WATER QUALITY MONITORING AND TRIGGER LEVEL ASSESSMENT PROGRAM

Mayer Waste Disposal site
Township of Champlain, Ontario

Prepared for: 781996 Ontario Inc.

AUGUST 2000
REF. NO. 3045(22)
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1.0 INTRODUCTION

This report details the Surface Water and Groundwater Quality Monitoring and Trigger Level Assessment Program designed for the Mayer Waste Disposal Site (Site) located in the Township of Champlain, Ontario. This report has been prepared by Conestoga-Rovers & Associates (CRA), at the request of 781998 Ontario Inc. to document the surface and groundwater impact assessment program developed for the particular hydrologic and hydrogeologic setting of the Site. This report replaces the Draft Supplementary Hydrogeologic Assessment "Water Quality Monitoring and Trigger Level Assessment Program" (CRA, January 1999) and addresses comments raised by the Ministry of the Environment (MOE) Approvals Branch (correspondence dated March 1, 1999) and recommendation by the MOE's Water Resources Unit (correspondences dated June 2, 1999 and July 14, 2000).

This Water Quality Monitoring and Trigger Level Assessment Program report includes discussions of the following items:

- updated groundwater contour plan utilizing September 1999 monitoring data;
- water quality monitoring program proposed for the extended emergency period and the proposed landfill expansion;
- comprehensive trigger level assessment and contingency plan for both surface water and groundwater;
- enhanced Reasonable Use Criteria (RUC) assessment for groundwater quality; and
- contingency measures to comply with the groundwater RUC exceedance reported at the downgradient attenuation zone boundary.

The enclosed Water Quality Monitoring and Trigger Level Assessment Program will be implemented for the 2000 monitoring period at the Site. The program also incorporates new monitoring wells installed in support of the proposed extension of the Contaminant Attenuation Zone (CAZ). An application for amendment to the existing Emergency Certificate of Approval (EC of A) No. A471506 for the Domestic Landfill will be submitted by CRA to the MOE's Environmental Assessment and Approvals Branch in August 2000.

2.0 UPDATED GROUNDWATER CONTOUR PLAN

CRA has collected groundwater and leachate data at the Site since 1994. This database has been used to define the hydrogeological features of the Mayer Waste Disposal Site as well as the adjacent properties. As of 1999, a network of thirty-one (31) observation wells, three (3) leachate wells, and two (2) residential wells was being monitored bi-annually to define the groundwater flow pattern and quality at this Site, as well as the adjacent western property (Gilles Parisien's Property), the adjacent eastern property (Gilles R. Mayer Sanitation Ltd. Property [formerly Hawkesbury Transport Property]), and the residential subdivision located to the north of the Site (Carillon Gardens Subdivision). The groundwater and surface water elevations gathered during 1998 and 1999 are provided in Table 2.1, while a site plan is provided in Figure 1.

2.1 WATER TABLE AQUIFER

Figure 2 presents the September 1999 groundwater contours for the water table aquifer. Hydraulic data from all nine water table aquifer monitoring wells and the two leachate wells located on the Domestic Landfill were used to generate the water table groundwater contours. Water level data gathered from these wells indicates that the groundwater flow within the water table aquifer in vicinity of the Domestic Landfill occurs in an east-northeast direction.

A comparison of the groundwater data obtained from the leachate wells and monitoring wells located in vicinity of the Domestic Landfill indicates some leachate mounding occurs within the landfill. A review of the 1999 groundwater elevation data (Table 2.1), indicates that mounding within the Domestic Landfill reached approximately 0.5 to 1.5 metres above surrounding groundwater levels. The mounding effect appears to be more pronounced in the southern portion of the Domestic Landfill. Given the presence of a leachate mound, there is a potential for a limited and localized northwesterly flow of the water table groundwater along the western limit of the property.

Data obtained to date indicate that a portion of the water table aquifer which flows underneath the Domestic Landfill is captured by an off-Site drainage ditch located immediately beyond the downgradient limit of the existing CAZ. This ditch was observed to extend through the entire thickness of the water table aquifer and is based within the underlying clay aquitard. The groundwater and surface water collected in this drainage ditch is then discharged to a surface pond located within an excavated pit located in the central portion of the lands immediately east of the Site. Surface water

elevations historically gathered from the pond (SW3-93) indicate that the pond is located within the lower overburden aquifer.

In view of the reported presence of elevated levels of alkalinity and DOC during 1998 and 1999 monitoring events along the current downgradient (eastern) Site boundary, 781998 Ontario Inc. has proceeded with the implementation of the leachate management contingency plan established for the Site. The contingency plan involves extension of the CAZ on lands to the east (Gilles R. Mayer Sanitation Ltd.) where 781998 Ontario Inc. holds the groundwater rights. It is CRA's opinion that the resulting extended CAZ will permit groundwater compliance along the new CAZ downgradient boundary. Three new nested monitoring wells (OW25A/B-00, OW26A/B-00 and OW27A/B-00) were installed along the downgradient boundary of the proposed extended CAZ during January 2000, as shown of Figure 1. These new monitoring wells will replace the current downgradient wells and will be incorporated into the annual monitoring program. An application for amendment to the Emergency Certificate of Approval (EC of A) No. A471506 for the Domestic Landfill will be submitted by CRA (August, 2000) to adopt the extended CAZ.

2.2 LOWER OVERBURDEN AQUIFER

Figure 3 presents the September 1999 groundwater contours generated for the lower overburden aquifer. The hydraulic data from seventeen monitoring wells and the Industrial Landfill leachate well (LW2-94) were used to generate the contours for this aquifer. Based on the hydraulic data collected, groundwater flow in the lower overburden aquifer in vicinity of the Domestic Landfill is towards the east-northeast, as was the overlying water table aquifer, however, the direction of groundwater flow of the lower overburden aquifer shifts toward the north between the Domestic and Industrial Landfills, as shown on Figure 3. This shift in groundwater flow coincides roughly with the area where the water table aquifer joins the lower overburden aquifer. The northerly groundwater flow direction in the lower overburden aquifer continues in vicinity of the Industrial Landfill. Leachate mounding within the limits of the Industrial Landfill was not observed.

3.0 WATER QUALITY / LANDFILL GAS MONITORING

Water quality monitoring is currently being conducted twice per year at the Site and is summarized and reported in an Annual Monitoring and Progress Report. The Site Monitoring Program includes surface water, leachate, groundwater, and private residence well monitoring and landfill gas monitoring. The Extended Emergency Period Site Monitoring Specifications for the water quality monitoring program is provided in Appendix A. The specification identifies the objectives for each monitoring group, provides details on monitoring locations frequency and lists the sampling parameters. The program, as specified in Appendix A, has been updated to include 3 new nested groundwater monitoring wells (OW25-00, OW26-00 and OW27-00) and a new surface water sampling-location (SG5-00) located downgradient of the proposed extended CAZ. The Site Monitoring Program is proposed to be carried-out during the remainder of the Extended Emergency Period.

4.0 TRIGGER LEVEL ASSESSMENT AND CONTINGENCY PLAN

4.1 SURFACE WATER

CRA has collected surface water and leachate data at the Site since 1994. This database has been used in support of the development of a trigger level monitoring program and determination of the nature and extent of any incremental surface water quality impact as a result of landfilling operations. CRA has chosen specific monitoring locations as to provide upstream, landfill vicinity, and downstream surface water quality at the Site. SG1-93 is located upstream to the Domestic Landfill, SG3-93 is located immediately downstream of the Domestic Landfill at the surface water management pond discharge point, and SG4-94 is located at the current downstream Site boundary. Surface water location SG4-94 has historically been used as a trigger location for the surface water trigger level assessment described below. As part of the proposed CAZ extension, CRA has installed a new surface water monitoring location (SG5-00) along the proposed eastern boundary of the extended CAZ during April 2000. The newly installed surface water monitoring location (SG5-00) will replace the existing downgradient surface water monitoring location (SG4-94) and will be included in the 2000 monitoring program and used as a trigger location. An amendment to the existing EC of A will be sought in 2000 to adopt the extended CAZ. The location of the surface water monitoring locations is presented on Figure 1.

Assessment Criteria

A three-tier trigger level mechanism has been developed to assess surface water quality at the Site. Based on the trigger level assessment, the need to implement contingency measures will be determined. This assessment approach is consistent with that provided in the MOE Interim Guidelines – Surface Water Quality Assessment of Waste Disposal Sites (January 1998) and Interim Surface Water Monitoring Trigger Mechanism for Waste Disposal Sites (March 1998). The following describes the proposed Three-Tier Surface Water Assessment:

Tier I Trigger – Annual Routine Monitoring

Surface water monitoring is conducted twice annually at the Site (see Appendix A). The annual monitoring program is part of Tier I and is considered to be an Alert Level of monitoring. At this tier, Provincial Water Quality Objectives (PWQOs) are used as initial trigger levels.

Tier I trigger parameters were chosen by comparing leachate quality (general chemistry parameters, metals, and volatile organic compounds (VOCs)) to PWQOs in order to define leachate constituents that are of potential concern. These parameters may result in an incremental adverse impact to surface water quality. This assessment did not take into account the beneficial effects of dilution and attenuation downgradient of the landfill area. Table 4.1 identifies the leachate parameters that were detected at concentrations above PWQOs during at least one sampling event for the 1994 to 1999 monitoring period. Table 4.1 also includes upstream water quality as an indicator of background quality. This upstream data is essential in order to discern upstream bias and to gauge Site performance in recognition of MOE's Provincial Water Quality Policy 1 and Policy 2 as applicable.

The surface water Tier I trigger parameter selected for the Site are listed on Table 4.2. These parameters were selected based on their high concentration in the landfill leachate and their relatively low prevalence in the upstream surface water, as detailed in Table 4.1. As such, the use of the PWQOs as the trigger level criteria is appropriate.

As requested by the Water Resources Unit (MOE's comments on the 1998 Annual Monitoring and Progress Report, dated June 2, 1999), total phosphorus was added to the list of potential additional surface water indicator parameters. However, in view of the general reported exceedance to the PWQOs for total phosphorus in the upstream surface water (Table 4.1) it is recommended that the upstream 75th percentile concentration be used as a trigger criteria for this parameter. Under this evaluation process the upstream background water quality is defined as the 75th percentile concentration of the parameter's upstream historical database. This evaluation process could be implemented to determine background quality for surface waters for both PWQO and non-PWQO indicator parameters. The selected surface water trigger and assessment criteria are provided in Table 4.2.

If, during two consecutive monitoring events, a parameter concentration exceeds the corresponding PWQO criteria (initial trigger level) or the 75th percentile concentration for selected parameters (total phosphorus), at the trigger location the Tier II Trigger-Confirmation Monitoring will subsequently be implemented.

Tier II Trigger - Confirmation Monitoring

The Tier II will be used as a confirmation level to evaluate the degree and nature of non-compliance identified in Tier I. As a first step, the PWQO exceeding concentrations will be compared to 75th percentile concentration criteria. This comparison will be utilized as

an indicator to determine the timing and urgency of response. The Tier II evaluation components are as follows:

1. evaluation of surface water assessment parameters;
2. evaluation of upstream vs. downstream concentrations (75th percentile);
3. trend analysis over time and season for trigger and other assessment parameters; and
4. evaluation for the need to increase monitoring frequency and expand trigger parameter list.

If the upstream 75th percentile concentration criteria are not exceeded, an initial Tier II assessment to determine the significance of impact and evaluation of the need for increased annual monitoring frequency will be conducted. The results of the four components Tier II Assessment noted above, will be provided in the Annual Monitoring and Progress Report. Tier I monitoring would be continued to provide monitoring and evaluation of identified PWQO exceedances.

