produced and shipped to locations in Guelph, Huron County, Simcoe, Eramosa, Clinton and Blyth in 2021. The compost distribution/market for 2021 was focused on agricultural customers. Customers are within a two (2) hour radius of the Guelph Compost Facility and either require third-party hauling or have their own trucks. A total of 760.2 tonnes of screening, residual compost waste and organic rejected material were shipped to the Transfer Station and then Waste Management Twin Creeks Landfill in Sarnia, Ontario

c) The total tonnage of wood waste (“clean wood”) and amendment/mulch material received at the site in 2021 was about 39.6 tonnes and 700.1 tonnes, respectively. Wood waste was received mostly from the City of Guelph. Amendment material was received from the City of Guelph or in the form of wood chips from the City of Guelph Parks and Recreation Department and the Region of Waterloo.

d) City staff received 34 odour complaints in 2021 at the Waste Resources Innovation Centre. The complaints and remedial actions were reported to the Ministry, and a response letter was provided to each complainant. One complaint from September 10, 2021, consisting of a slight to moderate odour that lasted between one (1) and 30 seconds at the complaint location, was identified to be of a similar characteristic to the odour detected at the biofilter monitoring ports. None of the remaining complaints were confirmed to be attributed to the Waste Resource Innovation Centre site.

e) Compost samples indicate that all compost that has been shipped off the site has passed the conditions for a Class A compost under the CCME Guidelines and the conditions within the ECA. Temperature monitoring logs of the tunnels at the composting facility show that pasteurisation at 55 degrees C was maintained for 72 hours, as required.

f) The compost facility operated in 2021 without any major incidents. There were no environmental or operational problems that could negatively impact the environment, encountered during the operation of the composting site or identified during the facility inspections in 2021. The facility is operating as designed.

14.2 Operations

a) The total tonnage of waste accepted by the site in 2021 was 97,760 tonnes. By the end of 2021, 75,195 tonnes were shipped off-site with 13,133 tonnes of marketable processed material from the Material Recovery facility (MRF).

b) Of the 50,691.4 tonnes of non-processed outgoing materials from the Transfer Station, 50,691.4 tonnes (100% of the outgoing materials) were sent to the Waste Management Twin Creeks Landfill in Lambton County.

c) In 2021, 13,132.7 tonnes of marketable processed material were transferred off the site from the Waste Resource Innovation Centre (MRF/PDO) facility. 3,621.7 tonnes (28%) were paper-based goods such as cardboard and newsprint, 5,606.3 tonnes (43%) was organics, 512.7 tonnes (4%) was plastics and the remaining 3,395.1 tonnes (26%) was other recyclable materials such as aluminum, steel cans, glass, tires and metal. As reflected in the volumes above, the majority of the marketable materials sold were paper products.

d) The Emergency and Contingency Plan for the site were reviewed and the items pertinent to the ECA are summarized in this document.

e) No remedial or mitigative actions were required at the site in 2021 based on findings from the monitoring program.

14.3 Groundwater Elevations and Flows

a) Shallow groundwater flow beneath the majority of the site is in a north-easterly direction. To the west of the site, groundwater flows out of a bedrock high into the outwash beneath the site before being directed to the northeast.

b) The bedrock groundwater flow pattern is similar to the overlying shallow groundwater system. Groundwater flow is from west to east and east to west coming into the site area from both directions and ultimately to the north following the former paleo river valley (incised bedrock low) that trends to the north.

14.4 Groundwater

a) Groundwater monitoring results indicate road salt effects at some up-gradient groundwater monitoring locations (5-96, 14b-01, 19b-08, 20b-08, 23b-12). These are related to off-site winter road salting of the adjacent major roadways. Road salt effects are detected in some on-site downgradient groundwater monitors (6b-96, 7-96, 11b-00, 13b-01, 15b-01, 17b-08, 19b-08). Monitors 5-96 and 7-96 exceeded ODWS for sodium and/or chloride in 2021 as a result of road salt effects. There were no apparent leachate impacts observed in the groundwater at the site boundary.

b) Potential sources of odour and microbiology counts at monitor 15b-01 continue to be investigated however they are not interpreted to be related to the waste operations site and so are reported separately.

