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Municipality of West Grey
Normanby Waste Disposal Site

Annual Monitoring Report (2018)
MOE Certificate Approval No. A262104

GMBP File: 213087

April 2019



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ANNUAL MONITORING REPORT (2018)

NORMANBY WASTE DISPOSAL SITE MUNICIPALITY OF WEST GREY

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1. INTRODUCTION & BACKGROUND INFORMATION

The Normanby Landfill Site is located at 221291 Grey Road 9 and is approximately 1.5 kilometres (km) east of the village of Neustadt, as shown on Figure No. 1. The landfill property is located on the north side of Grey Road 9 and is east and adjacent to the South Saugeen River, which flows in a northwesterly direction. The area approved for waste placement comprises an area of 2.8 hectares (6.9 acres) within a total site area of 33 hectares (81.5 acres). The landfill property is legally described as Part of Lot 7, Concession 14, former Township of Normanby, Municipality of West Grey.

The site was reportedly opened in 1974 and has been used as a waste disposal site since that time. Provisional Certificate of Approval (C of A) # A262104 was issued by the Ministry of the Environment (MOE) on February 2, 1987. Amendments to the C of A were completed on August 28, 1989 to extend the service area to include the Village of Neustadt and on September 17, 1992 which provided formal requirements for completion of an annual monitoring and reporting program. The original C of A was revoked and replaced by a new C of A on June 24, 2005, which licensed a landfilling area of 2.8 hectares within a total site area of 33 hectares and modified the service area to include the entire Municipality of West Grey.

A Plan of Development and Operation (PDO) was initially prepared by Gamsby and Mannerow Limited (now GM BluePlan Engineering Limited) in July, 1991 and revised in January, 1992. The PDO (1992) outlined a five phase site development plan whereby the Area/Ramp Method is used to place refuse in progressive phases. The PDO was revised and updated in December of 2006, and was subsequently amended in 2011 to facilitate the operation of a Waste Diversion and Transfer Facility. The amended PDO is referenced in Schedule "A" of the current Environmental Compliance Approval (ECA). A copy of the ECA and the associated amendments is provided in Appendix "A".

2. SITE USAGE

The approved service area for the waste disposal site includes residents from the entire Municipality of West Grey. Refuse delivered to the Site primarily originates from full time and seasonal residents situated within the former Township of Normanby including the villages of Neustadt and Ayton. The contributing population within the Township before amalgamation occurred in 2000 was approximately 2,678 based on the Statistics Canada Census Report. Based on the statistical information available, the population of the former Township of Normanby has historically fluctuated with a reported decline in population between 1991 and 2001. Therefore, the growth rate for the area is considered to be generally stagnant and the contributing population within the current service area is expected to be generally consistent with the pre-amalgamation totals.

At this time, the activities occurring at the Normanby landfill have been reduced. Activities that occurred at the site previously included the landfilling of waste, shredding and/or burning of wood wastes, collection of blue box materials, bale wrap and e-waste, and stockpiling of construction materials, scrap metal, and tires as appropriate for recycling. Currently, the Normanby landfill is no longer accepting waste for onsite waste placement and the Site is operating as a transfer site. During 2018, the landfill site was still open to the public to allow for waste disposal (bagged garbage) and recycling.

3. SITE LIFE EXPECTANCY

3.1 Existing Conditions

The amended ECA provides for the use and operation of a waste disposal site consisting of a 2.8 ha landfilling area and a total approved waste disposal capacity of 69,000 m³ including waste, daily, and final cover. Historically, landfilling has occurred in the northern portion of the landfill, moving south as the area progressively filled with waste. Based on previous reports, areas A1 and A2 were filled and capped in 1999. Landfill development then progressed into the northerly end of Area A4 and A5. Landfilling in the south portion of the approved footprint has ceased, and the site has reached its maximum capacity.

In the past, topographical surveys have been completed on an annual basis to monitor site development and evaluate the remaining site capacity. The most recent survey was completed by GMBP in May of 2018. Based on a comparison of the December 2016 survey, to the May 2018 survey a total of 720 m³ of waste was landfilled. Therefore, the previous reduced fill rate is considered to be a representative yearly estimate (i.e., 475 m³). Based on a general rule, approximately 20% of the filled volume can be attributed to daily cover. Therefore, the estimated volume of fill attributed only to waste is approximately 380 m³ in 2018. Based on an assumed density of 400 kg/m³, this correlates to approximately 152 tonnes of waste.

Based on a review of available information, the reported remaining airspace capacity for waste and daily cover at the beginning of the 2018 operating year was 1,795 m³. Based on the volumes of construction waste and stockpiled material to enter the approved footprint, the site was closed to the public in 2018 and acceptance of waste has ceased.

4. BURNING OPERATIONS

Burning of waste is prohibited at the Site. Based on the current ECA requirements, only segregated clean, dry wood wastes such as brush, trees and untreated lumber may be burned at the site. Supervised burning of wood waste is to occur on clear, dry, windless days when the site is closed to the public. Approved burning of wood wastes is to be conducted in accordance with the Ministry Guideline C-7 "*Burning at Landfill Sites.*" A copy of Guideline C-7 is presented in Appendix "C". The Site Attendant is responsible for removing any non-wood wastes from the pile prior to burning, and to regularly remove cold ashes from the burn area for disposal in the active landfill area.

The operating authority is responsible to maintain appropriate burning operations at the site. Appropriate operations include the burning of approved wood wastes, which are separated from refuse and stockpiled in a designated burn area that is located a minimum distance of 30 metres from the active fill area and is within view of the Site Attendants building.

Burning is to be completed under direct supervision of the operator and is to be conducted as frequently as necessary to maintain a burn pile that measures no greater than 6m by 6m in area and 3m in height. Cold ashes are to be removed from the burn area and placed directly in the active area following each burn.

The Municipality reports that approximately 128 cubic yards (i.e., 98 cubic metres) of wood waste and 248 cubic yards of brush (i.e., 190 cubic metres) were diverted from the landfill footprint in the current reporting period. Inspections by staff of GM BluePlan (GMBP) during the current reporting period noted that the wood pile was generally being well maintained. The Municipality should continue to ensure that the responsibilities of the Site Attendant to only burn the appropriate wood wastes specified in the ECA and in the burning regulation (Appendix "C") are being carried out on a consistent basis.

5. RECYCLING/WASTE REDUCTION

During the current reporting period, Waste Management was contracted to collect curbside recyclable goods from households and to collect the accumulation of recyclables from the landfill site. All Ontario Recycling (AOR) was contracted to collect and remove accumulations of scrap metal and tires from the site. Recyclable goods not accepted as part of the blue box program, such as scrap metal, tires, used propane tanks, plastic bale wrap, waste electrical and electronic equipment, and vehicle batteries are stockpiled and hauled from the landfill site as required.

Based on information provided by West Grey, a total of 432 tires were segregated and diverted from the landfill footprint. Continued attention should be given to the management of the tire pile located at the landfill. The size of the tire pile at the site should be monitored regularly to ensure that there are fewer than 5,000 tire units onsite at any given time as per the requirements of the Environmental Protection Act (EPA). Regular removal of used tires and other accumulations of salvageable materials will also help to maintain an aesthetically acceptable site.

Records received from Waste Management provide the total recycling tonnage diverted from within the entire Municipality of West Grey in the current reporting period. Relevant correspondence is provided in Appendix "B". As previously reported, the contributing population for the waste disposal site is approximately 2,678 including full time and seasonal residents. Based on the Census data provided by Statistics Canada, the population of the Municipality is approximately 12,300. Therefore, based on the contributing population for the Normanby Site, it is estimated that the quantity of recyclables diverted from the facility represents approximately 25% of the total recycling tonnage that has been reported for the Municipality. The following approximate quantities of recyclables were diverted from the landfill in the current monitoring period:

- Onsite Depot & Curbside Recycling Program – 232 tonnes
- Scrap metal – 6 tonnes
- Tires – 432 units
- Waste Electrical and Electronic Equipment (WEEE) – 3.56 tonnes
- Wood Waste Diverted from Site – 288 cubic metres

Based on the previously reported totals, the diversion totals and blue box recyclables are generally consistent with previous totals. It is important that the Municipality continue to remove stockpiles of recyclable goods on a regular basis to further reduce the volume of waste entering the landfill, to prevent clutter, and to maintain an aesthetically acceptable site.

6. GENERAL OPERATIONS

6.1 Site Controls

The site is currently open from 8:00 am to 4:00 pm on Saturday of each week. The ECA allows for waste to be accepted at the Site from 7:00 am to 7:00 pm on Monday through Saturday each week. A sign at the access gate notes the hours of operation and specifies the acceptable wastes that are received at the Site. The ECA also notes that the hours of operation may be changed by the Owner to accommodate seasonal or unusual quantities of waste with prior written approval from the District Manager. When the landfill is closed to the public, a locked gate across the entrance road controls access to the site. Although signs are not posted at all of the various disposal locations, designated areas for waste, recyclable materials, and wood waste are clearly visible. The landfill is situated approximately 475 metres from the road and is adequately screened from the public view by low hills and tree cover along the property boundary.

6.2 Site Cleanliness

The most important aspect of site cleanliness is to ensure that all landfilled wastes are adequately covered and compacted immediately following waste placement so that refuse is not exposed at the surface. The application and compaction of an appropriate soil cover immediately following waste disposal decreases blowing litter and reduces surface water infiltration vertically through the refuse to reduce leachate production at the site.

As previously noted, the site is currently closed to the public. Final closure and capping of the site is being coordinated by the Municipality.

An important aspect of site cleanliness is to ensure that accumulations of recyclable materials, including waste tires and scrap metals, are efficiently managed, and that appropriate wood wastes are burned regularly to maintain a manageable pile. Designated areas for recyclable goods at the site appear to be organized and well managed. The recyclable pile sizes were observed to be adequate during the spring and fall inspections in during the current reporting period.

7. ENVIRONMENTAL MONITORING

The current ECA requires the submission of an annual monitoring report summarizing the environmental conditions at the landfill site, the findings of the monitoring programs, and a discussion of the site operations. Based on the MOE requirements specified in the ECA, the report must address the results of the monitoring programs and assess the environmental conditions at the site to ensure compliance with the RUC and with the requirements of the Provincial Water Quality Objectives (PWQO).