If the 75th percentile criteria are exceeded, a detailed Tier II Assessment would be conducted and the urgency of response determined. The following briefly describes each of the four components listed above.

The assessment may be increased to include non-PWQO indicator parameters (Table 4.2) which do not have a corresponding PWQOs values, but are useful in deriving landfill impacts. Given that these parameters do not have corresponding PWQOs, an evaluation tool such as the comparison to upstream 75th percentile concentrations will be used. An evaluation of upstream vs. downstream concentrations for all trigger and indicator parameters would also be conducted to reflect MOE's Provincial Water Quality Policy No. 2.

A trend analysis over time and season would be conducted to evaluate surface water impact of trigger and selected assessment parameters. The trend analysis would provide an evaluation of observed concentrations at trigger locations and determine if observed levels are erratic or anomalous.

An evaluation of the monitoring frequency would be provided to ensure that sufficient analytical data is collected for assessment and confirmation purposes. An evaluation of the trigger parameter list would also be conducted to determine if additional parameters need to be included in future monitoring events and assessments.

If the Tier II assessment indicates that significant degradation of surface water quality has occurred in excess of PWQOs, and 75th percentile criteria at the downgradient property boundary due to landfilling activities, CRA will evaluate contingency measures to be implemented as part of a Contingency Plan. An evaluation of contingency measures alternatives will be conducted based on the Tier II assessment and nature of surface water impact. The most likely source of impact to the surface water is the discharge of impacted groundwater to the drainage ditch. Contingency measures to be evaluated would include but not be limited to the extension of the downgradient Site boundary and/or the extraction of impacted groundwater upgradient of the on-Site surface water regime for on-Site treatment or off-Site disposal. If a groundwater extracting and treatment system is found to be the appropriate contingency measure to implement, a groundwater treatability assessment would be conducted to determine potential treatability measures and required pre-treatment. Details of the treatability assessment would be based on the levels and nature of surface water quality observed in the Tier II assessment.

Tier III Trigger - Compliance Monitoring

The Tier III compliance monitoring trigger is a compliance performance evaluation to assess the effectiveness of the implemented contingency measures. The Tier III compliance monitoring details would be determined in conjunction with the development and implementation of the preferred contingency measures plan. The compliance performance trigger parameters, levels and monitoring frequency would be determined at such time. Once compliance is confirmed at the Tier III level, the Tier III trigger becomes the new Tier I monitoring trigger and the Tier I evaluation begins once again.

4.2 GROUNDWATER

CRA has collected groundwater and leachate data at the Site since 1994. This database has been used in support for the development of a trigger level monitoring program and determination of the nature and extent of any incremental groundwater quality impact as a result of landfilling. The hydrogeology of the Site is characterized by two overburden aquifers, an upper unconfined (water table) aquifer comprised of surficial sands and a lower confined overburden aquifer also consisting of sands. The two aquifers are separated by a Leda clay deposit which acts as an aquitard of very low hydraulic conductivity underneath the Domestic Landfill. This clay aquitard thins out between the Domestic and the Industrial Landfills, resulting in localized mixing of both the water table and the lower overburden aquifer. As such, groundwater monitoring at

the Site will target both the water table and lower overburden aquifers. The water table aquifer impact has historically been concentrated in the vicinity of the Domestic Landfill with lower concentrations observed towards the eastern Site boundary. Impact to the lower overburden aquifer may be of concern downgradient of the mixing zone, as well as in the vicinity of the Industrial Landfill.

Water Table Aquifer

CRA has chosen specific monitoring locations to provide upgradient, landfill vicinity, and downgradient groundwater quality at the Site for both the water table and lower overburden aquifers. The background groundwater quality of the water table aquifer will be provided by monitoring well OW1-93, which is located upgradient of the Domestic Landfill. The water table quality in proximity of the Domestic Landfill will be provided by monitoring well OW13-98, located to the immediate west of the Domestic Landfill, on lands currently owned by Parisien. The downgradient groundwater quality along the current eastern boundary of the CAZ has historically been assessed at the locations of OW5B-94, OW14C-98 and OW6B-94, which is located approximately 40 m downgradient of the current Site boundary.

As recommended in the 1999 Annual Monitoring and Progress Report (CRA, March 2000), the leachate management contingency plan established for the Site will be implemented by extending the current CAZ onto lands east of the Site which were acquired by 781998 Ontario Inc. during 1999 to address degradation of the water table aquifer along the current eastern Site boundary. As part of the Trigger Level Assessment implementation, CRA has installed three new nested monitoring wells along the proposed eastern boundary of the extended CAZ during January 2000. The newly installed nested monitoring wells are shown on Figure 1 as OW25A/B-00, OW26A/B-00 and OW27A/B-00. Monitoring wells OW25B-00, OW26B-00 and OW27B-00 will replace the existing downgradient water table monitoring locations (OW5B-94 and OW14C-98) and will be included in the 2000 monitoring program and used as trigger locations. An amendment to the existing EC of A's will be sought in August 2000 to adopt the extended CAZ.

Lower Overburden Aquifer

The background groundwater quality of the lower overburden aquifer will be provided by monitoring well OW17-98, located upgradient of the Domestic Landfill. As detailed in the previous section, the lower overburden groundwater quality along the proposed eastern boundary of the extended CAZ will be assessed at the location of OW25A-00, OW26A-00 and OW27A-00. Downgradient of the mixing zone, the lower overburden

groundwater quality will be monitored at the location of wells OW11C-94 and OB-6, located between the Industrial Landfill and the Carillon Gardens subdivision. The groundwater quality downgradient of the Industrial Landfill will be assessed at OW15-98, which is located on the Parisien Property.

Assessment Criteria

Prior to 1998, chloride was the only trigger parameter used for groundwater quality assessment for the Site. As of 1998, in an attempt to increase the reliability of the groundwater quality assessment program at the Site, CRA implemented an enhanced groundwater assessment which included an expanded list of trigger parameters.

The trigger level assessment criteria used is the calculated RUC, as per the MOE's Reasonable Use Concept (RUC). To assess groundwater quality impact, CRA proposes to adopt a similar Tier evaluation to the surface water quality impact assessment. The following details the proposed Three-Tier Groundwater Assessment:

Tier 1 Trigger – Annual Routing Monitoring

Groundwater monitoring is conducted twice annually at the Site (see Appendix A). The annual monitoring is part of Tier I and is considered to be an Alert Level of monitoring. At this tier, calculated RUCs are used as trigger levels for Site-specific trigger parameters.

Trigger parameters were chosen by comparing leachate quality to current Ontario Drinking Water Objectives (ODWO) criteria in order to define those leachate constituents that are of potential concern. This assessment did not take into account the beneficial effects of dilution and attenuation downgradient of the landfill area. A list of leachate quality parameters that were detected at concentrations above ODWOs during at least one sampling event during the 1994 to 1999 monitoring period are provided in Table 4.3 and Table 4.4. Table 4.3 also includes upgradient water quality (OW1-93) as an indicator of background quality in the water table aquifer, while Table 4.4 presents the upgradient lower overburden water quality at OW17-98.

The trigger level assessment criteria used is the calculated RUC, as per the MOE's Reasonable Use Concept. According to the MOE's RUC, the maximum allowable level of particular parameter in groundwater can be calculated as follows:

For non-heath related parameters, such as chloride, the maximum allowable level equals 50% of the difference between the MOE drinking water objective and background

level plus background level. The MOE drinking water objective for chloride is 250 mg/L. Based on the results of the groundwater sampling program conducted to date, the average background chloride level for the water table aquifer at OW1-93 is approximately 15.3 mg/L. Thus, utilization of the RUC yields a maximum allowable chloride level of about 133 mg/L at the downstream Site boundary.

For heath related parameters, such as benzene, the maximum allowable level equals 25% of the difference between the MOE drinking water objective and background level plus background level. The MOE drinking water objective for benzene is 0.005 mg/L. Based on the results of the groundwater sampling program conducted to date, the average background benzene level for the shallow water table aquifer at OW1-93 was set at 0 mg/L (all data were reported as being below the analytical detection limit). Thus, utilization of the RUC yields a maximum allowable benzene level of about 0.00125 mg/L at the downstream Site boundary.

Background data and corresponding RUCs for the chosen trigger parameters, which will be used as trigger levels, are provided in Table 4.5 for the water table aquifer and Table 4.6 for the lower overburden aquifer. The 75th percentile concentrations of the parameter's upgradient historical database is also presented in these tables.

If, during two consecutive monitoring events, a parameter concentration exceeds the corresponding RUC criteria (trigger level) for any of the trigger parameters, the Tier II Trigger-Confirmation Monitoring will be implemented.

Tier II Trigger - Confirmation Monitoring

The Tier II will be used as a confirmation level to evaluate the degree and nature of non-compliance identified in Tier I. As a first step, the RUC exceeding concentrations will be compared to the 75th percentile concentration criteria. This comparison will be used to determine the timing and urgency of response. The Tier II assessment components are as follows:

1. evaluation of landfill impact indicator parameters;
2. evaluation of upgradient vs. downgradient concentrations (75th percentile);
3. trend analysis over time and season for trigger parameters; and
4. evaluation for the need to increase monitoring frequency and expand trigger parameter list.

The trigger assessment may be increased to include additional indicator parameters (as listed on Table 4.5 and 4.6) which are useful to derive landfill impacts. For the parameters which do not have corresponding ODWOs and RUCs, an evaluation tool such as the comparison to upgradient 75th percentile concentrations will be used. An evaluation of upgradient vs. downgradient concentrations for all trigger and indicator parameters would also be conducted to reflect the MOE's Provincial Water Quality Policy No. 2.

A trend analysis over time and season would be conducted to evaluate groundwater impact of selected trigger and indicator parameters. The trend analysis would provide an evaluation of observed concentrations and determine if observed levels are erratic or anomalous.

An evaluation of the monitoring frequency would be provided to ensure that sufficient analytical data is collected for assessment and confirmation purposes. An evaluation of the trigger parameter list would also be conducted to determine if additional parameters need to be included in future monitoring events and assessments. As requested by the Water Resources Unit (MOE's comments on the Proposed Amendment to the Trigger Level Assessment Program, dated July 14, 2000), a determination on the degree and nature of the non-compliance will be made within three months of the implementation of the Tier II trigger assessment.

If the Tier II assessment indicates that significant degradation of groundwater quality has occurred in excess of RUC at the downgradient property boundary due to landfilling activities, CRA will evaluate contingency measures to be implemented, as part of a Contingency Plan. An evaluation of contingency measures alternatives will be conducted, based on the Tier II assessment and nature of groundwater impact. Contingency measures to be evaluated would include, but not be limited to, the extension of the downgradient Site boundary and/or the extraction of impacted groundwater for on-Site treatment or off-Site disposal. If a groundwater extracting and treatment system is found to be the appropriate contingency measure to implement, a groundwater treatability assessment would be conducted to determine potential treatability measures and required pre-treatment. Details of the treatability assessment would be based on the levels and nature of groundwater quality observed in the Tier II assessment.

Tier III Trigger - Compliance Monitoring

The Tier III compliance monitoring trigger is a compliance performance evaluation to assess the effectiveness of the implemented contingency measures. The Tier III compliance monitoring details would be determined in conjunction with the development and implementation of the preferred contingency measures plan. The compliance performance trigger parameters, levels and monitoring frequency would be determined at such time. Once compliance is confirmed at the Tier III level, the Tier III trigger become new Tier I monitoring trigger and the Tier I evaluation begins once again.