c) There were no exceedances of the nitrate ODWS in 2021. Historically, elevated nitrate concentrations were prevalent across the site at all locations prior to development of the site. Nitrate concentrations have decreased, in some case significantly, over the years from the historical highs observed prior to the commencements the Waste Resource Innovation Centre but are still found to be elevated.

d) Exceedances of the iron ODWS occurred at many of the monitoring locations during the December 2011 and also continue to be noted in 2021. The cause of the overall increase in iron concentrations is unknown. These elevated iron concentrations will continue to be investigated further in future monitoring events. Aside from the sodium, chloride and iron exceedances discussed above, there were no other exceedances of the Ontario Drinking Water Standards in 2021 for the groundwater monitors sampled for the site monitoring programs.

e) The 2021 organic sampling showed that there were detections of 2-Methylnaphthalene, bis(2-ethylhexyl), bromodichloromethane, chloroform, and dibromochloromethane at some of the on-site monitors. However, based on the historic detections of occasional low levels of VOC throughout the site in both upgradient and downgradient monitors, the 2021 VOC detections are not considered to be related to site operations. There are no sources of VOCs on the Waste Resource Innovation Centre or Transfer station property as waste is handled within the covered buildings, truck boxes are covered when outside (preventing contact between the waste and precipitation) and no waste processing occurs on-site.

f) New monitors 21-13A and 21-13B each had detections of one or more of benzene, toluene, ethylbenzene, xylenes (BTEX). Although above background criteria the BTEX concentrations remain quite low. This is a newly installed monitor and therefore we recommend at this time they be monitored to determine if detections persist.

g) Guideline B-7 assessment for the overburden and the bedrock was completed for monitoring nest 22-11, located along the western property boundary. The iron concentration at monitor 22a-11 exceeded Guideline B-7 limits during both 2021 monitoring event. As previously discussed, iron concentrations at some of the monitor locations have been unusually high since the December 2011 monitoring event. The elevated iron concentrations occurred in both upgradient and downgradient monitors and therefore, do not appear to be related to site operations.

h) No observable effects were detected in the shallow outwash water quality related to site operations. Similarly, no effects related to site operation were observed in the bedrock. Further, no effects related to site operations was observed at the downgradient site boundary.

14.5 Surface Water Monitoring

a) Of the 11 sets of samples collected in 2021 at EPTS-01 (the existing background on-site surface water pond, East Pond), the PWQO for zinc was exceeded during all 11 of the 2021 monitoring events. Zinc has consistently exceeded PWQO in the past at this location. Total Phosphorus also exceeded the PWQO in September and October, which it has occasionally historically. All other leachate indicator parameters concentrations were within background overburden ranges. Surface water organic sampling in June 2021 showed a low concentration of chloroform at the background surface water station, EPTS-01. Low chloroform levels have historically occasionally been detected at this location

b) Monthly monitoring of the stormwater management pond in the northwest corner of the site was conducted, with samples collected at the discharge at the north end of the pond (TP1 (out)) on 12 occasions in 2021. SWM pond samples exceeded the PWQO for total phosphorus, iron, phenols and zinc during one or more 2021 sampling events. The elevated total phosphorus is a result of surrounding land use and not a result of operations at the site. Elevated zinc, total phosphorus and iron concentrations appear to be related to external factors since background surface water have also exceeded PWQO for these parameters. Metals are a common contaminant from roadway runoff. Elevated phosphorus is typical in rural and

urbanized areas. No VOCs were detected at TP1 (out) during June 2021. Low April 2019 VOC detections may have been related to the fire at the waste transfer station three days prior to this monitoring event. Water from fire fighting efforts was directed to the SWM Pond where TP1 (out) is located. As expected, VOC concentrations quickly dissipated such that they were below the laboratory detection limits during the subsequent monitoring events later in 2019 and in 2020.

c) SW 1 (Stormwater Detention Area 2) was not sampled in 2021 as the water level in the detention pond was not above the trigger level of 0.46 m. No discharge was required from the Detention Pond 2 in 2021.

15. Recommendations

The following recommendations are provided for consideration:

a) The approved ground and surface water monitoring program should be continued for the site during 2022. The monitoring program for both the sites is outlined in Sections 6.1 and 6.2 of this report and summarized on **Table 25**.

b) All samples should be analyzed for the parameters listed in **Table 24**.