The shallow groundwater has been determined to flow primarily in a northwesterly direction toward the South Saugeen River. Previously completed annual monitoring reports concluded that leachate impacted groundwater is being contained to the subject property and that the landfill site was in compliance with the criteria specified in MOE Guideline B-7. **It is proposed to continue the established annual monitoring program at the site, with the addition of added leachate parameters and the proposed monitoring well locations, on a semi-annual basis according to the analytical parameters outlined in Table 2.** Monitoring locations are shown on the Monitoring Well Location Plan presented on Figure 4.

TABLE 2 - Monitoring Locations & Analytical Requirements

GROUNDWATER SAMPLE/ MONITORING WELL LOCATIONS		SURFACE WATER SAMPLE LOCATIONS
TW-1 TW-3 TW-5A OW-2 TW-8 (proposed) TW-9 (proposed)	TW-2 TW-5 TW-6 OW-3 TW-10 (proposed)	SW-1 SW-2 SW-3 SW-4 SW-5
ANALYTICAL PARAMETERS (GROUNDWATER & SURFACE WATER)		
Conductivity, Chloride, Alkalinity, Iron, pH, Total Ammonia, Hardness, Sodium, Nitrate, Sulphate, TKN	Additional Leachate Well Parameters: Arsenic, Barium, Boron, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Total Phosphorus, Potassium, TSS, TDS	Conductivity, Chloride, Alkalinity, Iron, pH, Total Ammonia, Total Phosphorus, Phenols, Dissolved Oxygen, Temperature

Notes:

Borehole/Well logs are presented in Appendix "H". A tabulated summary of the monitoring well locations and construction details is provided in Table 3.

7.1 Sampling Procedures and Requirements

Groundwater quality is monitored at the site by semi-annual sampling at the above noted network of monitoring wells in the spring and fall. It is standard procedure to measure the static groundwater level prior to purging three (3) casing volumes of stagnant water from each test well. Wells are allowed to recharge with fresh groundwater before sampling. Groundwater samples are collected using dedicated sampling materials and inertial pumps, are kept chilled, and are sent within 24 hours of the sampling event to an accredited laboratory for appropriate analyses.

MOE Guideline B-7 establishes the basis for determining what constitutes the reasonable use of groundwater on properties adjacent to landfill sites. The potential use of groundwater in this region will typically be for domestic consumption. Therefore the allowable concentrations presented within the Ontario Drinking Water Standards (ODWS) are utilized to determine the site specific Reasonable Use Criteria (RUC) through the application of MOE Guideline B-7.

MOE Procedure B-7-1 provides technical details for the application of MOE Guideline B-7. A change in the quality of groundwater on an adjacent property, where the reasonable use is determined to be for drinking water, will be acceptable only where:

- i) Quality is not degraded by more than 50% of the difference between background concentrations and the Ontario Drinking Water Standards for *non-health related* parameters, and;
- ii) Quality is not degraded by more than 25% of the difference between background concentrations and the Ontario Drinking Water Standards for *health-related* parameters.

Background concentrations are considered to be, the quality of the groundwater prior to influence or impact from landfill related activities.

Using the reasonable use approach, the acceptable concentrations at the site boundary (i.e., RUC), are calculated from MOE Procedure B-7-1 using the following formula:

$$C_m = C_b + x(C_r - C_b)$$

Where:

C_m = Maximum concentration acceptable in groundwater beneath an adjacent property (RUC).

C_b = Background concentration.

C_r = Maximum concentration that should be present in groundwater for domestic consumption according to the ODWS.

X = 0.5 for non-health related parameters (AO and OG) and 0.25 for health related parameters (MAC and IMAC).

AO = Aesthetic Objective

OG = Operational Guideline

MAC = Maximum Acceptable Concentration, Parameters Related to Health

IMAC = Interim Maximum Acceptable Concentration, Parameters Related to Health

It should be noted that if background concentrations exceed the ODWS, the objective level is to be set at the background concentration, as outlined by Procedure B-7-1. The calculated RUC values are provided in Table 4.

To determine if leachate is impacting groundwater, individual indicator parameters were evaluated in conjunction with other indicator parameters and concentration trends. Wells with elevated and stable concentrations of the identified naturally elevated constituents, that show no increases in other leachate indicator parameters, are deemed un-impacted by landfill leachate.

Additionally, comparison of known leachate impacted groundwater is compared to the groundwater chemistry at locations with naturally elevated concentrations to determine if leachate contributes to the elevated concentrations measured.

Surface water samples are collected by submerging the appropriate sample container into the water body and removing the container when a sufficient volume of sample has been collected. During collection, contact with the bottom sediment is avoided to prevent stirring-up sediment. When collecting surface water samples, direct dipping of the sample bottle is completed unless the bottle contains preservative. For those samples requiring preservative, a clean unpreserved bottle is used to obtain the sample then transferred into the appropriate preserved bottle. The surface water temperature is measured and recorded at the time of sampling.

7.2 Summary & Comparison of Background Groundwater Quality

The background groundwater quality at the site has historically been determined by calculating the average concentrations from the groundwater samples collected at TW-1. As previously reported, background groundwater quality is typically evaluated by considering the quality of groundwater at a location that is not subject to potential influence or impact from landfill related activities. Although TW-1 continues to display stable long-term trends and relatively low concentrations of the typical leachate indicator parameters, it is noted that the monitoring well is screened in the shallow overburden and is located directly at the northwest toe of the landfill footprint, which is considered to be directly downgradient of the landfill pile. Therefore, the monitoring well is situated where there is an increased potential for influence or impact from landfill leachate and is not considered to be in an ideal location to represent background conditions. As discussed within Section 7.7, the installation of a new background monitoring well located hydraulically upgradient of the landfill footprint has been previously recommended and would provide a more representative background location.

Based on the current and historic groundwater data from TW-1, the concentrations of hardness (as CaCO₃), sulphate, and organic nitrogen in the natural groundwater are moderately elevated and the reported historic concentrations of hardness and organic nitrogen consistently exceed the criteria identified in the ODWS. The previous Hydrogeological Assessment completed at the Site in 1986 included the sampling and analytical testing of the adjacent and nearby domestic water supply wells. At that time, it was noted that the nitrate and organic nitrogen concentrations in the domestic wells were elevated at concentrations that exceeded the ODWS. Additionally, the domestic wells located south and hydraulically upgradient of the landfill property had some of the highest measured concentrations of nitrate (i.e., 16 to 19 mg/L). Therefore, these parameters are considered to be unrelated to landfill leachate and are likely due to agricultural practices, or the typical background quality of the natural groundwater in the area of the site. In general, the background groundwater quality at the site is considered to have low levels of typical anions. In particular, chloride concentrations are typically less than 7 mg/L and do not appear to be influenced by road salting or other activities. Therefore, the use of chloride as a leachate indicator parameter is considered to be valid.

7.3 Physiographic and Geological Setting

The site is located in the highland area of central Grey County, within the physiographic region known as the "Horseshoe Moraines". The region is generally characterized by till ridges, kame moraines, outwash plains and spillways. This area of Grey County is located on the Singhampton Recessional Moraine, in the northern "toe" of the horseshoe. The Singhampton Recessional Moraine is a till moraine feature which is aligned in a southwest/northeast direction across the drumlinized till plain that dominates the area. Relief among the moraines and drumlins is often more than 30 metres. Many small lakes, streams and wetland areas exist within the low areas between drumlins.

In the immediate area of the site, the overburden soils consist mainly of glaciofluvial deposits that correspond to the location of the Saugeen River, and loamy tills, which primarily consist of clayey silt, silty sands, and sand and gravel. These loamy tills are classified in the Burford Series, which are described as loams comprised of well sorted gravelly outwash with good drainage characteristics.

A more detailed description of the onsite subsurface soils is provided in the borehole/monitoring well logs provided in Appendix "H". According to MECP well records and the Grey and Bruce Counties Groundwater Study (Waterloo Hydrogeologic, 2003) the bedrock in the area is approximately 23 to 40 metres deep. Based on a review of the Grey and Bruce Counties Groundwater Study, the groundwater flow in the bedrock unit is reported to be in a northerly direction. MECP water well records indicate that the lower overburden consists of a layer of red to grey clay and stones, which is underlain by the shale and limestone bedrock of the Salina Formation.

Regionally, the drainage from the high plateau is generally from east to west toward Lake Huron. In the area of the subject site, the landscape is generally described as being flat with a gentle slope to the northwest. Surface drainage is generally from south to north toward the onsite tributaries of the South Saugeen River, which flows in a northwesterly direction across the northwest portion of the Site.

Based on a review of the MECP water well records for supply wells in close proximity to the landfill, the shale and limestone bedrock surface is encountered at depths of 23 to 26 metres (76 to 85 ft.) below grade. The water supply wells in the area of the Site obtain their water from the underlying dolostone/limestone bedrock unit.

7.4 Summary of Hydrogeologic Setting

The hydrogeological conditions in the study area were determined based on the information presented within the previous Hydrogeological Assessments, the Annual Monitoring Reports, and on a review of the available borehole/monitoring well logs. According to the above noted document review, the direction of shallow groundwater flow has been established and documented as part of the annual monitoring program that has been conducted for a period of over 30 years. Based on the previous and ongoing studies, the direction of shallow groundwater flow is reportedly in a northwesterly direction toward the South Saugeen River. The shallow groundwater flow was determined through the measurement of groundwater elevations in the monitoring wells located on the landfill property.

Based on previous investigations, the groundwater flow pattern has been divided into two different overburden units comprised of the shallow sand/silty sand and gravel, and the underlying grey silt till. This division was based on an assessment of the borehole depths, screened intervals, soil descriptions, and historic groundwater quality data. A summary of the monitoring well details, including a division of the wells into each separate flow system, is provided in Table 3. Cross sections of the shallow sand/silty sand and gravel unit have been provided on Figure 5. An on-going assessment of the flow pattern and groundwater quality will continue in future annual monitoring reports based on their established designations within these units.