5.0 ENHANCED RUC ASSESSMENT FOR GROUNDWATER QUALITY

5.1 WATER TABLE AQUIFER

The groundwater impact assessment for the Domestic Landfill focuses on the water table aquifer along the current downgradient boundary of the CAZ (OW5B-94 and OW14C-99). In addition, monitoring well OW13-98, located to the immediate west of the Domestic Landfill, was chosen as another trigger location in order to evaluate potential adverse effect on the water table aquifer on the adjacent property (Parisien Property) due to leachate mounding.

As summarized in Table 5.1, the groundwater quality data obtained during the 1998-1999 monitoring events from trigger locations OW5B-94, OW14C-98 and OW13-98 indicated selected exceedances when compared with the proposed expanded list of trigger parameters. At the location of OW5B-94, situated in proximity to the downgradient Site boundary, exceedances to the RUC were registered for alkalinity and DOC during all sampling events and for aluminum during the April 1998-1999 sampling events. Further north, at the location of OW14C-98, exceedances to the RUC were reported for DOC and alkalinity during most sampling events and for benzene and sodium in September 1998-1999. Of the RUC exceedances reported along the downgradient Site boundary (OW5B-94 and OW14C-98) during the 1998-1999 monitoring period, aluminum, alkalinity and DOC were also in excess of the ODWOs. However, at location OW6B-94, located approximately 40 m downgradient of the Eastern Site boundary within the proposed extended CAZ, no RUC exceedances were reported during the 1998-1999 monitoring period.

To the immediate west of the Domestic Landfill, at the location of OW13-98, RUC and ODWOs exceedances were reported for DOC during the April 1999 sampling event, and for alkalinity during the September 1999 event. All other trigger parameters were reported at levels inferior to their corresponding RUCs.

In summary, levels of targeted trigger parameters along the downgradient (eastern) Site boundary indicate several RUC exceedances in the water table aquifer, including two consecutive exceedances (April and September 1999) for alkalinity and DOC at both OW5B-94 and OW14C-98. In view of the reported and replicated RUC exceedances along the current downgradient boundary, the confirmation monitoring portion of the Tier II assessment program has been bypassed and 781998 Ontario Inc. has proceeded with the implementation of the leachate management contingency plan established as part of the Remediation Plan for the Site. The contingency plan involves extension of the CAZ on lands to the east where 781998 Ontario Inc. holds the groundwater rights. The

resulting extended CAZ will permit groundwater compliance along the new CAZ downgradient boundary considering the exceedances at the current boundary are primarily for alkalinity and DOC. As previously discussed, new monitoring wells (OW25B-00, OW26B-00 and OW27B-00) have been installed in January 2000 along the new downgradient boundary of the proposed extended CAZ. These new monitoring wells will replace the current downgradient wells for the 2000 monitoring period. An amendment to the existing EC of A's will be sought in August 2000 to adopt the extended CAZ.

With regards to the groundwater quality to the immediate west of the Domestic Landfill, the analytical data generated from the two sampling events conducted in 1999 indicates that the overall quality immediately west of the Domestic Landfill (OW13-98) has substantially improved since the first sampling event of September 1998. As shown on Table 5.1, the RUC exceedances reported for sodium, benzene and chloride during the September 1998 sampling event were not repeated during the 1999 monitoring period, and the alkalinity and DOC levels were observed to decrease substantially. Ongoing final grading, sloping and placement of the final cover along the Domestic Landfill has reduced the level of leachate mounding under the landfill, which translates to a reduced gradient and westerly flow component. It is presently anticipated that the levels of the selected trigger parameters at the location of OW13-98 will continue to decrease over the next few sampling events, as ongoing closure of the western and central portions of the Domestic Landfill continues.

5.2 LOWER OVERBURDEN AQUIFER

Based on the previously noted lower overburden groundwater flow characteristics, lower overburden groundwater impact assessment currently focus on the area downgradient (east) of the Domestic Landfill (OW5A-94 and OW14A-98), in vicinity of the Industrial Landfill, OB-6 and OW11C-94, (both of which are located between the Industrial Landfill and the Carillon Gardens subdivision), and OW15-98, installed immediately west of the Industrial Landfill. The RUC groundwater assessment of the lower overburden aquifer is summarized in Table 5.2.

Downgradient of the Domestic Landfill, at the location of OW5A-94 situated along the eastern Site boundary, no RUC exceedances (of the trigger parameters) were reported during the 1998-1999 monitoring period, with the exception of a one time (April 1998-1999) exceedance to the RUC and ODWOs for aluminum. Further north, at the location of OW14A-98, exceedances to the RUC and ODWOs were reported for aluminum during sampling events carried out in 1999, with the exception of

September 1999. However, at the location of OW6-94, located approximately 40 m downgradient of the Eastern Site boundary, within the proposed extended CAZ, no RUC exceedances were reported during the 1998-1999 monitoring period, with the exception of a one time (April 1998) aluminum RUC exceedance.

To the north of the Industrial Landfill, at the location of OW11C-94, located between the Carillon Gardens subdivision and the Industrial Landfill, and at the location of OB6, situated some 60 meters north of the Industrial Landfill, all trigger parameters were reported below their respective RUC.

To the immediate west of the Industrial Landfill, at the location OW15-98, RUC exceedances were reported for alkalinity and DOC during the 1999 monitoring events. The DOC and alkalinity levels reported at OW15-98 in 1999 also exceeded the ODWOs.

In summary, levels of targeted parameters showed little or no RUC exceedances along the eastern and northern Site boundaries, with the exception of consecutive aluminum exceedances at the location of OW14A-98, along the current eastern CAZ boundary. As previously stated, implementation of the leachate management contingency plan established for the Site (extension of the CAZ in an easterly direction) should permit compliance during subsequent monitoring events. The new monitoring wells (OW25A-00, OW26A-00 and OW27A-00) installed in January 2000 along the new downgradient boundary of the proposed extended CAZ will replace the current downgradient wells (OW5A-94 and OW14A-98) for the 2000 monitoring period. An amendment to the existing EC of A's will be sought in August 2000 to adopt the extended CAZ.

Groundwater quality results obtained at the location of OW15-98 during 1999 generally revealed a slight decrease in the levels of the selected trigger parameters, with RUC exceedances limited to alkalinity and DOC, two aesthetic parameters. It is expected that this decreasing trend should persist and probably accelerate in the coming years, as the Industrial Landfill is closed.

6.0 ENHANCED PWQO ASSESSMENT FOR SURFACE WATER QUALITY

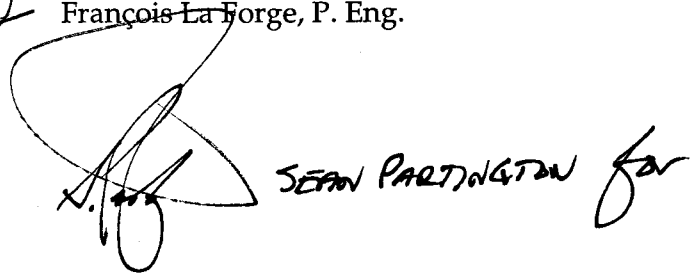
The surface water assessment focussed on upstream, landfill vicinity, and downstream surface water quality at the Site, as gathered at the location of SG1-93, SG3-93 and SG4-94, respectively. In addition, areas of both natural and artificial ponded water were also monitored (SW2-93, SW3-93, SW4-96 and SW5-98).

The surface water quality data reported for both 1999 monitoring events indicated only one PWQOs exceedance for the specific trigger parameters, as summarized in Table 5.3. Water collected from the Domestic Landfill surface water management pond (SW5-98) located to the east of the Domestic Landfill reported a PWQOs exceedance for zinc during the April 1999 sampling event. The trigger parameters at all other surface water locations were observed to be below their respective trigger criteria for both 1999 monitoring events. As such, no discernable impact to surface water quality has occurred due to the landfilling operations.

A new surface water monitoring location (SG5-00) has been installed in April 2000 along the new eastern boundary of the proposed extended CAZ. This new surface water monitoring location will replace the current downstream location (SG4-94) for the 2000 monitoring period. An amendment to the existing EC of A's will be sought in August 2000 to adopt the extended CAZ.

All of Which is Respectfully Submitted,
CONESTOGA-ROVERS & ASSOCIATES

François La Forge, P. Eng.



Gregory D. Ferraro, P. Eng.

TABLE 2.1

GROUNDWATER AND SURFACE WATER ELEVATIONS SUMMARY
WATER QUALITY MONITORING AND TRIGGER LEVEL ASSESSMENT PROGRAM
MAYER WASTE DISPOSAL SITE TOWNSHIP OF CHAMPLAIN

Monitoring Location	*Ground Elevation (m AMSL)*	*Reference Point Elevation (m AMSL)*	*Leachate/Water Elevation (m AMSL)*			
			Apr. 28/98	*Sept. 28/98*	*Apr. 27/99*	*Sept.27/99*
Leachate Wells						
LW2-94	60.55	61.42	52.69	51.91	52.78	51.91
LW3-98	75.48	76.25	66.37	66.38	65.91	65.77
LW4-98	74.93	78.84 (1)	62.86	61.38	63.00	61.90
Water Table Aquifer						
OW1-93	67.56	68.32	66.40	65.86	66.43	65.78
OW4B-93	63.20	63.85	61.72	60.95	61.81	60.94
OW5B-94	63.93	64.94	61.98	61.65	62.03	61.65
OW6B-94	62.41	63.32	60.31	60.06	60.18	60.15
OW7B-94	62.96	63.59	62.40	61.52	62.53	61.55
OW12-94	62.42	63.26	60.63	59.97	60.70	59.92
OW13-98	64.10	64.91	NI	62.37	63.04	62.43
OW14C-98	63.23	64.02	61.00	60.52	61.10	60.42
OW16C-98	62.73	63.48	59.98	59.64	60.21	59.92
Lower Overburden Aquifer						
OB-3	51.97	52.84	52.00	51.34	52.11	51.22
OB-6	52.14	52.63	51.38	51.47	52.20	51.38
OW2-93	56.85	57.80	52.36	51.61	52.50	51.51
OW3A-93	52.23	53.11	52.86	51.99	53.03	51.87
OW3B-93	52.29	53.02	52.85	51.99	flooded	51.86
OW4A-93	63.36	64.02	53.67	53.05	53.82	52.84
OW5A-94	63.97	64.99	54.03	53.38	54.18	53.27
OW6A-94	62.42	63.41	53.63	52.72	53.84	52.62
OW7A-94	63.03	64.01	53.65	53.13	53.69	53.07
OW9-94	54.05	54.96	53.05	52.34	53.25	52.27
OW10-94	60.75	61.57	52.31	51.55	52.46	51.44
OW11C-94	52.24	53.16	52.10	51.50	52.19	51.38
OW14A-98	63.36	64.13	53.61	52.75	53.77	52.64
OW15-98	52.95	53.84	NI	51.64	52.48	51.51
OW16B-98	62.63	63.49	53.39	53.00	53.55	52.98
OW17-98	68.75	69.61	61.46	60.71	61.49	60.43
OW18-98	53.41	54.24	NI	52.42	NM	52.34

Notes:

All ground and reference point elevations were established during the total station surveys completed January 29, 1994 and November 2, 1998, unless otherwise noted.

NM - Not Measured.