Table 24: Monitoring Parameter List

Analysis Groups	Leachate Indicator
Parameters	■ Biological Oxygen Demand (BOD) ■ Chemical Oxygen Demand (COD) ■ Total Kjeldahl Nitrogen (TKN) ■ Ammonia as Nitrogen (NH3-N) ■ Total Phosphorus (Total P) ■ Total Suspended Solids (TSS) for surface water and leachate. ■ Total Sulphate (SO4) ■ Phenols ■ Nitrate (NO3) and Nitrite (NO2) ■ Chloride (Cl) ■ Sodium (Na) ■ Calcium (Ca) ■ Boron (B) ■ Total Iron (Fe) ■ Phosphorus (P) ■ Zinc (Zn)
General Parameters	■ pH ■ Conductivity ■ Alkalinity ■ Magnesium (Mg) ■ Potassium (K)
Organics	■ EPA 624,625 (ATG 16+17+18 & ATG 19+20)

Table 25: Monitoring Program Summary

City of Guelph WRIC
Groundwater Monitoring Locations and Sampling Frequency

Formation	Monitor Locations		Sampling Frequency	Water Levels *
Sandy Silt Till	7-96		Semi Annually - Inorganics (June, December) Annually - Organics (June)	Semi Annually (June, December)
Sandy Outwash	6b-96	9-96	Semi Annually - Inorganics (June, December) Annually - Organics (June)	Semi Annually (June, December)
Gravelly Outwash	11b-00	12b-00	Semi Annually - Inorganics (June, December) Annually - Organics (June)	Semi Annually (June, December)
Dolostone Bedrock	5-96 6a-96 8-96	10-00 11a-00 12a-00	Semi Annually - Inorganics (June, December) Annually - Organics (June)	Semi Annually (June, December)

Surface Water Monitoring Stations and Sampling Frequency

Monitor Locations	Sampling Frequency	SW Level Sampling
SW1 - Downstream outflow of Detention Pond 2 (East of Admin)	Monthly - Inorganics, if pond levels exceed the target level of 0.46 m.	Monthly - Discharge

** C of A requirements for Wet-Dry is semi-annual. Recommend quarterly water levels collected to compare to Waste Transfer Station locations, which have quarterly requirements.*

City of Guelph Transfer Station
Groundwater Monitoring Locations and Sampling Frequency

Formation	Monitor Locations		Sampling Program
Gravelly Outwash	13b-01	18b-14	Semi Annually - Inorganics (June, December) Annually - Organics (June)
	14b-01	19b-08	
	15b-01	20b-08	
	16b-08	22b-11	
	17b-08	23b-12	
Dolostone Bedrock	13a-01	19a-08	Semi Annually - Inorganics (June, December) Annually - Organics (June)
	14a-01	20a-08	
	15a-01	21a-08	
	16a-08	22a-11	
	17a-08	23a-12	
	18a-14	EPTS-01	

Groundwater Levels

Formation	Monitor Locations		Sampling Program
Gravelly	13b-01	18b-14	Quarterly (June, December)
	14b-01	19b-08	
	15b-01	20b-08	
	16b-08	22b-11	
	17b-08	23b-12	
Dolostone	13a-01	18a-14	Quarterly (June, December)
	14a-01	19a-08	
	15a-01	20a-08	
	16a-08	21a-08	
	17a-08	22a-11	
	23a-12		

Surface Water Monitoring Stations and Sampling Frequency

Monitor Locations	Sampling Program
TP1 (out)	Monthly*** - Inorganics Annually*** - Organics
East Pond (EPTS-01)	Monthly*** - Inorganics Annually*** - Organics

**** After a rain event, if no rain or stagnent conditions persit No sampling required monitoring period*

Discontinuation of the organic groundwater sampling program is recommended as historical data, and increased data collected for the soil stock piling at the site, has consistently shown that low concentrations of organics are not related to the site. However, until the discontinuation of the organic sampling program is formalized by the MECP, QA/QC samples should be collected.

a) Inquires into the causes of water quality changes at monitoring nest 15-01 continued in 2021 and further recommendations were provided to the City independently as the impacts are not interpreted to be related to the waste operations at site.

b) The East Pond will continue to be used as a background surface water station for water quality from the on-site surface water features. To effectively compare surface water samples, monthly samples should continue to be collected on the same day. If no samples are collected from the any of the SWM pond locations, no sample from the East Pond for that month is required.

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