As previously reported, the Grey and Bruce Counties Groundwater Study (July, 2003) indicates that the regional groundwater flow in the bedrock aquifer is in a north to northwesterly direction. Upward gradients are commonly measured at the nested monitoring wells located on the landfill property. Based on the measured vertical gradients and on the occurrence of the clayey layer overlying the bedrock, the bedrock groundwater system is inferred to be under confined to semi-confined conditions. Additionally, a groundwater system that contains deeper groundwater systems with an upward gradient typically acts to prevent the downward migration of the shallow groundwater. Therefore, the shallow groundwater in proximity to the landfill site is expected to primarily have a horizontal flow direction within the shallow sand and gravel overburden materials.

Based on the area topography and on the occurrence of the South Saugeen River and associated tributaries adjacent to the Site, a shallow groundwater and surface water flow divide is inferred to exist at the adjacent tributaries to the north of the Site, and at the South Saugeen River to the northwest of the property. Additionally, the hydrogeological conditions indicate that the South Saugeen River would likely be the ultimate receptor for both potential groundwater and surface water impacts from the waste disposal site. As such, it is reasonable to expect that surface water or groundwater impacts would not occur beyond the River.

Groundwater level measurements are collected twice annually in conjunction with the established monitoring program. A review of previous groundwater contour plans and previously measured groundwater elevation data indicates that the flow pattern depicted using the most recent data are representative of the typical groundwater flow directions at the site. A summary of the historical groundwater elevation measurements is provided in Appendix "G". In general, the groundwater flow patterns and vertical and horizontal gradients calculated are consistent with those historically presented.

7.5 Leachate Production

The quality of leachate is measured and characterized by the collection of groundwater samples at the location of TW-6, which is located within the refuse pile. Analytical data for the monitoring well is available dating back to 1984 and a review of the data indicates that there is evidence of leachate influence to the shallow groundwater at this location where elevated concentrations of hardness, alkalinity, chloride, conductivity, sulphate, and organic nitrogen have consistently been reported for several years. Evidence of leachate influence/impact is also identified at the locations of TW-2 and OW-3 (i.e., near-source monitors), which are screened in the upper sand and gravel overburden directly downgradient of the landfill footprint. The current and historic groundwater quality results and the long-term trend graphs are presented in Appendix "D". It must be noted that TW-2 and OW-3 are situated at the downgradient toe of the landfill pile and are screened in the shallow sand and gravel overburden at approximate depths of 3.5 and 3.8 metres, respectively.

Based on these conditions, the monitoring wells are expected to represent shallow groundwater that is most likely to be impacted from landfill leachate.

An ongoing evaluation and trend analysis of analytical results from the monitoring wells will be completed to more accurately characterize the leachate, evaluate the potential for radial flow/mounding, and to discern long-term attenuation and leachate quality trends.

Based on previous recommendations made by the MECP, the following parameters have been added to the leachate sample analysis list: Arsenic, Barium, Boron, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Total Phosphorus, Potassium, TSS (Total Suspended Solids), TDS (Total Dissolved Solids). Based on the numerous years of data that has been provided and reviewed, the general characterization of leachate is thought to be well understood. Therefore, the installation of additional leachate wells is not considered to provide additional information pertaining to site compliance.

A detailed review of the analytical results from the shallow and deep overburden monitors continues to indicate that leachate impacts are primarily limited to the upper and higher permeability soils within the overburden. The relatively thick layer (i.e. 23 to 26 metres) of lower permeability silt till and clay overlying the bedrock surface, combined with upwards gradients observed in the area of the landfill are expected to provide a level of hydraulic separation between the shallow overburden unit and the underlying bedrock aquifer.

7.6 Annual Monitoring Program

A groundwater monitoring program was reportedly initiated at the site in about 1984 as part of the initial hydrogeological study and to satisfy MOE conditions at that time. Historically, the monitoring program included up to eleven onsite monitoring wells and five surface water sampling locations. Currently, the sampling program consists of a total of eight monitoring wells that intercept the groundwater within two different geologic units including the shallow sand and gravel overburden and the underlying silt till.

Additionally, surface water sampling is also conducted as part of the annual monitoring program. Surface water samples are collected at the locations of SW-1 to SW-5, which are located in the adjacent tributaries to the South Saugeen River and include upstream and downstream locations relevant to the landfill property.

The sampling program was completed at the Site in April and November of 2018. Samples were submitted to Maxxam Analytics Inc. (Maxxam) in Mississauga for analysis of the established analytical parameter list. Copies of the laboratory Certificates of Analyses are presented in Appendix "F".

The following is a detailed summary of the Environmental Monitoring Program for the Normanby Landfill site.

7.7 Groundwater Quality Review

North of Landfill Footprint (Downgradient)

The downgradient area to the north and northwest of the landfill footprint is monitored at TW-2, TW-3, and OW-3. It is noted that the north property boundary is located approximately 220 metres north of these monitoring wells and the groundwater measured at these locations does not represent the actual environmental condition of groundwater flowing offsite. Based on the additional distance to the north property boundary beyond the monitoring wells, it is reasonable to expect that further attenuation of the groundwater occurs beyond the monitoring network.

With the exception of hardness, alkalinity, and nitrate levels, the downgradient observation wells continue to have concentrations of leachate indicator parameters below the criteria of MOE Guideline B-7. The chloride concentrations at TW-3 and OW-3 are slightly elevated but are well below the RUC and continue to display stable long-term trends.

The concentrations of leachate indicator parameters generally demonstrate stable long term trends. The analytical findings suggest that there is minor leachate influence to the groundwater at the monitoring wells located onsite and immediately downgradient of the landfill footprint. Exceedences of MOE Guideline B-7 are summarized by location in Table 5. It is of particular note that OW-3 is installed as an open-bottomed, 450mm diameter corrugated steel pipe (CSP), which does not allow for proper purging and facilitates the stagnation of water within the pipe. Therefore, the water in OW-3 is not expected to be representative of actual groundwater concentrations in the subsurface in this location.

As noted above, the elevated concentrations identified at the downgradient monitoring wells are consistent with the historical range of background values and a trend analysis indicates stable long-term trends. It is noted that the ODWS criterion for hardness in drinking water is 80 to 100 mg/L with levels as high as 200 mg/L being considered poor, but tolerable. The ODWS criterion for Alkalinity in drinking water is 500 mg/L. It should be noted that the ODWS criteria for Hardness and Alkalinity are Operational Guidelines (OG) that have been set for *treated* drinking water and not for groundwater. It should also be noted however that Operational Guidelines are established for parameters that, if not controlled, may negatively affect the efficient and effective treatment, disinfection and distribution of the water.

The current and historical analyses suggest that the groundwater that is influenced by leachate above the RUC remains onsite and does not cause impact to groundwater leaving the subject property that exceeds MOE Guideline B-7. Based on the extent of property directly to the north of the landfill footprint, it is noted that the concentrations measured to the north of the Site do not represent the quality of groundwater flowing offsite. Additional attenuation of landfill impacts is expected prior to discharge to the South Saugeen River.

Previous MECP correspondence and Annual Reports have recommended the installation of additional monitoring wells adjacent to the northwest edge of the landfill footprint, respectively. Since there are currently no monitoring wells located at, or in close proximity to the northwest property boundary, the installation of a proposed monitoring well to the northwest of the landfill would provide additional information regarding compliance and could replace the current OW-3 in the monitoring program.

To address the previous recommendations, it is recommended that the installation of a monitoring well to the northwest of the landfill be completed at the associated property boundaries rather than directly adjacent to the landfill pile. It is also recommended that OW-3 be decommissioned at this time. Proposed well locations have been provided on Figures 3 and 4.

Based on the inferred discharge of shallow groundwater to the adjacent surface water bodies, it is noted that the relatively extensive surface water sampling completed within the tributaries to the Saugeen River located north of the landfill footprint provides additional information pertaining to the Site's compliance. Further discussion of the surface water sampling program and the surface water quality to the north of the landfill is provided in Section 7.8.

East Boundary Condition

The groundwater quality to the east of the landfill footprint is monitored at TW-5 and TW-5A, which are considered to be hydraulically cross-gradient of the landfill footprint. These nested monitoring wells are screened in the shallow (TW-5A) and deep (TW-5) overburden and provide information regarding groundwater quality in the upper sand and gravel versus the groundwater quality at the same location in the lower silt till layer. TW-5 and TW-5A are located approximately 50 metres from the east property boundary and do not represent the actual quality of groundwater at the property boundary.

The analytical data at these wells indicates that the groundwater quality at these monitoring locations is generally consistent with the groundwater in the upgradient/background monitoring well with elevated concentrations of hardness, alkalinity, organic nitrogen and nitrate. Completion of a trend analysis for these wells indicates that the concentrations of leachate indicator parameters exhibit stable trends.

A review of the laboratory results for TW-5/5A indicates that the measured groundwater quality in the upper, higher permeability soils consistently has elevated concentrations as compared to the groundwater measured in the lower silt till, which suggests a level of hydraulic separation between the upper and lower overburden units.

The elevated concentrations of hardness and nitrate are consistent with background conditions and with historical monitoring trends. The historical data indicates that the concentrations of these parameters have consistently been reported above the MOE Reasonable Use Criteria. It has been noted that the chloride concentrations at TW-5A are slightly elevated and have begun to display an upward trend, but continue to be well below the RUC. The groundwater quality at TW-5/5A will continue to be monitored as part of the established groundwater monitoring program to discern if there is a component of radial flow away from the landfill footprint and to evaluate the long-term trends at this location.

South Boundary Condition (Upgradient)

Based on the “L” shape of the property, the south boundary in the west portion of the Site is located approximately 230 metres from the landfill footprint and the south boundary in the east portion extends to Grey Road 9 approximately 500 metres south of the landfill footprint. Due to the documented northwesterly groundwater flow direction, the southern property boundary is considered to be located hydraulically upgradient of the landfill footprint and is considered to have a low risk for potential leachate impact. No evidence of groundwater mounding or radial flow from the landfill is apparent at this time.

As previously reported, the current background monitoring well is actually located immediately downgradient of the landfill pile and is screened in the overburden at an approximate depth of 5 to 7 metres below ground surface. Due to this location and the screened interval, the monitor is considered to be in a location that is susceptible to influence or impact from landfill leachate. At this time, the analytical results continue to indicate that there are no leachate related impacts to the groundwater in the lower silt till. However, as previously recommended by others, the installation of an upgradient nested well in the southeast portion of the Site would provide a well location that is considered to be more representative of actual background conditions.