NI - Not Installed

(1) New reference point elevation at LW4-98, following extension of the monitoring well on September 28, 1999

TABLE 2.1

GROUNDWATER AND SURFACE WATER ELEVATIONS SUMMARY
WATER QUALITY MONITORING AND TRIGGER LEVEL ASSESSMENT PROGRAM
MAYER WASTE DISPOSAL SITE TOWNSHIP OF CHAMPLAIN

Monitoring Location	*Ground Elevation (m AMSL)*	*Reference Point Elevation (m AMSL)*	*Leachate/Water Elevation (m AMSL)*			
			Apr. 28/98	*Sept. 28/98*	*Apr. 27/99*	*Sept.27/99*
Bedrock Aquifer						
OW11A-94	52.30	53.29	51.87	51.23	51.98	51.13
OW16D-98	62.80	63.66	NI	53.58	54.34	53.58
Confined Aquitard						
OW14B-98	63.33	64.12	57.27	59.51	59.82	59.45
Lower Till Aquifer						
OW11B-94	52.31	53.26	51.95	51.30	52.06	51.21
OW16A-98	62.56	63.46	54.18	53.59	54.33	53.57
Surface Water						
SG1-93	--	63.66(1)	62.42	62.63	62.97	NM
SG3-93	--	62.63	61.51	61.48	61.95	61.49
SG4-94	--	62.29	61.26	61.19	61.32	61.18
SW2-93	--	53.02	52.21	51.60	52.32	51.51
SW3-93	--	53.77(2)	NM	52.93	52.76	NM
SW4-96 (D.L. SWMP Outfall)	--	--	Dry	Dry	Dry	Dry
SW5-98(D.L. SWMP Outfall)	--	--	NM	Dry	NM	Dry

Notes:

All ground and reference point elevations were established during the total station surveys completed January 29, 1994 and November 2, 1998, unless otherwise noted.

(1) Staff Gauge relocated into flow prior to April 28, 1998 monitoring event.

(2) Staff Gauge installed prior to September 28, 1998 monitoring event.

NM - Not Measured.

NI - Not Installed

D.L. SWMP-Domestic Landfill Surface Water Management Pond.

IDENTIFIED UP-STREAM SURFACE WATER QUALITY AND LEACHATE QUALITY PWQO EXCEEDANCES [1]
WATER QUALITY MONITORING AND TRIGGER LEVEL ASSESSMENT PROGRAM
MAYER WASTE DISPOSAL SITE, TOWNSHIP OF CHAMPLAIN

Upstream Quality - SG1-93

	Nov. 30/93	Apr. 18/94	Sept. 27/94	Apr. 24/95	Sept. 5/95	Apr. 23/96	Sept. 3/96	Apr. 29/97	Sept. 28/97	Apr. 28/98	Sept. 28/98	Apr.27/99	Sept. 27/99	PWQOs [2]
Metals														
Aluminum	0.56U/1.9U	0.34	0.15	0.15	0.15	0.319J/2.03J	0.331	0.219	0.297	0.17	1.36	0.327	0.115	0.075
Boron	<0.05/<0.05	0.01	--	--	--	--/--	--	--	--	0.018	<0.01	<0.01	0.015	0.2
Cadmium	<0.0003/<0.000	0.0001	<0.0001	<0.0001	<0.0001	<0.0001/<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	0.0002
Chromium	<0.01/<0.01	0.01	<0.01	<0.01	0.06	<0.005/<0.005	0.009U	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	0.1
Cobalt	<0.01/<0.01	<0.001	--	--	--	--/--	--	--	--	--	--	--	--	0.0006
Copper	0.02/<0.01	0.003U	0.002	0.01	0.002	0.0595J/0.0027J	0.0532	0.0018	0.0027	0.002	0.0065	0.003	0.0016	0.005
Iron	0.1U/0.5U	0.31	0.62	0.32	0.28	0.40J/1.95J	0.71	0.33	0.87	0.39	10.5	0.45	0.49	0.3
Lead	<0.003/<0.003	<0.001	0.001	<0.001	0.001	0.0034U/0.0035U	0.0018	<0.0005	0.0021	<0.0005	0.0039	0.0009	<0.0005	0.001-0.005
Nickel	<0.01/<0.01	<0.001	<0.001	<0.001	0.002	0.001J/0.003J	0.003	<0.001	0.001	<0.001	0.006	0.001	<0.001	0.025
Selenium	<0.05/<0.05	<0.1	<0.001	<0.001	<0.001	<0.002/<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.1
Vanadium	<0.01/<0.01	<0.005	--	--	--	--/--	--	--	--	0.0018	0.0103	0.0014	0.0007	0.007
Zinc	0.01/<0.01	<0.01	<0.01	<0.01	<0.01	0.006J/0.024J	0.011	0.004	0.006	0.005	0.039	0.014	<0.002	0.02
Total Phosphorus	<0.1/<0.1	0.069	0.052	0.021	0.043	0.060/0.170	0.048	0.056	0.078	<1	0.630	0.055	0.015	0.02
VOCs														
1,1-dichloroethene	<1/<1	<0.5	<0.5	<0.2	<0.2	<0.2/<0.2	<0.2	--	--	<0.5	--	<0.2	<0.2	40
1,1-dichloroethane	<2/<2	1.7	<0.2	0.5	<0.2	<0.2/<0.2	<0.2	--	--	<0.5	--	<0.2	<0.2	200
1,1,1-tricholoroethane	<2/<2	2.9	<0.2	0.5	<0.3	<0.2/<0.2	<0.3	--	--	<0.5	--	0.3	<0.2	10
Toluene	1.5U/1.7U	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2U	<0.2	--	--	<0.5	--	<0.2	<0.2	0.8
Ethylbenzene	<0.5/<0.5	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2	--	--	<0.5	--	<0.2	<0.2	8
m&p Xylene	1.4U/<0.5	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2	--	--	<0.5	--	<0.2	<0.2	32
Vinyl chloride	<1/<1	<0.5	<1.0	<0.5	<0.5	<0.5/<0.5	<0.5	--	--	<0.5	--	<0.5	<0.5	400
Chlorobenzene	<0.5/<0.5	<0.2	<1.0	<0.2	<0.2	<0.2/<0.2	<0.2	--	--	<0.5	--	<0.2	<0.2	15

Leachate Quality at LW1-94 (Jan. 24/94 - Apr. 22/96) and Leachate Quality at LW4-98 (Apr. 28/98 - Sept. 27/99)

	Jan. 24/94	Apr. 18/94	Sept. 26/94	Apr. 24/95	Sept. 5/95	Apr. 22/96	Apr. 28/98	Sept. 28/98	Apr. 27/99	Sept. 27/99	PWQOs [2]
Metals											
Aluminum	0.11	7.5	--	0.11	--	1.42	2.49	382	0.049	0.053	0.075
Boron	2.02	2.41	--	--	--	--	2.45	2.06	2.26	1.7	0.2
Cadmium	<.005	0.0019	--	<.005	--	0.0013	<0.0001	0.01	<0.0001	<0.0001	0.0002
Chromium	0.02	0.05	--	0.04	--	0.133	<0.05	1.54	<0.05	<0.05	0.1
Cobalt	0.01	0.01	--	--	--	--	--	--	--	--	0.0006
Copper	<0.01	<0.01	--	<0.01	--	0.0318	0.0026	0.835	<0.0005	0.0012	0.005
Iron	40.3	163	--	37.9	--	52.3	79.2	746	1.36	0.36	0.3
Lead	<0.05	0.1	--	<0.05	--	0.036	0.0042	0.613	<0.0005	0.0015	0.001-0.005
Nickel	0.06	0.07	--	0.08	--	0.094	0.064	0.94	0.036	0.02	0.025
Selenium	0.1	<0.001	--	<0.1	--	0.012	0.002	<0.001	<0.002	<0.002	0.1
Vanadium	0.011	0.037	--	--	--	--	0.0371	1.34	0.006	0.21	0.007
Zinc	<0.01	0.74	--	<0.01	--	0.543	0.118	2.68	<0.002	0.009	0.02
Total Phosphorus	0.5	2.6	--	--	--	--	0.38	22	6.67	9.70	0.02
VOCs											
1,1-dichloroethene	130	10100	<50	<125	<25	20.5	<0.2	<0.2	<2.0	<1.0/<1.0	40
1,1-dichloroethane	2300	<20	2710	3960	86.2	4620	<0.2	<0.2	<2.0	<1.0/<1.0	200
1,1,1-tricholoroethane	4070	<20	702	652	43.7	5770	<0.2	<0.2	<2.0	<1.0/<1.0	10
Toluene	25	116	64	105	218	212	1.8	2	<2.0	0.5/0.5	0.8
Ethylbenzene	5.3	32.5	50	<50	37.5	40.2	1.9	10.5	13.9	5.9/5.7	8
m&p Xylene	9.3	59.2	26	71	81.8	105	3.5	23.6	45.4	20.5/22.2	32
Vinyl chloride	16.7	400	<100	<125	<25	<25	<1.3	<2.5	<2.0	<2.5/<2.5	400
Chlorobenzene	1.9	<20	28	<50	<10	<10	2	8.6	12.4	14.8/14.4	15

Notes:

(1) All results expressed in mg/L except for VOCs which are expressed in µg/L
Parameters listed for metals, VOCs and general chemistry do not include all parameters analysed, but do include all parameters that were detected at concentration above PWQOs during at least one sampling period at either background or leacahate locations.

(2) Ministry Of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQOs)

-- Not analyzed

<0.2/<0.2 Duplicate samples were submitted for analysis

<0.001 The parameter was analyzed for but not detected at or above the method detection limit. The associated value is the method detection limit.

U, J Qualified Results

Exceedance of PWQOs

TABLE 4.2

SURFACE WATER TRIGGER AND ASSESSMENT CRITERIA [1]
WATER QUALITY MONITORING AND TRIGGER LEVEL ASSESSMENT PROGRAM
MAYER WASTE DISPOSAL SITE, TOWNSHIP OF CHAMPLAIN

Initial Surface Water Trigger Parameters	*Trigger Levels*	
	PWQOs [2]	*75th Percentile* [3]
Metals		
Boron	0.2	0.018
Cadmium	0.0002	0.0001
Lead	0.025	0.0019
Nickel	0.025	0.0023
Vanadium	0.007	0.0088
Zinc	0.02	0.01025
General Chemistry		
Total Phosphorus	0.02	0.0835
VOCs		
1,1-dichloroethane	200	<2
1,1,1-trichloroethane	10	0.15
Toluene	0.8	<0.5
Ethylbenzene	8	<0.5
m&p Xylene	32	<0.5
chlorobenzene	15	<0.5

Additional Surface Water Indicator Parameters

General Chemistry
Chloride
Alkalinity
Conductivity
Hardness
Nitrate
Ammonia Nitrogen
Biological Oxygen Demand
Chemical Oxygen Demand

Notes:

(1) All results expressed in mg/L except for VOCs which are expressed in µg/L
(2) Ministry Of Environment (MOE), Provincial Water Quality Objectives (PWQOs)
(3) 75th percentile concentration of the parameter's upstream (SG1-93) historical database
-- No criteria available

TABLE 4.3

IDENTIFIED UPGRADIENT WATER TABLE AQUIFER QUALITY AND LEACHATE QUALITY ODWO EXCEEDANCES[1]
WATER QUALITY MONITORING AND TRIGGER LEVEL ASSESSMENT PROGRAM
MAYER WASTE DISPOSAL SITE, TOWNSHIP OF CHAMPLAIN