Therefore, the installation of a nested background monitoring well in the southeast (hydraulically upgradient) portion of the landfill is recommended to allow for a comparison to the MOE Reasonable Use Criteria and to facilitate an ongoing compliance review. Proposed well locations have been provided on Figures 3 and 4.

West Boundary Condition

The onsite groundwater quality to the west of the landfill is monitored by well OW-2. OW-2 extends to a measured depth of approximately 2.25 metres below ground surface and monitors the groundwater in the upper sand and gravel overburden. Based on the direction of shallow groundwater flow at the site, the groundwater at OW-2 is primarily considered to be hydraulically cross-gradient of the landfill footprint. Additionally, it is noted that the monitor is not located at the property boundary and is approximately 150 metres east of the west property limit. Therefore, the measured groundwater quality at OW-2 does not represent the quality of water flowing offsite.

A review of the historical groundwater quality for OW-2 indicates that the groundwater quality at this location has slightly elevated concentrations of hardness, alkalinity, chloride, conductivity, and organic nitrogen. The analytical results indicate stable to slightly decreasing long-term trends. In the current reporting period, the hardness concentrations remain elevated but are attributed to natural background conditions and do not appear to be related to leachate impacts. Similar to OW-3, OW-2 is also installed as an open-bottomed, 450mm diameter CSP, which does not allow for proper purging and facilitates the stagnation of water within the pipe. Therefore, the water in OW-2 is not expected to be representative of actual groundwater concentrations in the subsurface in this location.

Previous Annual Reports have recommended the installation of additional monitoring wells adjacent to the west and southwest edge of the landfill footprint, respectively. Since there are currently no monitoring wells located at, or in close proximity to the west property boundary, the installation of monitoring wells to the west of the landfill would provide additional information regarding compliance and could replace the current OW-2 in the monitoring program.

To address the previous recommendations, it is recommended that the installation of monitoring wells to the west and northwest of the landfill be completed at the associated property boundaries rather than directly adjacent to the landfill pile. It is also recommended that OW-2 be decommissioned at this time. Proposed well locations have been provided on Figures 3 and 4.

7.8 Surface Water Quality Review

7.8.1 Regulatory Framework

The purpose of surface water quality management at the Site is to achieve the requirements established in the Provincial Water Quality Objectives (PWQO) set out by the MECP. The criteria established by the PWQO ensure that surface waters are of a quality that is satisfactory for aquatic life and recreation. Areas that have water quality that meet the PWQO requirements are to be maintained at or below the applicable objectives. Areas that have water quality that does not presently meet the PWQO are not to be degraded any further and are to be upgraded if practicable.

7.8.2 Surface Water Quality Summary

The surface water monitoring program consists of five sampling locations (SW-1 to SW-5), which are located at various points on the Saugeen River tributaries located to the north of the landfill site. The locations of the surface water bodies and the associated surface water sampling locations are presented on the attached Figures. SW-1 measures surface water quality within a small creek located onsite approximately 75 metres northeast of the landfill pile. SW-2 represents background surface water conditions upstream of the landfill in an adjacent tributary located approximately 150 metres north of the landfill footprint. SW-3 evaluates water quality within the tributary at the confluence of the above noted creeks. SW-4 and SW-5 measure water quality in the tributary downstream of the landfill and prior to flowing into the South Saugeen River. The water within the tributaries is reportedly derived partially from shallow groundwater discharge and each represents continuous year-round surface water bodies (i.e., not stagnant or intermittent flow conditions).

A comparison of the current analytical data indicates that the surface water quality at each sampling location continues to meet objective levels with no reported exceedences of the PWQO.

The analytical results for each sample location are consistent with historic findings and display stable long-term trends. Additionally, the concentrations reported at each respective sample location are consistent relative to each other, which indicate that the quality of the surface water downstream of the landfill is consistent with the quality in each of the upstream tributaries.

Due to the similar surface water chemistry and close proximity between each of the 5 surface water samples, it is recognized that a level of redundancy exists in the surface water sampling program. As such, it is recommended that the number of surface water samples be reduced to three (3) locations (SW-1, SW-2, and SW-5). This is expected to be sufficient to assess the upgradient and downgradient surface water quality in the tributary while also still comparing the difference in water quality between the two noted creeks.

Phenols have been analyzed in the surface water samples since monitoring of the tributary began in 2001. Since then, no detections have been reported above 0.001 mg/L with the exception of SW-4 and SW-5 in the April 2015 monitoring event (0.0012 and 0.0013 mg/L, respectively). **It is expected that the concentrations of phenols will generally remain stable and low at the surface water sampling locations. Therefore, it is recommended that phenols be removed from the surface water monitoring program.**

The analytical results from the most recent surface water monitoring program and a comparison to the PWQO are provided in Table 6. A summary of the historical surface water sampling data, compared to the PWQO, is tabulated and presented in Appendix "E".

8. LANDFILL GAS MEASUREMENT

Methane is a colorless and odourless gas formed by the decomposition of organic matter under oxygen poor (anaerobic) conditions and is commonly associated with landfills. It is produced by anaerobic bacteria, which become active only when the oxygen in the landfill has been completely consumed. The primary concern related to this parameter is that, under certain conditions, the mixture of methane in air can be explosive within a confined area. Methane gas is measured relative to the lower explosive limit (LEL) which corresponds to 5% the concentration of methane in air.

Based on MECP correspondence, it is proposed that a gas monitoring program be implemented at the Normanby Landfill site. It is recommended that the gas monitoring program include the proposed boundary compliance wells TW-8, TW-9, and TW-10. It is our understanding that the Municipality intends to install these new boundary wells in 2019.

9. CLOSED AREAS

Previous areas A1, A2 and the northern part of A4, as identified in the 1992 PDO have been closed and capped. The remainder of the landfill footprint was closed in 2018. Closure and capping of the remaining portion of the landfill site is currently being coordinated by the Municipality. Covering and grading of finished areas should be conducted in such a manner as to promote runoff and reduce infiltration, thus reducing the generation of landfill leachate at the site.

10. ENVIRONMENTAL COMPLIANCE APPROVAL

The waste disposal site operates under amended Certificate of Approval (C of A) Number A262104, which was issued by the MOE on February 2, 1987. Amendments to the C of A were completed on August 28, 1989 to extend the service area to include the Village of Neustadt and on September 17, 1992 which provided formal requirements for completion of an annual monitoring and reporting program.

The original C of A was revoked and replaced by a new C of A on June 24, 2005, which licensed a landfilling area of 2.8 hectares within a total site area of 33 hectares and modified the service area to include the entire Municipality of West Grey. A copy of the C of A and the associated amendments are provided in Appendix "A".

11. CONCLUSIONS

- 1) The approved area of the Site specified within the C of A covers a total area of 2.8 ha (6.9 acres) within a total site area of 33 hectares (82 acres).
- 2) Currently, the total approved capacity for waste, daily cover, and final cover is 69,000 m³. Based on a review of the remaining capacity, existing stockpiled materials at the site, and site conditions landfill at the site was discontinued in 2018.
- 3) The landfill is closed to the public and waste placement has been discontinued. Closure and capping of the site is being coordinated by the Municipality.
- 4) The findings of the groundwater monitoring program indicate that minor leachate impacts are being measured in the shallow overburden at the landfill site and that there is a level of hydraulic separation between the shallow sandy overburden soils and the underlying silt till.
- 5) Based on a review and evaluation of the analytical findings, there is currently no apparent impact to the groundwater migrating off of the subject property above the Reasonable Use Criteria as referenced in MOE Guideline B-7.
- 6) The surface water monitoring program indicates that the surface water quality in the adjacent surface water bodies directly north of the landfill footprint is not being influenced by landfill leachate and has concentrations that meet the PWQO.
- 7) The reported surface water results indicate that the concentrations measured downstream of the landfill Site are consistent with those measured in the sample locations in the tributaries upstream of the Site.

12. RECOMMENDATIONS

The following actions are recommended for the upcoming monitoring year(s):

- 1) We recommend that formal closure and capping operations are completed as per the approved Closure Plan.
- 2) It is important that the Municipality continue to remove stockpiles of recyclable goods on a regular basis to further reduce the volume of waste entering the landfill, to prevent clutter, and to maintain an aesthetically acceptable site.
- 3) All future capping operations should be completed using a low permeability clayey silt material, or equivalent cover (as per the PDO), to reduce surface water infiltration as per the Closure Plan.

- 4) To address the previous recommendations regarding the network of monitoring wells, the installation of the following monitoring wells is recommended:
 - i. A nested background monitoring well in the southeast (hydraulically upgradient) portion of the landfill is recommended that would represent background conditions and allow for a comparison to the MOE Reasonable Use Criteria to facilitate an ongoing compliance review,
 - ii. Two monitoring wells to the west and northwest of the landfill be completed at the associated property boundaries rather than directly adjacent to the landfill pile as previously recommended.
 - iii. Decommissioning of OW-2 and OW-3 is recommended at the time the new monitoring wells are installed.

- 5) Based on previous MECP recommendations, the implementation of a landfill gas monitoring program is recommended. Upon installation of the new boundary monitoring wells, the landfill gas monitoring program will be implemented accordingly.


- 6) We recommend continuing the established monitoring program on a twice annual basis in the spring and fall with the exception of the removal of SW-3 and SW-4 from the surface water monitoring program, and the adjustments to the groundwater monitoring program as outlined below:

GROUNDWATER SAMPLE/ MONITORING WELL LOCATIONS		SURFACE WATER SAMPLE LOCATIONS
TW-1 TW-3 TW-5A TW-8 (Proposed) TW-10 (Proposed)	TW-2 TW-5 TW-6 TW-9 (Proposed)	SW-1 SW-2 SW-5
ANALYTICAL PARAMETERS (GROUNDWATER & SURFACE WATER)		
Conductivity, Chloride, Alkalinity, Iron, pH, Total Ammonia, Hardness, Sodium, Nitrate, Sulphate, TKN	Additional Leachate Well Parameters: Arsenic, Barium, Boron, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Total Phosphorus, Potassium, TSS, TDS	Conductivity, Chloride, Alkalinity, Iron, pH, Total Ammonia, Total Phosphorus, Phenols, Dissolved Oxygen, Temperature

All of which is respectfully submitted,

GM BLUEPLAN ENGINEERING LIMITED

Per:



J. K. Weller., Env. Tech., Dipl.

Per:



A.W. Bringleton, B.E.S., C.E.T

Per:



M.D. Nelson, P.Eng., P.Geo.