	Background Quality in Water Table Aquifer (OW1-93)													ODWO [2]	*OW1-93 Average Background Level* [3]
	Jan. 24/94	*Apr. 18/94*	*Sept. 26/94*	*Apr. 24/95*	*Sept. 5/95*	*Apr. 22/96*	*Sept. 3/96*	*Apr. 29/97*	*Sept. 28/97*	*Apr. 28/98*	*Sept. 28/98*	*Apr. 27/99*	*Sept. 27/99*		
Metals															
Aluminum	0.07	<0.05	--	--	--	--	--	--	--	0.059	<0.005	<0.03	0.04	0.1	0.06
Chromium	<0.01	<0.01	--	--	--	--	--	--	--	--	--	--	--	0.05	0.00
Iron	0.08	0.04	--	--	--	--	--	0.13	0.46	0.07	<0.03	<0.01	<0.01	0.3	0.16
Manganese	0.06	0.03	--	--	--	--	--	--	--	0.322	0.039	0.057	0.141	0.05	0.11
Selenium	<0.001	<0.001	--	--	--	--	--	--	--	<0.002	<0.002	<0.001	<0.001	0.01	0.00
Sodium	11.9	9.2	--	--	--	8.5	17.1	14.8	18.2	10.3	19.3	14.9	11.4	200	13.56
VOCs															
Dichloromethane	<1.0	<1.0	<1.0	<1.0/<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--	<1.0	--	<1.0	50	0.00
Benzene	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	--	<0.1	5	0.00
1,2-Dichloroethane	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	--	<0.2	--	<0.2	5	0.00
Toluene	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	--	<0.2	--	<0.2	24	0.00
Ethylbenzene	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	--	<0.2	--	<0.2	2.4	0.00
Vinyl Chloride	<1.0	<1.0	<1.0	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	<0.5	--	<0.5	2	0.00
General Chemistry															
Chloride	18.4	14.5	30.4	31.0/31.9	13.4	10.1	26	19	10.7	4.1	2.3	1.3	1.2	250	15.31
Alkalinity	94	38.1	111	35.2/36.3	29.2	29	90.2	61.8	89	25	94	78	52	30-500	61.63
Hardness	111	53.2	155	111.4/115.3	40.9	65	146	97.3	98.5	32	105	82.2	54.5	80-100	90.52
Dissolved Organic Carbon	1.3	1.4	3.1	2.3/2.7	2.5	1	2.6	1.1	1.9	1.8	1.1	1.6	0.9	5	1.81

	Leachate Quality at LW1 - 94 (Jan. 24/94 - Sept. 28/97) and Leachate Quality at LW4-98 (Apr. 28/98 - Sept 27/99)													ODWO [2]	*Average Leachate Level* [3]	*Average Leachate Level to Average Background Level Ratio*	*Average Leachate Level to ODWO Ratio*
	Jan. 24/94	*Apr. 18/94*	*Sept. 26/94*	*Apr. 24/95*	*Sept. 5/95*	*Apr. 22/96*	*Sept. 3/96*	*Apr. 29/97*	*Sept. 28/97*	*Apr. 28/98*	*Sept. 28/98*	*Apr. 27/99*	*Sept. 27/99*				
Metals																	
Aluminum	0.11	7.5	--	0.11	--	1.42	--	--	--	2.49	382	0.049	0.053	0.1	49.22	873.7	492
Chromium	0.02	0.05	--	0.04	--	0.133	--	--	--	<0.05	1.54	<0.05	<0.05	0.05	0.36	Elevated [4]	7
Iron	40.3	163	--	37.9	--	52.3	--	--	--	79.2	746	1.36	0.36	0.3	140.05	898	467
Manganese	0.58	2.36	--	0.57	--	0.484	--	--	--	2.82	11	0.304	0.607	0.05	2.34	22	47
Selenium	0.1	<0.001	--	<0.1	--	0.012	--	--	--	0.002	<0.001	<0.002	<0.002	0.01	0.04	Elevated [4]	4
Sodium	508	703	--	643	--	757	--	--	--	592	453	492	264	200	551.50	41	3
VOCs																	
Dichloromethane	17	<100	<100	<250	108	<50	--	--	--	<0.2	<0.2	<10.0	<5.0/<5.0	50	62.50	Elevated [4]	1.3
Benzene	5.5	17.4	11	<25	10.8	11.4	--	--	--	2.5	3.3	5.7	6.1/5.8	5	7.95	Elevated [4]	2
1,2-Dichloroethane	2	26.3	<20	<50	<10	<10	--	--	--	<0.2	<0.2	<2.0	<1.0/<1.0	5	14.15	Elevated [4]	3
Toluene	25	116	64	105	218	212	--	--	--	1.8	2	<2.0	0.5/0.5	24	92.98	Elevated [4]	4
Ethylbenzene	5.3	32.5	50	<50	37.5	40.2	--	--	--	1.9	10.5	13.9	5.9/5.7	2.4	20.34	Elevated [4]	8
Vinyl Chloride	16.7	400	<100	<125	<25	<25	--	--	--	<1.3	<2.5	<2.0	<2.5/<2.5	2	208.35	Elevated [4]	104
General Chemistry																	
Chloride	837	920	924	882	1100	996	--	--	--	837	613	667	308	250	808.40	53	3
Alkalinity	2990	2420	3740	--	4000	3605	--	--	--	2 470	2 400	2 290	1 950	30-500	2874.00	47	6
Hardness	983	1317	135	1054	1367	1126	--	--	--	1 090	547	576	493	80-100	844.22	9	9
Dissolved Organic Carbon	290	1020	213	--	494	190	--	--	--	161	108	165	97	5	304.22	168	61

Notes:

(1) All results and guidelines expressed in mg/L except for VOCs which are expressed in µg/L. Parameters listed for metals, VOCs and general chemistry do not include all parameters analysed, but do include all parameters that were detected at concentrations above ODWOs during at least one sampling period at either background or leachate locations.

20/13 Duplicate samples were submitted for analysis.

(2) Ministry of Environment and Energy (MOEE), Ontario Drinking Water Objectives (ODWO)

(3) Average background and leachate level calculations use a value of 0 when the parameter was analyzed for but not detected at or above the method detection limit, unless other data ara available for other sampling dates(s), *in which case the non-detect samples(s) are not used in the calculation of the average level.*

-- Not Analyzed

(4) Ratio is elevated but undefined since average level is set at zero

Exceedance of ODWOs

IDENTIFIED UPGRADIENT LOWER OVERBURDEN AQUIFER QUALITY AND LEACHATE QUALITY ODWO EXCEEDANCES[1]
WATER QUALITY MONITORING AND TRIGGER LEVEL ASSESSMENT PROGRAM
MAYER WASTE DISPOSAL SITE, TOWNSHIP OF CHAMPLAIN

	Background Quality in Lower Overburden Aquifer (OW17-98)				*ODWO [2]*	*OW17-98 Average Background Level [3]*
	Apr. 28/98	*Sept. 28/98*	*Apr. 27/99*	*Sept. 27/99*		
Metals						
Aluminum	2.28	0.029	0.04	<0.03	0.1	0.59
Chromium	--	--	--	--	0.05	0.00
Iron	3.93	<0.03	0.02	0.02	0.3	1.32
Manganese	0.107	0.011	0.013	0.008	0.05	0.03
Selenium	<0.002	<0.002	<0.001	<0.001	0.01	0.00
Sodium	93	103	89.3	81.5	200	91.70
VOCs						
Dichloromethane	--	<1.0	--	<1.0	50	0.00
Benzene	--	<0.1	--	<1.0	5	0.00
1,2-Dichloroethane	--	<0.2	--	<0.2	5	0.00
Toluene	--	<0.2	--	<0.2	24	0.00
Ethylbenzene	--	<0.2	--	<0.2	2.4	0.00
Vinyl Chloride	--	<0.5	--	<0.5	2	0.00
General Chemistry						
Chloride	5.3	35	48.1	59.7	250	37.03
Alkalinity	233	181	168	144	30-500	181.50
Hardness	41.6	40.7	53.1	54.3	80-100	47.43
Dissolved Organic Carbo	3.8	2.6	2.2	1.8	5	2.60

	Leachate Quality at LW1 - 94 (Jan. 24/94 - Sept. 28/97) and Leachate Quality at LW4-98 (Apr. 28/98 - Sept 27/99)													*ODWO [2]*	*Average Leachate Level [3]*	*Average Leachate Level to Average Background Level Ratio*	*Average Leachate Level to ODWO Ratio*
	Jan. 24/94	*Apr. 18/94*	*Sept. 26/94*	*Apr. 24/95*	*Sept. 5/95*	*Apr. 22/96*	*Sept. 3/96*	*Apr. 29/97*	*Sept. 28/97*	*Apr. 28/98*	*Sept. 28/98*	*Apr. 27/99*	*Sept. 27/99*				
Metals																	
Aluminum	0.11	7.5	--	0.11	--	1.42	--	--	--	2.49	382	0.049	0.053	0.1	49.22	83.8	492
Chromium	0.02	0.05	--	0.04	--	0.133	--	--	--	<0.05	1.54	<0.05	<0.05	0.05	0.36	Elevated [4]	7
Iron	40.3	163	--	37.9	--	52.3	--	--	--	79.2	746	1.36	0.36	0.3	140.05	106	467
Manganese	0.58	2.36	--	0.57	--	0.484	--	--	--	2.82	11	0.304	0.607	0.05	2.34	67	47
Selenium	0.1	<0.001	--	<0.1	--	0.012	--	--	--	0.002	<0.001	<0.002	<0.002	0.01	0.04	Elevated [4]	4
Sodium	508	703	--	643	--	757	--	--	--	592	453	492	264	200	551.50	6	3
VOCs																	
Dichloromethane	17	<100	<100	<250	108	<50	--	--	--	<0.2	<0.2	<10.0	<5.0/<5.0	50	62.50	Elevated [4]	1.3
Benzene	5.5	17.4	11	<25	10.8	11.4	--	--	--	2.5	3.3	5.7	6.1/5.8	5	7.95	Elevated [4]	2
1,2-Dichloroethane	2	26.3	<20	<50	<10	<10	--	--	--	<0.2	<0.2	<2.0	<1.0/<1.0	5	14.15	Elevated [4]	3
Toluene	25	116	64	105	218	212	--	--	--	1.8	2	<2.0	0.5/0.5	24	92.98	Elevated [4]	4
Ethylbenzene	5.3	32.5	50	<50	37.5	40.2	--	--	--	1.9	10.5	13.9	5.9/5.7	2.4	20.34	Elevated [4]	8
Vinyl Chloride	16.7	400	<100	<125	<25	<25	--	--	--	<1.3	<2.5	<2.0	<2.5/<2.5	2	208.35	Elevated [4]	104
General Chemistry																	
Chloride	837	920	924	882	1100	996	--	--	--	837	613	667	308	250	808.40	22	3
Alkalinity	2990	2420	3740	--	4000	3605	--	--	--	2 470	2 400	2 290	1 950	30-500	2874.00	16	6
Hardness	983	1317	135	1054	1367	1126	--	--	--	1 090	547	576	493	80-100	844.22	18	9
Dissolved Organic Carbon	290	1020	213	--	494	190	--	--	--	161	108	165	97	5	304.22	117	61

Notes:

(1) All results and guidelines expressed in mg/L except for VOCs which are expressed in µg/L. Parameters listed for metals, VOCs and general chemistry do not include all parameters analysed, but do include all parameters that were detected at concentrations above ODWOs during at least one sampling period at either background or leachate locations.

20/13 Duplicate samples were submitted for analysis.

(2) Ministry of Environment and Energy (MOEE), Ontario Drinking Water Objectives (ODWO)

(3) Average background and leachate level calculations use a value of 0 when the parameter was analyzed for but not detected at or above the method detection limit, unless other data ara available for other sampling dates(s), in which case the non-detect samples(s) are not used in the calculation of the average level.

-- Not Analyzed

(4) Ratio is elevated but undefined since average level is set at zero

Exceedance of ODWOs

TABLE 4.5

GROUNDWATER TRIGGER AND ASSESSMENT CRITERIA [1]
WATER TABLE AQUIFER
MAYER WASTE DISPOSAL SITE, TOWNSHIP OF CHAMPLAIN

Groundwater Trigger Parameters	*OW1-93 Average Background Level (2)*	*LW1-94/LW4-98 Average Leachate Level (2)*	*ODWO Characterization*	*ODWO*	*Average Leachate Level to Average Background Level Ratio*	*Average Leachate Level to ODWO Ratio*	*RUC (Trigger Level)*	*75th (Percentile)(4)*
Metals								
Sodium	13.56	551.50	NHR	200	41	3	106.8	16.55
Aluminum	0.060	49.22	NHR	0.1	820	492	0.083	0.057
VOCs								
Benzene	0.00	7.95	HR	5	Elevated [3]	2	1.25	<0.1
Toluene	0.00	92.98	NHR	24	Elevated [3]	4	12	<0.2
Ethylbenzene	0.00	20.34	NHR	2.4	Elevated [3]	8	1.2	<0.2
Vinyl Chloride	0.00	208.35	HR	2	Elevated [3]	104	0.5	<0.1
General Chemistry								
Chloride	15.31	808.40	NHR	250	53	3	132.7	19
Alkalinity	61.63	2874.00	NHR	500	47	6	281	90.2
Dissolved Organic Carbon	1.81	304.22	NHR	5.0	168	61	3.4	2.5

Additional Groundwater Indicator Parameters

General Chemistry
Conductivity
Hardness
Nitrate
Ammonia Nitrogen
Biological Oxygen Demand
Chemical Oxygen Demand

Notes:

(1) All results and guidelines are expressed in mg/L except for VOCs which are expressed in µg/L

(2) Average background and leachate level calculations use a value of 0 when parameter was analysed for but not detected at or above the method detection limit unless other data are available for other sampling date(s) in which case the non-detect sample(s) are not used in the calculation of the average level

(3) Ration is elevated but undefined since average background level is set at zero

(4) 75th percentile concentration of the parameters upstream (OW1-93) historical database

HR: Health Related Parameters

NHR: Non Health Related Parameters

RUC: Reasonable Use Criteria

RUC for NHR Parameters = (ODWO - Average Background Level) x 0.5 + Average Background Level

RUC for HR Parameters = (ODWO - Average Background Level) x 0.25 + Average Background Level

TABLE 4.6

GROUNDWATER TRIGGER AND ASSESSMENT CRITERIA [1]
LOWER OVERBURDEN AQUIFER
MAYER WASTE DISPOSAL SITE, TOWNSHIP OF CHAMPLAIN

Groundwater Trigger Parameters	*OW17-98 Average Background Level* [2]	*LW1-94/LW4-98 Average Leachate Level* [2]	*ODWO Characterization*	*ODWO*	*Average Leachate Level to Average Background Level Ratio*	*Average Leachate Level to ODWO Ratio*	*RUC (Trigger Level)*	*75th (Percentile) (4)*
Metals								
Sodium	91.70	551.50	NHR	200	6	3	145.9	95.5
Aluminum	0.590	49.22	NHR	0.1	83	492	0.345	0.6
VOCs								
Benzene	0.00	7.95	HR	5	Elevated [3]	2	1.25	<1.0
Toluene	0.00	92.98	NHR	24	Elevated [3]	4	12	<0.2
Ethylbenzene	0.00	20.34	NHR	2.4	Elevated [3]	8	1.2	<0.2
Vinyl Chloride	0.00	208.35	HR	2	Elevated [3]	104	0.5	<0.5
General Chemistry								
Chloride	37.03	808.40	NHR	250	22	3	143.5	51
Alkalinity	181.50	2874.00	NHR	500	16	6	341	194
Dissolved Organic Carbon	2.60	304.22	NHR	5.0	117	61	3.8	2.9

Additional Groundwater Indicator Parameters

General Chemistry
Conductivity
Hardness
Nitrate
Ammonia Nitrogen
Biological Oxygen Demand
Chemical Oxygen Demand

Notes:

(1) All results and guidelines are expressed in mg/L except for VOCs which are expressed in µg/L

(2) Average background and leachate level calculations use a value of 0 when parameter was analysed for but not detected at or above the method detection limit unless other data are available for other sampling date(s) in which case the non-detect sample(s) are not used in the calculation of the average level

(3) Ration is elevated but undefined since average background level is set at zero

(4) *75th percentile concentration of the parameter's upstream (OW17-98) historical database*

HR: Health Related Parameters

NHR: Non Health Related Parameters

RUC: Reasonable Use Criteria

RUC for NHR Parameters = (ODWO - Average Background Level) x 0.5 + Average Background Level

RUC for HR Parameters = (ODWO - Average Background Level) x 0.25 + Average Background Level

TABLE 5.1

RUC GROUNDWATER ASSESSMENT [1]
WATER TABLE AQUIFER
MAYER WASTE DISPOSAL SITE
TOWNSHIP OF CHAMPLAIN

	CURRENT DOWNGRADIENT LIMIT OF CAZ *OW5B-94*				*RUC*	
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*	*(Trigger Level)*	ODWO
Metals						
Sodium	52.1/52.8	88.2/90.4	56.5/57.9	92.4/96.5	106.6	200
Aluminum	0.184/0.107	0.027/0.024	0.15/0.08	<0.03/<0.03	0.083	0.1
VOCs						
Benzene	--	0.2/0.2	--	0.4/0.4	1.25	5
Toluene	--	<0.2/<0.2	--	<0.2/<0.2	12	24
Ethylbenzene	--	<0.2/<0.2	--	<0.2/<0.2	1.2	2.4
Vinyl Chloride	--	<0.5/<0.5	--	<0.5/<0.5	0.5	2
General Chemistry						
Chloride	66.5/63.9	94.1/94.5	97.7/97.8	108/107	132.7	250
Alkalinity	500/491	770/763	701/697	923/902	281	500
Dissolved Organic Carbon	15.9/20	30.4/40.2	33.5/32	25.1/26.2	3.4	5

	CURRENT DOWNGRADIENT LIMIT OF CAZ *OW14C-98*				RUC	
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*	*(Trigger Level)*	ODWO
Metals						
Sodium	18.1/18.9	115/113	48.4/50.5	112/114	106.6	200
Aluminum	0.035/0.044	0.083/0.059	0.07/0.06	0.03/<0.03	0.083	0.1
VOCs						
Benzene	--	2.4/2.7	--	1.4/1.4	1.25	5
Toluene	--	3.0/3.7	--	<0.2/<0.2	12	24
Ethylbenzene	--	<0.2/<0.2	--	<0.2/<0.2	1.2	2.4
Vinyl Chloride	--	<0.5/<0.5	--	<0.5/<0.5	0.5	2
General Chemistry						
Chloride	9.8/10.3	116/118	42.8/45.7	122/128	132.7	250
Alkalinity	138/136	698/711	276/285	816/803	281	500
Dissolved Organic Carbon	5.4/4.7	57/89.7	14.4/16.6	34.5/33.4	3.4	5

Notes:

(1)	All results expressed in mg/L except for VOCs which are expressed in µg/L
--	Not analyzed
41.4/44.1	Duplicate samples
<0.001	The parameter was analyzed for but not detected at or above the method detection limit.
	The associated value is the method detection limit.
RUC	Reasonable Use Criteria
ODWO	Ministry of the Environment (MOE) Ontario Drinking Water Objectives
☐	Exceedance of RUC

TABLE 5.1

RUC GROUNDWATER ASSESSMENT [1]
WATER TABLE AQUIFER
MAYER WASTE DISPOSAL SITE
TOWNSHIP OF CHAMPLAIN

	WITHIN PROPOSED CAZ EXTENSION AREA *OW6B-94*				RUC *(Trigger Level)*	ODWO
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*		
Metals						
Sodium	5.8	10.2	6.8	5.9	106.6	200
Aluminum	0.025	<0.005	<0.03	<0.03	0.083	0.1
VOCs						
Benzene	<0.1	<0.1	--	<0.1	1.25	5
Toluene	<0.2	<0.2	--	<0.2	12	24
Ethylbenzene	<0.2	<0.2	--	<0.2	1.2	2.4
Vinyl Chloride	<0.5	<0.5	--	<0.5	0.5	2
General Chemistry						
Chloride	2.2	1.8	2.2	2.6	132.7	250
Alkalinity	79.0	21.0	13	23	281	500
Dissolved Organic Carbon	2.6	1.8	3.5	1.9	3.4	5

	WEST OF DOMESTIC LANDFILL *OW13-98*				*RUC* *(Trigger Level)*	ODWO
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*		
Metals						
Sodium	--	195	10.7	38.3	106.6	200
Aluminum	--	0.019	0.08	<0.03	0.083	0.1
VOCs						
Benzene	--	1.3	--	0.4	1.25	5
Toluene	--	<0.2	--	<0.2	12	24
Ethylbenzene	--	<0.2	--	<0.2	1.2	2.4
Vinyl Chloride	--	<0.5	--	<0.5	0.5	2
General Chemistry						
Chloride	--	160	4.5	43	132.7	250
Alkalinity	--	1,280	166	557	281	500
Dissolved Organic Carbon	--	47.1	12.6	1.6	3.4	5

Notes:

(1)	All results expressed in mg/L except for VOCs which are expressed in µg/L
--	Not analyzed
<0.001	The parameter was analyzed for but not detected at or above the method detection limit. The associated value is the method detection limit.
RUC	Reasonable Use Criteria
ODWO	Ministry of the Environment (MOE) Ontario Drinking Water Objectives
☐	Exceedance of RUC

RUC GROUNDWATER ASSESSMENT [1]
LOWER OVERBURDEN AQUIFER
MAYER WASTE DISPOSAL SITE, TOWNSHIP OF CHAMPLAIN

	CURRENT DOWNGRADIENT LIMIT OF THE CAZ *OW5A-94*				RUC *(Trigger Level)*	ODWO
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*		
Metals						
Sodium	18.4/20.9	22.8/23.1	18.8/18.7	18.1/18.4	145.9	200
Aluminum	0.127/0.432	0.008/<0.005	0.17/0.18	<0.03/<0.03	0.345	0.1
VOCs						
Benzene	--	<0.1/<0.1	--	<0.1/<0.1	1.25	5
Toluene	--	<0.2/<0.2	--	<0.2/<0.2	12	24
Ethylbenzene	--	<0.2/<0.2	--	<0.2/<0.2	1.2	2.4
Vinyl Chloride	--	<0.5/<0.5	--	<0.5/<0.5	0.5	2
General Chemistry						
Chloride	57/57	64.6/64.8	73.3/66.6	60.9/60.9	143.5	250
Alkalinity	85/86	87/87	85/87	85/89	341	500
Dissolved Organic Carbon	0.4/0.6	0.9/0.7	1.3/0.9	0.9/0.3	3.8	5