TABLES:

**Table 1:
Landfill Volume Capacity and Site Life**

	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	
<u>Total Approved Capacity (m³)</u>						
Total Capacity for Waste and Daily Cover	48000	48000	48000	48000	48000	
Total Capacity for Final Cover	21000	21000	21000	21000	21000	
Total Air space Capacity	69000	69000	69000	69000	69000	
<u>Volume Filled at Beginning of Year (m³)</u>						
Volume of Waste and Daily Cover	43660	44635	45255	45730	46730	
Volume of Final Cover	0	0	0	0	0	
Total Volume Filled	58660	59635	60255	60730	61730	
<u>Available Capacity at Beginning of Year (m³)</u>						
Capacity for Waste and Daily Cover	4340	3365	2745	2270	1270	
Capacity for Final Cover	6000	6000	6000	6000	6000	
Total Available Capacity	10340	9365	8745	8270	7270	
<u>Capacity Used During Year (m³)</u>						
Capacity Used for Waste and Daily Cover	975	620	475	1000	1270	
Capacity Used for Final Cover	0	0	0	0	0	
Total Capacity Used	975	620	475	1000	1270	
<u>Volume Filled at End of Year (m³)</u>						
Volume of Waste and Daily Cover	44635	45255	45730	46730	48000	
Volume of Final Cover	0	0	0	0	0	
Total Volume Filled	59635	60255	60730	61730	63000	
<u>Remaining Capacity at End of Year (m³)</u>						
Capacity for Waste and Daily Cover	3365	2745	2270	1270	0	
Capacity for Final Cover	6000	6000	6000	6000	6000	
Total Remaining Capacity	9365	8745	8270	7270	6000	
<u>Remaining Site Life (Years)</u>						
At 2018 Fill Rate	475	7.1	5.8	4.8	2.7	0.0
At Average Fill Rate (5 yr Avg)	885.8	3.8	3.1	2.6	1.4	0.0
At Maximum Fill Rate (5 yr)	1270	2.6	2.2	1.8	1.0	0.0

Notes:

1. 2017 and 2018 capacities have been updated to include existing stockpiled materials onsite.

**TABLE 3:
SUMMARY OF MONITORING WELL LOCATIONS
AND CONSTRUCTION DETAILS**

BOREHOLE ID [WELL ID]	LOCATION (relative to refuse pile)	Date of Installation	ELEVATION		Monitoring Well Depth	Screened Interval (metres)	Unit Measured
			Ground	Top of Casing			
TW-1	Onsite - Northwest Portion of Footprint	1984	90.38	91.42	7.00	5.2 to 7.0	Sandy Silt
TW-2	Onsite - Northwest Portion of Footprint	1984	90.33	91.36	3.55	0.9 to 3.55	Coarse Sand & Gravel / Sandy Silt
TW-3	Onsite - Downgradient	1984	88.77	89.85	3.80	1.2 to 3.8	Medium Sand & Gravel / Sandy Silt
TW-5	Onsite - East Portion of Footprint	1984	96.27	97.60	10.25	7.0 to 10.25	Medium to Fine Sand / Sandy Silt
TW-5A	Onsite - East Portion of Footprint	1984	96.34	97.17	4.70	1.5 to 4.7	Medium Sand & Gravel / Sandy Silt
TW-6	Onsite - In Footprint	1984	95.98	96.92	5.20	3.5 to 5.2	Sandy Silt
OW-2	Onsite - West of Footprint	1984	na	na	2.25	CSP - Open Bottom	Medium Sand & Gravel / Sandy Silt
OW-3	Onsite - Downgradient	1984	na	na	2.25	CSP - Open Bottom	Medium Sand & Gravel / Sandy Silt

NOTES:

1. All depths measured in mbgs = approximate depth in metres below ground surface
2. na = Not Available.
3. Borehole logs are provided in the Appendices
4. Elevations measured in mASL = meters above sea level
5. Monitoring Well Depths in meters below ground surface based on physical depth measurements
6. CSP: Corrugated Steel Pipe

**Table 4:
REASONABLE USE CRITERIA - OBJECTIVE LEVELS**

Parameter	Background Concentration (Cb)	Maximum Concentration (Cr)	Objective Level (Cm)
Alkalinity(as CaCO ₃)	211	30 - 500 [OG]	355
Ammonia(as N)	0.9	nv	nv
Barium	0.09	1 (MAC)	0.32
Boron	0.1	5 (IMAC)	1
Calcium	56	nv	nv
Chloride	5	250 [AO]	127
Conductivity - @25°C (µS/cm)	536	nv	nv
Hardness(as CaCO ₃)	266	80-100 [OG]	183
Iron	0.4	0.3 [AO]	0.36
Magnesium	30	nv	nv
Nitrate(as N)	0.24	10 (MAC)	3
Nitrite(as N)	0.04	1 (MAC)	0.28
Organic Nitrogen	0.66	0.15 (OG)	0.41
pH	7.74	6.5-8.5 [OG]	6.5 to 8.5
Sodium	14	200 [AO]	107
Sulphate	81	500 [AO]	290
Total Kjeldahl Nitrogen(as N)	nv	nv	nv

Notes:

* The background concentrations for these parameters exceed the ODWS. Therefore, the RUC is set at the maximum measured naturally occurring concentration in the background well

AO = Aesthetic Objective

OG = Operational Guideline

MAC = Maximum Acceptable Concentration

Background Concentrations are based on concentrations reported from TW-1 from 1989 to present

MOE Procedure B-7-1

$$C_m = C_b + x(C_r - C_b)$$

Where:

C_m = Maximum Concentration Acceptable in Groundwater at Property Line

C_b = Background Concentration from OW-8 from 2004 to Present

C_r = Maximum Concentration Acceptable in Groundwater as per Ontario Drinking Water Standards (ODWS)

x = A Constant; Being 0.5 for Non-Health related Parameters, and 0.25 for Health Related Parameters

Table 5:
Summary of Groundwater Quality and Comparison to RUC
SPRING - 2018

Sample ID MW Location Sampling Date	Ontario Drinking Water Standards (ODWS) (mg/L)	MOE Guideline B-7 Reasonable Use Criteria (mg/L)	Sample Identification And Monitoring Well Location																	
			10-Apr-18 Background/ Onsite		10-Apr-18 North - Downgradient		10-Apr-18 East Boundary		10-Apr-18 West Boundary		10-Apr-18 Onsite									
			TW-1	TW-2	TW-3	OW-3	TW-5	TW-5A	OW-2	TW-6										
Parameter																				
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	290	360	510	270	370	260	790											
Ammonia(as N)	nv	nv	0.31	0.29	2.3	1.3	1.6	<0.05	0.25											
Barium	1	0.32	--	--	--	--	--	--	0.13											
Boron	5 [IMAC]	1	--	--	--	--	--	--	0.32											
Calcium	nv	nv	80	86	110	72	100	78	180											
Chloride	250 [AO]	127	9.0	24	30	17	30	27	4.5											
Conductivity - @25°C (µS/cm)	nv	nv	660	720	1100	570	870	630	1500											
Hardness(as CaCO ₃)	80 - 100 [OG]	183	340	350	510	290	430	310	810											
Iron	0.3 [AO]	0.4	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02											
Magnesium	nv	nv	35	33	56	26	42	27	86											
Nitrate(as N)	10	3	1.3	<0.10	12	1.7	8.9	5.0	1.1											
Nitrite(as N)	1	0.28	--	--	--	--	--	--	--											
Organic Nitrogen	0.15	0.41	0.89	0.18	0.60	2.8	0.30	0.33	0.68											
pH	6.5 - 8.5 [OG]	6.5 - 8.5	8.0	7.8	7.9	8.0	7.8	7.9	7.7											
Sodium	200 [AO]	107	8.0	20	30	5.2	21	17	12											
Sulphate	500 [AO]	290	73	46	36	15	38	23	83											
Total Kjeldahl Nitrogen(as N)	nv	nv	1.0	1.2	2.9	4.1	1.9	0.35	0.93											

Notes:

1. Analytical results are reported in mg/L unless otherwise noted. Analysis completed by Maxxam Analytics Inc.
2. Reasonable Use Criteria are calculated using MOE Procedure B-7-1
3. Background Concentrations are based on concentrations measured at OW-8 from 2002 to present
4. AO: Aesthetic Objective; OG = Operational Guideline; MAC = Maximum Acceptable Concentration; IMAC = Interim Maximum Acceptable Concentration; ND: Not Detected
5. Values in bold are greater than the Reasonable Use Criteria
6. Shaded values are greater than the ODWS

Table 5:
Summary of Groundwater Quality and Comparison to RUC
FALL - 2018

Sample ID MW Location Sampling Date	Ontario Drinking Water Standards (ODWS) (mg/L)	MOE Guideline B-7 Reasonable Use Criteria (mg/L)	Sample Identification And Monitoring Well Location									
			North - Downgradient					East Boundary				
			14-Nov-18 Background/ Onsite TW-1	14-Nov-18 TW-2	14-Nov-18 TW-3	14-Nov-18 OW-3	14-Nov-18 TW-5	14-Nov-18 TW-5A	14-Nov-18 West Boundary OW-2	14-Nov-18 Onsite TW-6		
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	200	***	340	390	370	290	370	270	870	
Ammonia(as N)	nv	nv	0.11	***	0.28	<0.05	2.0	0.41	2.0	0.18	1.8	
Barium	1	0.32	***	***	***	***	***	***	***	***	0.13	
Boron	5 [IMAC]	1	***	***	***	***	***	***	***	***	0.50	
Calcium	nv	nv	***	***	***	***	***	***	***	***	***	
Chloride	250 [AO]	127	5.9	***	33	28	33	13	33	22	15	
Conductivity - @25°C (µS/cm)	nv	nv	540	***	830	780	730	510	730	600	1500	
Hardness(as CaCO ₃)	80 - 100 [OG]	183	260	***	400	400	420	300	420	350	870	
Iron	0.3 [AO]	0.4	<0.02	***	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.11	
Magnesium	nv	nv	***	***	***	***	***	***	***	***	***	
Nitrate(as N)	10	3	0.29	***	0.15	5.0	8.6	2.2	8.6	<0.10	0.32	
Nitrite(as N)	1	0.28	***	***	***	***	***	***	***	***	***	
Organic Nitrogen	0.15	0.41	0.71	***	0.30	0.03	0.04	0.23	***	0.04	0.80	
pH	6.5 - 8.5 [OG]	6.5 - 8.5	7.7	***	7.6	7.8	7.7	7.8	7.7	7.9	7.7	
Sodium	200 [AO]	107	***	***	***	***	***	***	***	***	46.0	
Sulphate	500 [AO]	290	70	***	87	34	37	8.8	37	72	110	
Total Kjeldahl Nitrogen(as N)	nv	nv	0.82	***	0.58	<0.10	1.7	0.64	1.7	0.22	2.6	