	CURRENT DOWNGRADIENT LIMIT OF THE CAZ *OW14A-98*				RUC *(Trigger Level)*	ODWO
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*		
Metals						
Sodium	44.8	56.8/51.9	51.7	42.3	145.9	200
Aluminum	1.4	0.695/0.427	0.93	0.19	0.345	0.1
VOCs						
Benzene	--	<0.1/<0.1	--	<0.1	1.25	5
Toluene	--	<0.2/<0.2	--	<0.2	12	24
Ethylbenzene	--	<0.2/<0.2	--	<0.2	1.2	2.4
Vinyl Chloride	--	<0.5/<0.5	--	<0.5	0.5	2
General Chemistry						
Chloride	3.5	4.5/4.5	1.4	4.4	143.5	250
Alkalinity	127	119/122	118	120	341	500
Dissolved Organic Carbon	1.4	1.1/1.2	1.2	1.0	3.8	5

Notes:

(1)	All results expressed in mg/L except for VOCs which are expressed in µg/L
--	Not analyzed
41.4/44.1	Duplicate samples
<0.001	The parameter was analyzed for but not detected at or above the method detection limit. The associated value is the method detection limit.
RUC	*Reasonable Use Criteria*
ODWO	Ministry of the Environment (MOE) Ontario Drinking Water Objectives
☐	Exceedance of RUC

RUC GROUNDWATER ASSESSMENT [1]
LOWER OVERBURDEN AQUIFER
MAYER WASTE DISPOSAL SITE, TOWNSHIP OF CHAMPLAIN

	WITHIN PROPOSED CAZ EXTENSION AREA *OW6A-94*				RUC *(Trigger Level)*	ODWO
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*		
Metals						
Sodium	30.2	33.3	32	27.7	145.9	200
Aluminum	0.573	0.014	<0.03	<0.03	0.345	0.1
VOCs						
Benzene	--	<0.1	--	<0.1	1.25	5
Toluene	--	<0.2	--	<0.2	12	24
Ethylbenzene	--	<0.2	--	<0.2	1.2	2.4
Vinyl Chloride	--	<0.5	--	<0.5	0.5	2
General Chemistry						
Chloride	22.9	26.9	23.4	26.6	143.5	250
Alkalinity	108	103	107	102	341	500
Dissolved Organic Carbon	1	1.2	1.3	1.1	3.8	5

	NORTH OF THE INDUSTRIAL LANDFILL *OW11C-94*				RUC *(Trigger Level)*	ODWO
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*		
Metals						
Sodium	8.7	10.8	12.6	13	145.9	200
Aluminum	0.095	0.066	<0.03	0.04	0.345	0.1
VOCs						
Benzene	--	<0.1	--	<0.1	1.25	5
Toluene	--	<0.2	--	<0.2	12	24
Ethylbenzene	--	<0.2	--	<0.2	1.2	2.4
Vinyl Chloride	--	<0.5	--	<0.5	0.5	2
General Chemistry						
Chloride	14.7	14.2	16.6	8.8	143.5	250
Alkalinity	205	240	182	214	341	500
Dissolved Organic Carbon	1.7	1.3	1.4	1.4	3.8	5

Notes:

(1)	All results expressed in mg/L except for VOCs which are expressed in µg/L
–	Not analyzed
<0.001	The parameter was analyzed for but not detected at or above the method detection limit. The associated value is the method detection limit.
RUC	Reasonable Use Criteria
ODWO	Ministry of the Environment (MOE) Ontario Drinking Water Objectives
☐	Exceedance of RUC

RUC GROUNDWATER ASSESSMENT [1]
LOWER OVERBURDEN AQUIFER
MAYER WASTE DISPOSAL SITE, TOWNSHIP OF CHAMPLAIN

	NORTH OF THE INDUSTRIAL LANDFILL *OB-6*				RUC *(Trigger Level)*	ODWO
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*		
Metals						
Sodium	23.2	15.8	23	13.9	145.9	200
Aluminum	0.161	0.007	0.03	<0.03	0.345	0.1
VOCs						
Benzene	--	<0.1	--	<0.1	1.25	5
Toluene	--	<0.2	--	<0.2	12	24
Ethylbenzene	--	<0.2	--	<0.2	1.2	2.4
Vinyl Chloride	--	<0.5	--	<0.5	0.5	2
General Chemistry						
Chloride	20.8	21.2	23.9	18.3	143.5	250
Alkalinity	230	200	248	278	341	500
Dissolved Organic Carbon	2.6	1.5	2.4	1.4	3.8	5

	WEST OF THE INDUSTRIAL LANDFILL *OW15-98*				RUC *(Trigger Level)*	ODWO
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*		
Metals						
Sodium	--	72.9	95.1	60.3	145.9	200
Aluminum	--	0.007	0.04	<0.03	0.345	0.1
VOCs						
Benzene	--	1	--	0.9	1.25	5
Toluene	--	<0.1	--	<0.1	12	24
Ethylbenzene	--	<0.1	--	<2.0	1.2	2.4
Vinyl Chloride	--	1.8	--	<5.0	0.5	2
General Chemistry						
Chloride	--	68.9	74.2	51.6	143.5	250
Alkalinity	--	971	1,030	878	341	500
Dissolved Organic Carbon	--	15.2	22.5	16.5	3.8	5

Notes:

(1)	All results expressed in mg/L except for VOCs which are expressed in µg/L
--	Not analyzed
<0.001	The parameter was analyzed for but not detected at or above the method detection limit. The associated value is the method detection limit.
RUC	Reasonable Use Criteria
ODWO	Ministry of the Environment (MOE) Ontario Drinking Water Objectives
☐	Exceedance of RUC

TABLE 5.3

PWQOs SURFACE WATER ASSESSMENT [1]
MAYER WASTE DISPOSAL SITE
TOWNSHIP OF CHAMPLAIN

Initial Surface Water Trigger Parameters	SG1-93				PWQOs [2]
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*	*(Trigger Level)*
Metals					
Boron	0.018	<0.01	<0.01	0.015	0.2
Cadmium	<0.0001	0.0003	<0.0001	<0.0001	0.0002
Lead	<0.0005	0.0039	0.0009	<0.0005	0.025
Nickel	<0.001	0.006	0.001	<0.001	0.025
Vanadium	0.0018	0.0103	0.0014	0.0007	0.007
Zinc	0.005	0.039	0.014	<0.002	0.02
Total Phosphorus	<1	0.63	0.055	0.015	0.0835[3]
VOCs					
1,1-dichloroethane	<0.2	<0.2	<0.2	<0.2	200
1,1,1-tricholoroethane	<0.2	<0.2	0.3	<0.2	10
Toluene	<0.2	<0.2	<0.2	<0.2	0.8
Ethylbenzene	<0.2	<0.2	<0.2	<0.2	8
m&p Xylene	<0.2	<0.2	<0.2	<0.2	32
Chlorobenzene	<0.2	<0.2	<0.2	<0.2	15

Initial Surface Water Trigger Parameters	SG3-93				PWQOs [2]
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*	*(Trigger Level)*
Metals					
Boron	0.056	0.07	0.15	0.077	0.2
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
Lead	<0.0005	<0.0005	<0.0005	<0.0005	0.025
Nickel	0.002	0.002	0.011	0.002	0.025
Vanadium	0.0018	0.0007	0.001	0.0009	0.007
Zinc	0.008	0.023	0.006	0.013	0.02
Total Phosphorus	<1	0.015	0.008	0.037	0.0835[3]
VOCs					
1,1-dichloroethane	<0.2	<0.2	<0.2	<0.2	200
1,1,1-tricholoroethane	<0.2	<0.2	<0.2	<0.2	10
Toluene	<0.2	<0.2	<0.2	<0.2	0.8
Ethylbenzene	<0.2	<0.2	<0.2	<0.2	8
m&p Xylene	<0.2	<0.2	<0.2	<0.2	32
Chlorobenzene	<0.2	<0.2	<0.2	<0.2	15

Notes:

(1) All results expressed in mg/L except for VOCs which are expressed in µg/L

(2) (PWQOs) Provincial Water Quality Objectives

(3) Up-stream 75th percentile is used as trigger level.

<0.001 The parameter was analyzed for, but not detected at or above the method detection limit. The associated value is the method detection limit.

- - Not analyzed

☐ Exceedance of PWQOs

TABLE 5.3

PWQOs SURFACE WATER ASSESSMENT [1]
MAYER WASTE DISPOSAL SITE
TOWNSHIP OF CHAMPLAIN

Initial Surface Water Trigger Parameters	SG4-94				PWQOs [2]
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*	*(Trigger Level)*
Metals					
Boron	0.05	0.06	0.03	0.071/0.071	0.2
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001/<0.0001	0.0002
Lead	<0.0005	<0.0005	<0.0005	<0.0005/<0.0005	0.025
Nickel	0.003	0.002	0.003	0.002/0.001	0.025
Vanadium	0.0036	0.0008	0.001	0.0008/0.0008	0.007
Zinc	0.1	0.007	0.008	0.013/0.012	0.02
Total Phosphorus	<1	0.012	0.019	0.01/0.009	0.0835[3]
VOCs					
1,1-dichloroethane	<0.2	<0.2	<0.2	<0.2/<0.2	200
1,1,1-tricholoroethane	<0.2	<0.2	<0.2	<0.2/<0.2	10
Toluene	<0.2	<0.2	<0.2	<0.2/<0.2	0.8
Ethylbenzene	<0.2	<0.2	<0.2	<0.2/<0.2	8
m&p Xylene	<0.2	<0.2	<0.2	<0.2/<0.2	32
Chlorobenzene	<0.2	<0.2	<0.2	<0.2/<0.2	15

Initial Surface Water Trigger Parameters	SW2-93				PWQOs [2]
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*	*(Trigger Level)*
Metals					
Boron	0.293	0.1	0.18	0.190	0.2
Cadmium	<0.0001	0.0002	<0.0001	<0.0001	0.0002
Lead	<0.0005	<0.0005	0.0011	<0.0005	0.025
Nickel	0.002	0.002	0.002	0.001	0.025
Vanadium	0.0008	<0.0005	<0.0005	<0.0005	0.007
Zinc	0.005	<0.002	0.011	<0.002	0.02
Total Phosphorus	<1	0.009	0.041	0.013	0.0835[3]
VOCs					
1,1-dichloroethane	<0.2	<0.2	<0.2	<0.2	200
1,1,1-tricholoroethane	<0.2	<0.2	<0.2	<0.2	10
Toluene	<0.2	<0.2	<0.2	<0.2	0.8
Ethylbenzene	<0.2	<0.2	<0.2	<0.2	8
m&p Xylene	<0.2	<0.2	<0.2	<0.2	32
Chlorobenzene	<0.2	<0.2	<0.2	<0.2	15

Notes:

(1) All results expressed in mg/L except for VOCs which are expressed in µg/L

(2) (PWQOs) Provincial Water Quality Objectives

(3) Up-stream 75th percentile is used as trigger level.

<0.001 The parameter was analyzed for, but not detected at or above the method detection limit. The associated value is the method detection limit.

- - Not analyzed

☐ Exceedance of PWQOs

TABLE 5.3

PWQOs SURFACE WATER ASSESSMENT [1]
MAYER WASTE DISPOSAL SITE
TOWNSHIP OF CHAMPLAIN

Initial Surface Water Trigger Parameters	SW3-93				*PWQOs* [2]
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*	*(Trigger Level)*
Metals					
Boron	0.184	0.21	0.03	0.170	0.2
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
Lead	<0.0005	<0.0005	<0.0005	<0.0005	0.025
Nickel	0.022	0.008	0.002	0.006	0.025
Vanadium	0.0018	0.0021	0.0011	0.0010	0.007
Zinc	0.008	<0.002	0.008	0.008	0.02
Total Phosphorus	<1	0.019	0.015	0.037	0.0835[3]
VOCs					
1,1-dichloroethane	<0.2	<0.2	<0.2	<0.2	200
1,1,1-tricholoroethane	<0.2	<0.2	<0.2	<0.2	10
Toluene	<0.2	<0.2	<0.2	<0.2	0.8
Ethylbenzene	<0.2	<0.2	<0.2	<0.2	8
m&p Xylene	<0.2	<0.2	<0.2	<0.2	32
Chlorobenzene	<0.2	<0.2	<0.2	<0.2	15

Initial Surface Water Trigger Parameters	SW5-98				*PWQOs* [2]
	Apr-98	*Sep-98*	*Apr-99*	*Sep-99*	*(Trigger Level)*
Metals					
Boron	0.383	NS	0.15/0.15	NS	0.2
Cadmium	<0.0001	NS	<0.0001/<0.0001	NS	0.0002
Lead	<0.0005	NS	0.0006/0.0006	NS	0.025
Nickel	0.014	NS	0.007/0.007	NS	0.025
Vanadium	0.001	NS	0.0005/0.0006	NS	0.007
Zinc	0.033	NS	0.051/0.31	NS	0.02
Total Phosphorus	<1	NS	0.065/0.068	NS	0.0835[3]
VOCs					
1,1-dichloroethane	<0.2	NS	<0.5/<0.5	NS	200
1,1,1-tricholoroethane	<0.2	NS	<0.5/<0.5	NS	10
Toluene	<0.2	NS	<0.5/<0.5	NS	0.8
Ethylbenzene	<0.2	NS	<0.5/<0.5	NS	8
m&p Xylene	<0.2	NS	<0.5/<0.5	NS	32
Chlorobenzene	<0.2	NS	<0.5/<0.5	NS	15

Notes:

(1) All results expressed in mg/L except for VOCs which are expressed in µg/L

(2) (PWQOs) Provincial Water Quality Objectives

(3) Up-stream 75th percentile is used as trigger level.

<0.001 The parameter was analyzed for, but not detected at or above the method detection limit. The associated value is the method detection limit.

- - Not analyzed

☐ Exceedance of PWQOs

NS - Not sampled, pond was dry

<0.5/<0.5 - Duplicate samples were submitted for analysis

APPENDIX A

EXTENDED EMERGENCY PERIOD
SITE MONITORING SPECIFICATIONS

EXTENDED EMERGENCY PERIOD
SITE MONITORING SPECIFICATIONS

PROJECT:	Mayer Waste Disposal Site
PROJECT NO.:	5345
PROJECT MANAGER:	Greg Ferraro
PROJECT COORDINATOR:	Christine Robertson

MONITORING STAFF:		RESPONSIBILITY
	Roger Waller	Field Technician
	Stephanie Tomka	Co-ordinator/Chemist QA/QC

LABORATORIES USED: Philip Analytical Services Corporation

AUTHORIZATION:	MONITORING EVENT	SIGNATURE	DATE
	April	_____	_____
	September	_____	_____

MONITORING DESCRIPTION

A. SURFACE WATER MONITORING
B. LEACHATE MONITORING
C. GROUNDWATER MONITORING
D. PRIVATE WELL MONITORING
E. LANDFILL GAS MONITORING
F. BOTTLE REQUIREMENTS

A) SURFACE WATER MONITORING

i) Objective: To provide upstream, downstream and on-Site monitoring of surface water quality, at designated surface water stations. To determine any potential impacts to surface water due to landfilling activities.

ii) Locations: SG1-93, SG3-93, SW2-93, SW3-93, SW4-97, SW5-98, SG5-00

sample locations	7
duplicates	1
field blank	1
total	9

iii) Monitoring Frequency:

Eight locations monitored twice per year in April and September, except as noted below.

iv) Type of Monitoring:

a) Water level and flow at each surface water sampling location should be recorded prior to sampling.

b) Water depth in the Domestic Landfill Surface Water Pond should be measured.

v) Sampling Parameters:

Field	-	pH, conductivity, dissolved oxygen, temperature.
General Chemistry	-	hardness, alkalinity, chloride, nitrite, nitrate, sulphate, ammonia, turbidity, colour, Total Kjeldahl Nitrogen (TKN), total phosphorous, Dissolved Organic Carbon (DOC), phenols, Total Suspended Solids (TSS), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD).
	-	at SW4, total suspended solids (TSS) are to be sampled monthly.
Total Metals	-	boron, calcium, magnesium, sodium, potassium, aluminium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, vanadium, silver, zinc.
	-	SW4 will be sampled for metals in April only.
VOCs	-	A list VOC parameters is provided in Table A-1.

B) LEACHATE

i) Objective: To provide monitoring of leachate quality generated at both the Domestic and Industrial Landfills identify exceeding parameters to be monitored downgradient, and evaluate the attenuation at the Site.

ii) Locations: LW2-94, LW3-98 and LW4-98

sample locations	3
duplicates	0
field blank	0
total	3

iii) Monitoring Frequency:

Three locations, as listed above, monitored twice per year in April and September.

iv) Type of Monitoring:

Leachate level at each leachate well sampling location should be recorded prior to sampling.

v) Sampling Parameters:

Field	-	pH, conductivity, temperature.
General Chemistry	-	hardness, alkalinity, chloride, sulphate, ammonia, nitrite, nitrate, Total Kjeldahl Nitrogen (TKN), Dissolved Organic Carbon (DOC), phenols, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), total phosphorous.
Metals	-	boron, calcium, magnesium, sodium, potassium, aluminium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, zinc.
VOCs	-	A list of VOC parameters is provided in Table A-1.

C) GROUNDWATER MONITORING

i) Objective: To provide groundwater quality monitoring of the water table, lower overburden, lower till and bedrock aquifers in upgradient, crossgradient and downgradient locations to the landfill. To monitor the attenuation at the Site and downgradient groundwater quality.

ii) Locations: 25 off-Site and on-Site wells:

Water Table Aquifer:	OW1-93, OW5B-94, OW6B-94, OW7B-94, OW13-98, OW14C-98, OW25B-00, OW26B-00, OW27B-00
Lower Overburden Aquifer:	OW2-93, OW3B-93, OW6A-94, OW7A-94, OW9-94, OW10-94, OW11C-94, OB-3, OB-6 OW15-98, OW17-98, OW25A-00, OW26A-00, OW27A-00
Lower Till Aquifer:	OW11B-94
Bedrock Aquifer :	OW11A-94

sample locations	25
duplicates	6
field blank	2
total	33

Note: Duplicates should be conducted at OW6A/B, OW26A/B and OW11A/B

iii) Monitoring Frequency:

Twenty-five locations monitored twice per year in April and September with the exception of VOCs which are monitored once per year in September.

iv) Type of Monitoring:

Water level at each monitoring well sampling location should be recorded prior to sampling. Additionally water levels should be recorded at the following locations: OW14B-98, OW16A-98, OW16B-98, OW16C-98 OW16D-98, and OW18-98, OW4B-93, OW12-94, OW3A-93, OW4A-93, OW5A-94, OW14A-98, SP21-00, SP22-00, SP23-00, SP24-00

v) Sampling Parameters:

Field	-	pH, conductivity, temperature.
General Chemistry	-	hardness, alkalinity, chloride, sulphate, ammonia, nitrite, nitrate, Total Kjeldahl Nitrogen (TKN), Dissolved Organic Carbon (DOC), phenols, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD).
Metals	-	aluminium, calcium, iron, manganese, magnesium, potassium, selenium, sodium.
VOCs	-	A list of VOC parameters is provided in Table A-1.

D) PRIVATE WELLS

i) Objective: To provide monitoring of private residences located off-Site (downgradient) to ensure that no impact due to landfilling activities is observed.

ii) Locations: 2 off-site wells: C, D.

sample location	2
duplicates	1
field blank	1
total	4

iii) Monitoring Frequency:

Two locations monitored twice per year in April and September.

iv) Type of Monitoring:

N/A

v) Sampling Parameters:

Field - pH, conductivity, temperature.

General Chemistry - hardness, alkalinity, chloride, sulphate, ammonia, nitrite, nitrate, Total Kjeldahl Nitrogen (TKN), Dissolved Organic Carbon (DOC), phenols, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD).

Metals - aluminium, calcium, iron, manganese, magnesium, potassium, selenium, sodium.

VOCs - A list of VOC parameters is provided in Table A-1.

E) GAS MONITORING

i) Objective: To monitor and assess landfill gas generation and migration at the Site.

ii) Locations: 3 nested and 1 single gas probe locations: GP1A/B-94, GP2A/B-94, GP3A/B-98, GP4-00

iii) Monitoring Frequency:

Seven gas probe locations monitored three times per year in February, April and September.

iv) Type of Monitoring:

Methane gas concentration (% by volume) and pressure (inches of water).

F) BOTTLE REQUIREMENTS

i) April

Analytical Destination	*Samples Analyzed*	*Test Parameters*
Philip	37 x 1 L PET	General Chemistry (alkalinity, hardness, chloride, nitrite, nitrate, sulphate)
Philip	12 x 1 L PET	General Chemistry (alkalinity, hardness, chloride, nitrite, nitrate, sulphate, colour, turbidity)
Philip	37 x 1 L PET (H2SO4)	DOC and Nutrients (COD, ammonia, TKN)
Philip	12 x 1 L PET (H2SO4)	DOC and Nutrients (COD, total phosphorus, ammonia, TKN)
Philip	49 x 1 L PET	BOD
Philip	49 x 125 mL Glass (Cu2SO4)	Total Phenols
Philip	12 x 125 mL Glass (HNO3)	Metals (B, Ca, Mg, Na, K, Al, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, Ag, V, Zn)
Philip	37 x 125 mL Glass (HNO3)	Metals (Al, Ca, Fe, Mn, Mg, K, Se, Na)
Philip	16 x 3 x 60 mL Glass, Teflon (HCl) Lined	VOCs
Philip	12 x 125 mL Glass (HNO3 + K2CrO7)	Mercury
Philip	12 x 1 L PET	TSS

ii) September

Analytical Destination	*Samples Analyzed*	*Test Parameters*
Philip	37 x 1 L PET	General Chemistry (alkalinity, hardness, chloride, nitrite, nitrate, sulphate)
Philip	12 x 1 L PET	General Chemistry (alkalinity, hardness, chloride, nitrite, nitrate, sulphate, colour, turbidity)
Philip	37 x 1 L PET (H2SO4)	DOC and Nutrients (COD, ammonia, TKN)
Philip	12 x 1 L PET (H2SO4)	DOC and Nutrients (COD, total phosphorus, ammonia, TKN)
Philip	49 x 1 L PET	BOD
Philip	49 x 125 mL Glass (Cu2SO4)	Total Phenols
Philip	12 x 125 ml Glass (HNO3)	Metals (B, Ca, Mg, Na, K, Al, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, Ag, V, Zn)
Philip	37 x 125 mL Glass (HNO3)	Metals (Al, Ca, Fe, Mn, Mg, K, Se, Na)
Philip	49 x 3 x 60 mL Glass, Lined Teflon (HCl)	VOCs
Philip	12 x 125 mL Glass (HNO3 + K2CrO7)	Mercury
Philip	9 x 1 L PET	TSS

iii) Monthly SW4 Monitoring

Analytical Destination	*Samples Analyzed*	*Test Parameters*
Philip	1 x 1L plastic	TSS