Notes:

- Analytical results are reported in mg/L unless otherwise noted. Analysis completed by Maxxam Analytics Inc.
- Reasonable Use Criteria are calculated using MOE Procedure B-7-1
- Background Concentrations are based on concentrations measured at OW-8 from 2002 to present
- AO: Aesthetic Objective; OG = Operational Guideline; MAC = Maximum Acceptable Concentration; IMAC = Interim Maximum Acceptable Concentration; ND: Not Detected
- Values in **bold** are greater than the Reasonable Use Criteria
- Shaded values are greater than the ODWS

Table 6:
Summary of Surface Water Quality and Comparison to PWQO

Parameter	PWQO (mg/L)	Spring Monitoring - 2018				
		SW-1 (Upstream)	SW-2 (Upstream)	SW-3 (Downstream)	SW-4 (Downstream)	SW-5 (Downstream)
Alkalinity (as CaCO ₃)	**345	300	320	320	320	320
Total Ammonia (as N)	nv	<0.05	0.05	<0.05	<0.05	<0.05
Chloride	nv	21	17	17	17	18
Conductivity - @25°C (µS/cm)	nv	680	650	660	650	660
Iron	0.3	--	--	--	--	--
pH	6.5-8.5	8.2	8.4	8.4	8.4	8.4
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, Total	nv	0.02	0.01	0.02	0.02	0.03

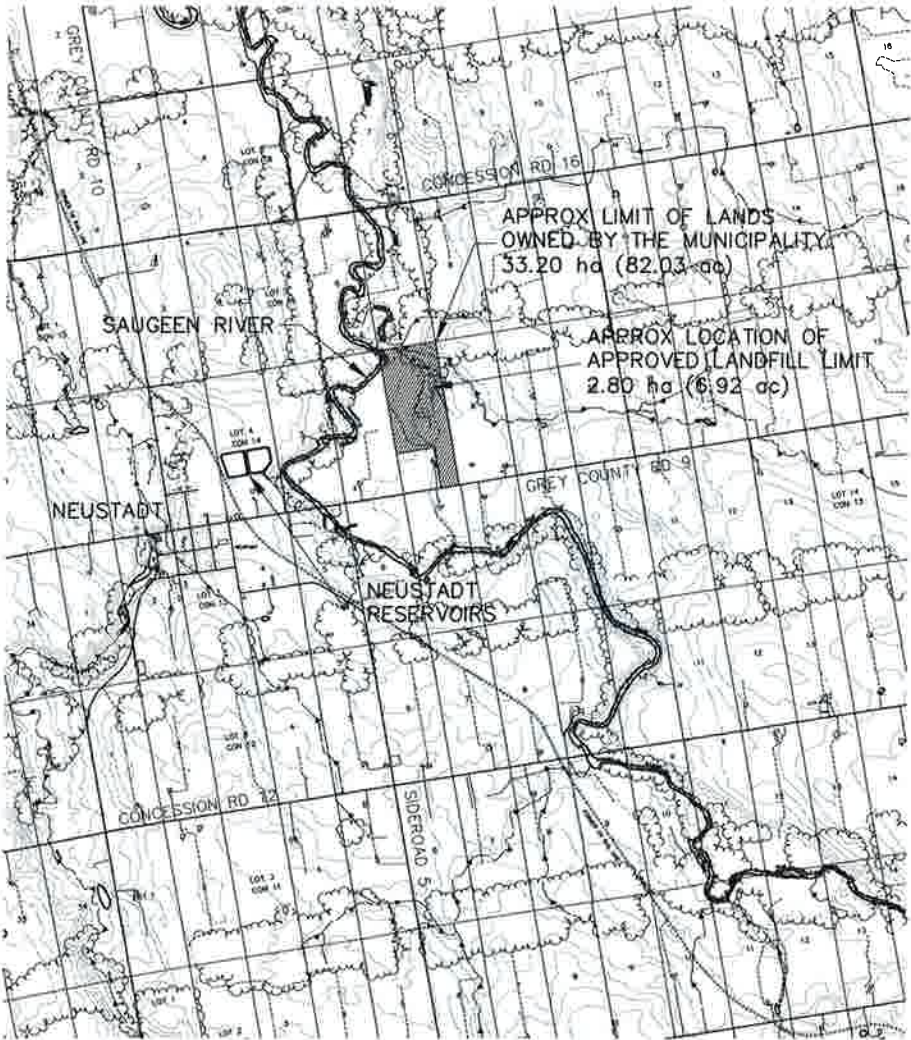
Parameter	PWQO (mg/L)	Fall Monitoring - 2018				
		SW-1 (Upstream)	SW-2 (Upstream)	SW-3 (Downstream)	SW-4 (Downstream)	SW-5 (Downstream)
Alkalinity (as CaCO ₃)	**345	300	310	310	310	300
Total Ammonia (as N)	nv	<0.05	0.05	<0.05	<0.05	<0.05
Chloride	nv	22	19	19	19	19
Conductivity - @25°C (µS/cm)	nv	660	660	660	650	670
Iron	0.3	<0.02	0.06	0.04	0.04	0.04
pH	6.5-8.5	8.1	8.3	8.3	8.3	8.2
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, Total	nv	<0.004	0.006	0.006	0.005	0.005

Notes:

1. Analytical results are reported in mg/L unless otherwise noted
2. PWQO: Provincial Water Quality Objective
3. NV: No Value
3. na: Not Available
5. ** Alkalinity should not be decreased by more than 25% of background.
6. Values in **BOLD** and shaded indicate exceedance of PWQO.

FIGURES:

213087
Normanby Landfill
Municipality of West Grey



SCALE 1:50,000
MARCH 2019

SITE LOCATION MAP

Part Lot 7, Concession 14
Former Township of
Normanby

Figure No. 1



213087
Normanby Landfill
Municipality of West Grey



LEGEND

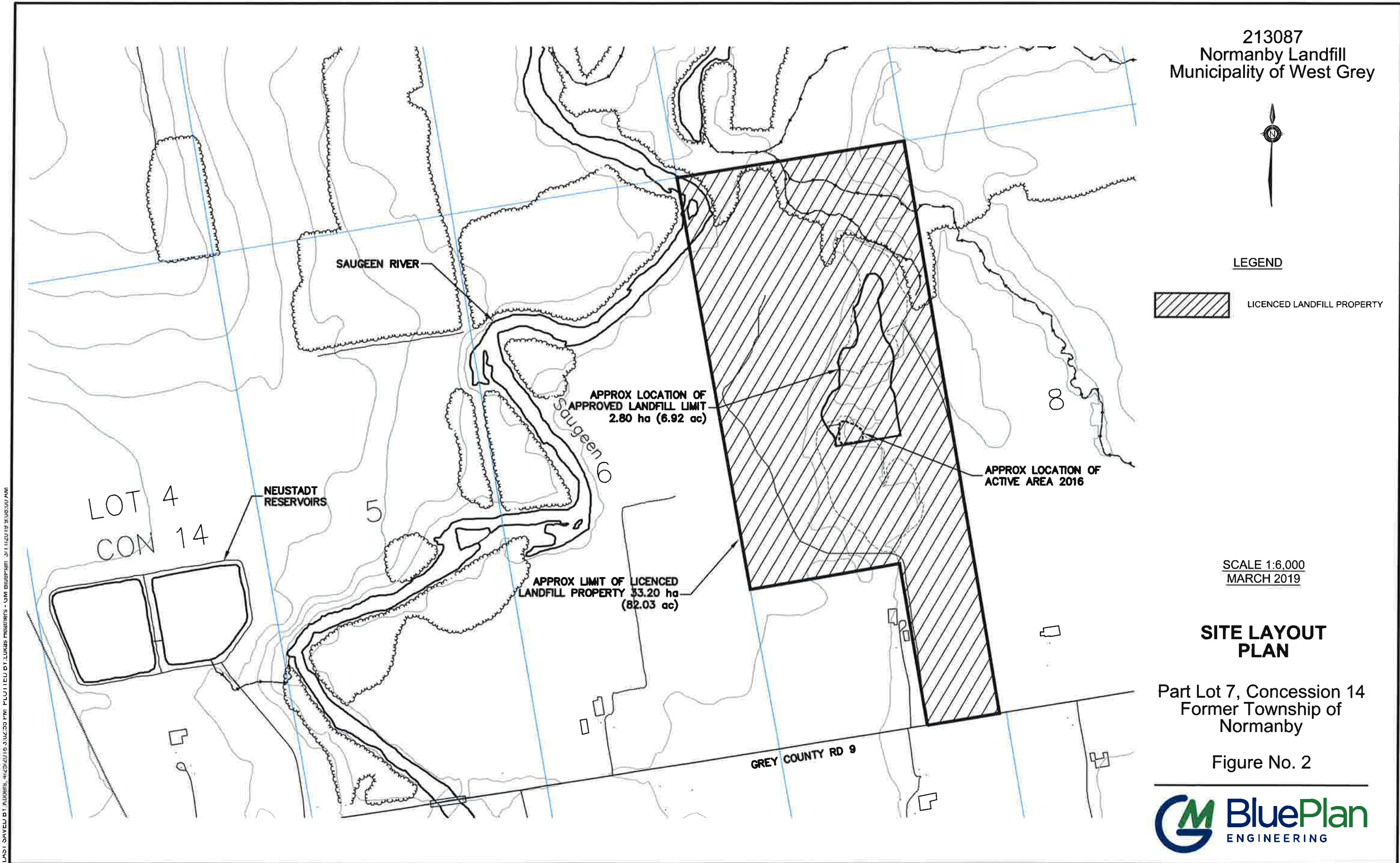
 LICENCED LANDFILL PROPERTY

SCALE 1:6,000
MARCH 2019

**SITE LAYOUT
PLAN**

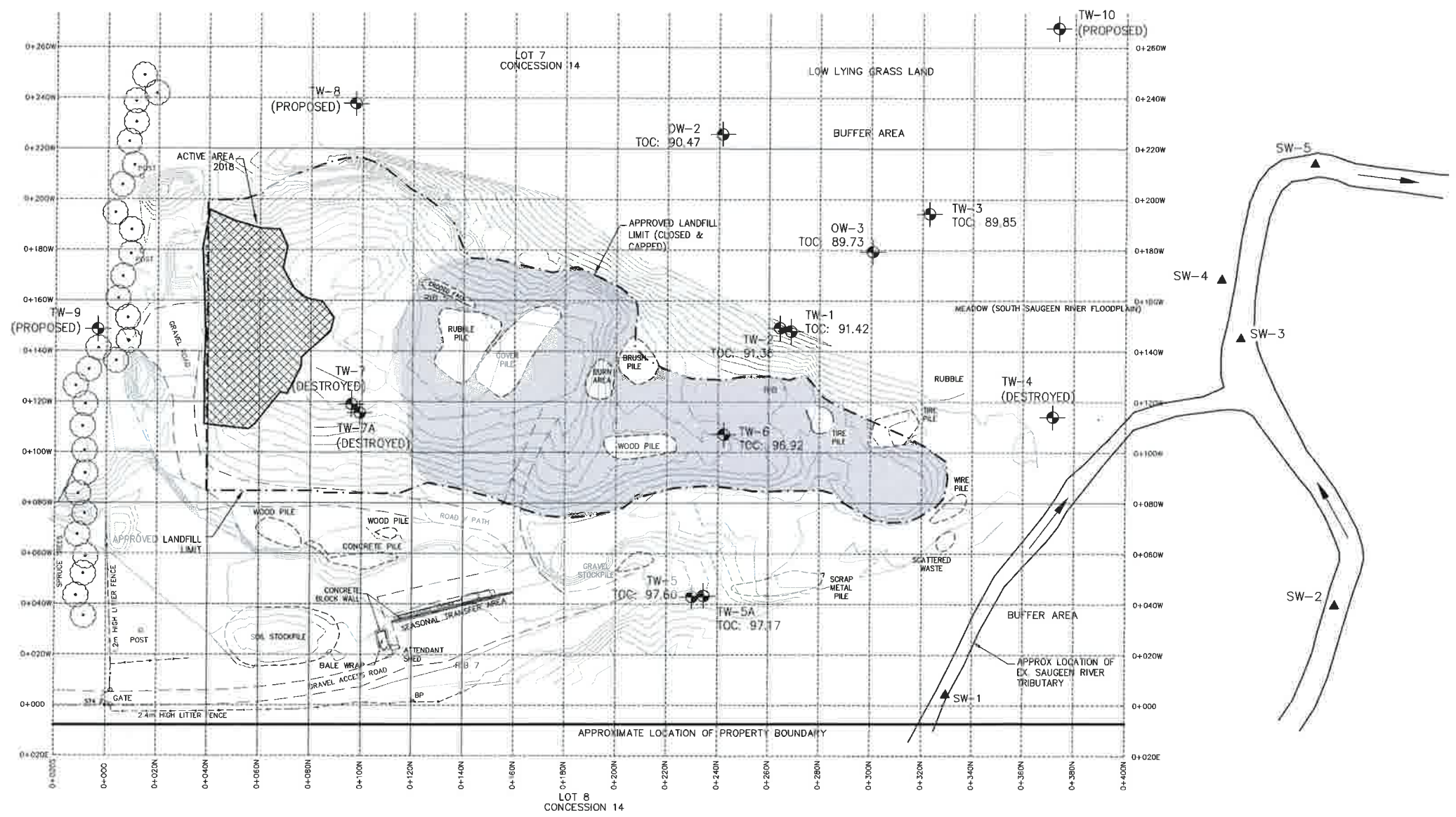
Part Lot 7, Concession 14
Former Township of
Normanby

Figure No. 2



LAST SAVED BY: JUDITH, 2019-03-15 10:30:00 PM, FILED BY: D. LUKAS MEATERS - CIVIL ENGINEER, 2019-03-15 10:30:00 AM

213087
 Normanby Landfill
 Municipality of West Grey



LEGEND

- TW/OW
- SW-2
- TOC
- APPROVED LANDFILL AREA
- PROPERTY BOUNDARY
- ACTIVE AREA
- CLOSED & CAPPED LANDFILL AREA

- NOTES**
- TOPOGRAPHIC FEATURES SHOWN ON THIS PLAN ARE BASED ON FIELD SURVEY DATA BY GENIVAR INC. ON DECEMBER 4, 2012, AND ACTIVE AREA SURVEY BY GM BLUEPLAN LTD. ON DECEMBER 21, 2016.

SCALE - 1:2,000
 MARCH 2019

**EXISTING CONDITIONS
 PLAN**

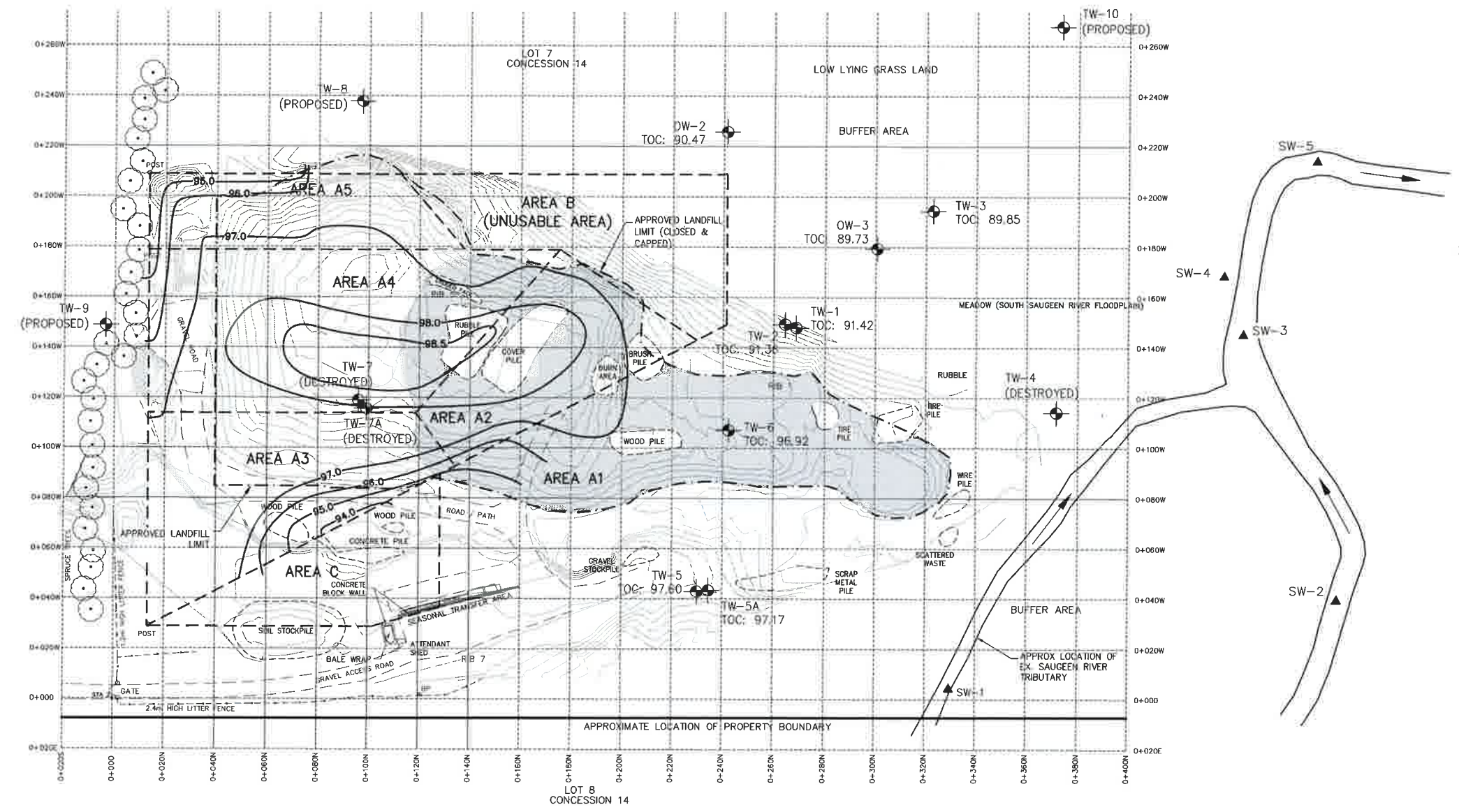
Part Lot 7, Concession 14
 Former Township of
 Normanby

Figure No. 3



FILE Z:\Owen Sound\213-2013\213087 AMR - Normanby Landfill\Drawings\213087AMR\Fig3-fbp.dwg LAYOUT: Figure 3
 LAST SAVED BY: Lheathers, 3/7/2019 1:38:12 PM PLOTTED BY: Lukas Heathers - GM BluePlan 3/11/2019 8:58:04 AM

213087
 Normanby Landfill
 Municipality of West Grey



LEGEND

	TW/OW	MONITORING WELL LOCATION
	SW-2	SURFACE WATER SAMPLE LOCATION
	TOC	TOP OF CASING ELEVATION
	98.0	PROPOSED FINAL CONTOUR
		APPROVED LANDFILL AREA
		PROPERTY BOUNDARY
		CLOSED & CAPPED LANDFILL AREA

- NOTES**
1. TOPOGRAPHIC FEATURES SHOWN ON THIS PLAN ARE BASED ON FIELD SURVEY DATA BY GENIVAR INC. ON DECEMBER 4, 2012, AND ACTIVE AREA SURVEY BY GM BLUEPLAN LTD. ON DECEMBER 21, 2016.

SCALE - 1:2,000
 MARCH 2019

FINAL CONTOUR PLAN

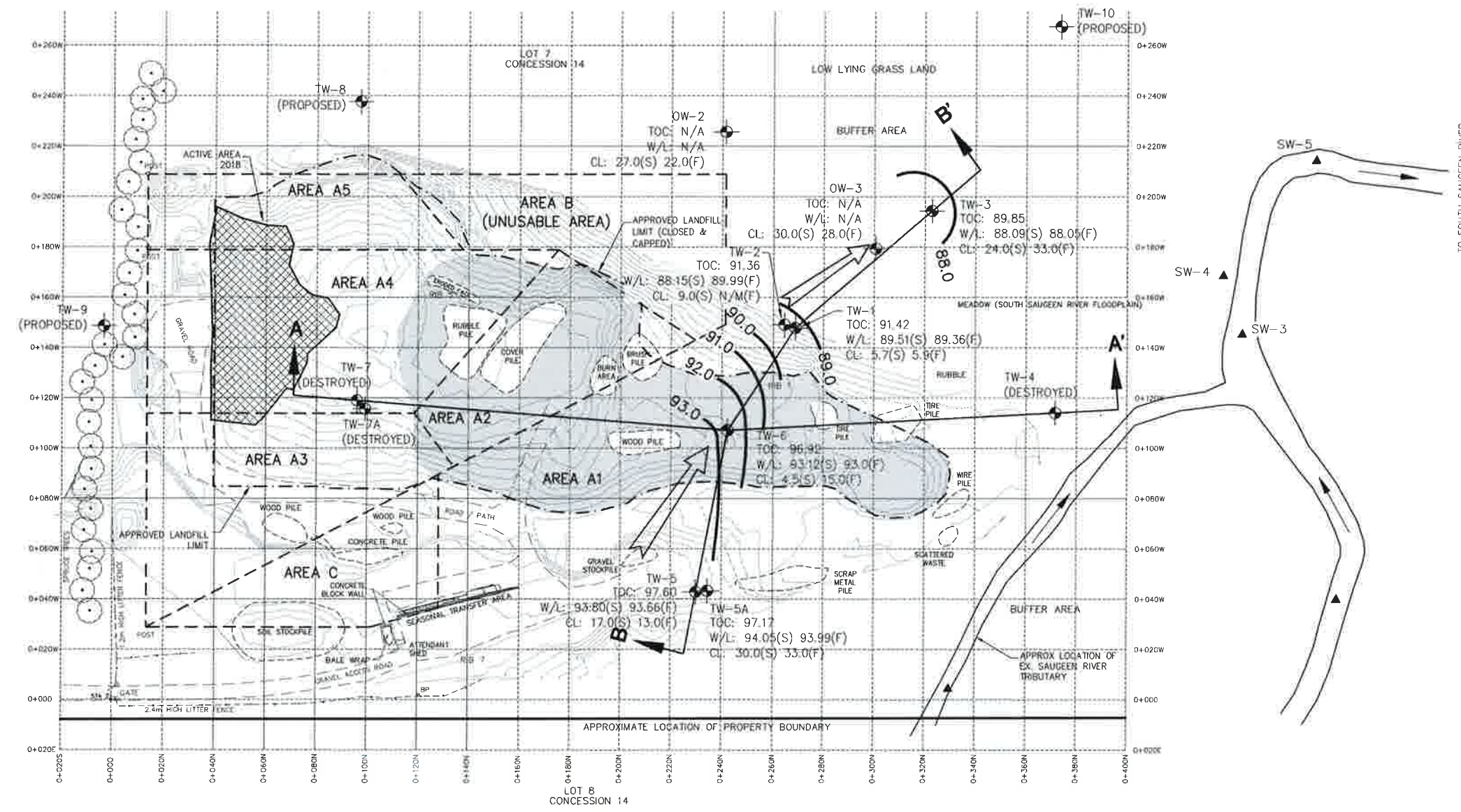
Part Lot 7, Concession 14
 Former Township of
 Normanby

Figure No. 3a



FILE:Z:\Owen Sound\213-2013\213087 AMR - Normanby Landfill\Drawings\213087AMR\Fig3-5b.dwg LAYOUT:Figure 3a
 LAST SAVED BY: L.heathers. 3/7/2019 1:38:12 PM PLOTTED BY: Lukas Heathers - GM BluePlan. 3/11/2019 8:57:21 AM

213087
 Normanby Landfill
 Municipality of West Grey



LEGEND

	MONITORING WELL LOCATION
	SURFACE WATER SAMPLE LOCATION
TOC	TOP OF CASING ELEVATION
W/L	GROUNDWATER ELEVATION
CL	CHLORIDE CONCENTRATION
(S)/(F)	SPRING/FALL MONITORING ROUND
	APPROVED LANDFILL AREA
	PROPERTY BOUNDARY
91.0	GROUNDWATER CONTOUR
	ACTIVE AREA
	CLOSED & CAPPED LANDFILL AREA
	INFERRED DIRECTION OF GROUNDWATER FLOW

TO SOUTH SAUGEEN RIVER

NOTES

1. TOPOGRAPHIC FEATURES SHOWN ON THIS PLAN ARE BASED ON FIELD SURVEY DATA BY GENIVAR INC. ON DECEMBER 4, 2012, AND ACTIVE AREA SURVEY BY GM BLUEPLAN LTD. ON MAY 15, 2018.
2. GROUNDWATER CONTOURS DERIVED FROM GROUNDWATER ELEVATIONS OBTAINED DURING THE FALL MONITORING ROUND.

SCALE - 1:2,000
 MARCH 2019

**MONITORING LOCATIONS &
 GROUNDWATER CONTOUR
 PLAN**

Part Lot 7, Concession 14
 Former Township of
 Normanby

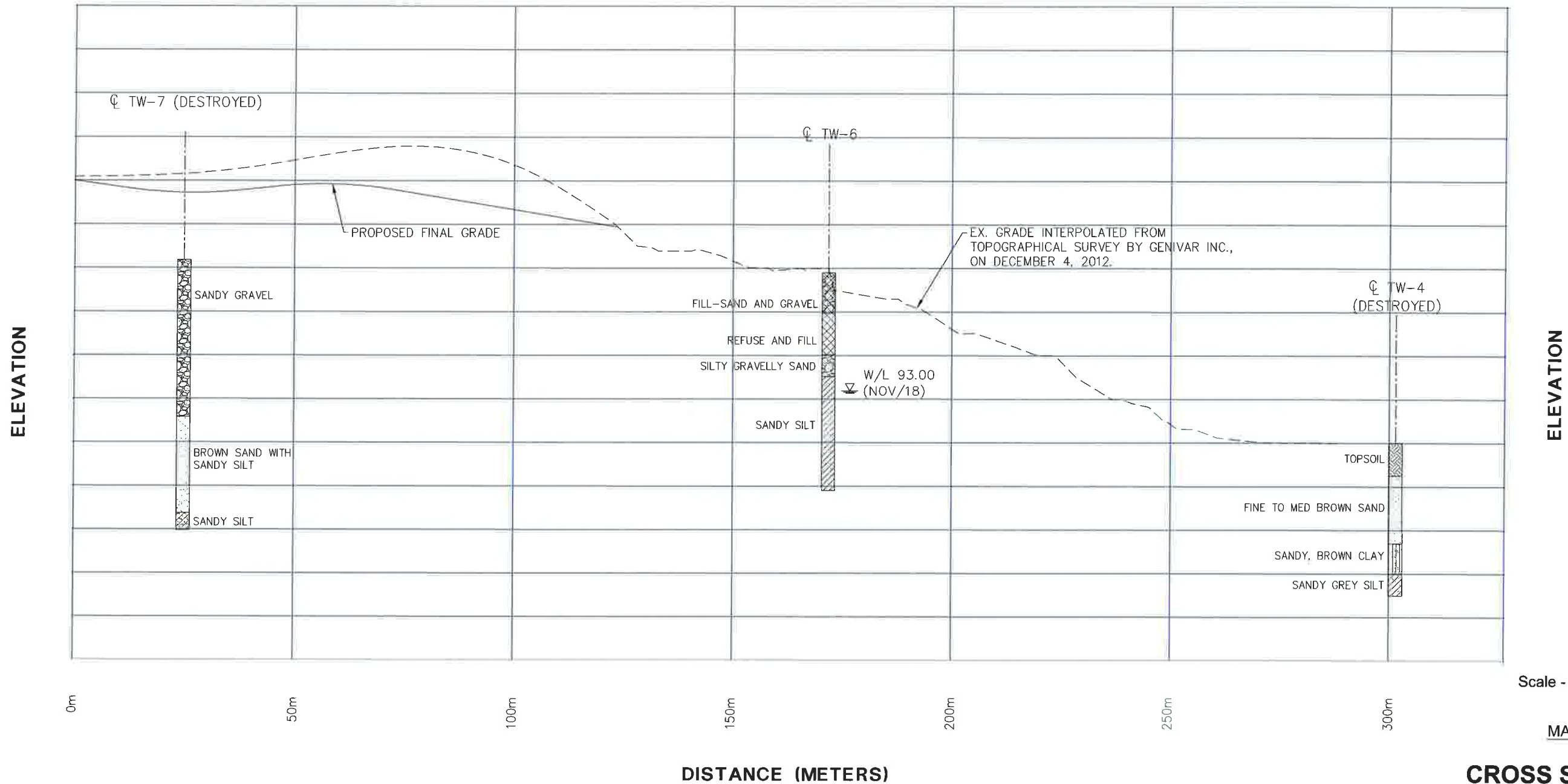
Figure No. 4



FILE Z:\Owen Sound\213-2019\213087 AMR - Normanby Landfill\Drawings\213087AMRFig3-5b.dwg LAYOUT:Figure 4
 LAST SAVED BY:Evmining_2/21/2019 5:24:46 PM PLOTTED BY:Lukas Heathers - GM BluePlan 3/7/2019 1:32:53 PM

A

A'



Scale - 1:1000 Horiz.
 1:100 Vert.

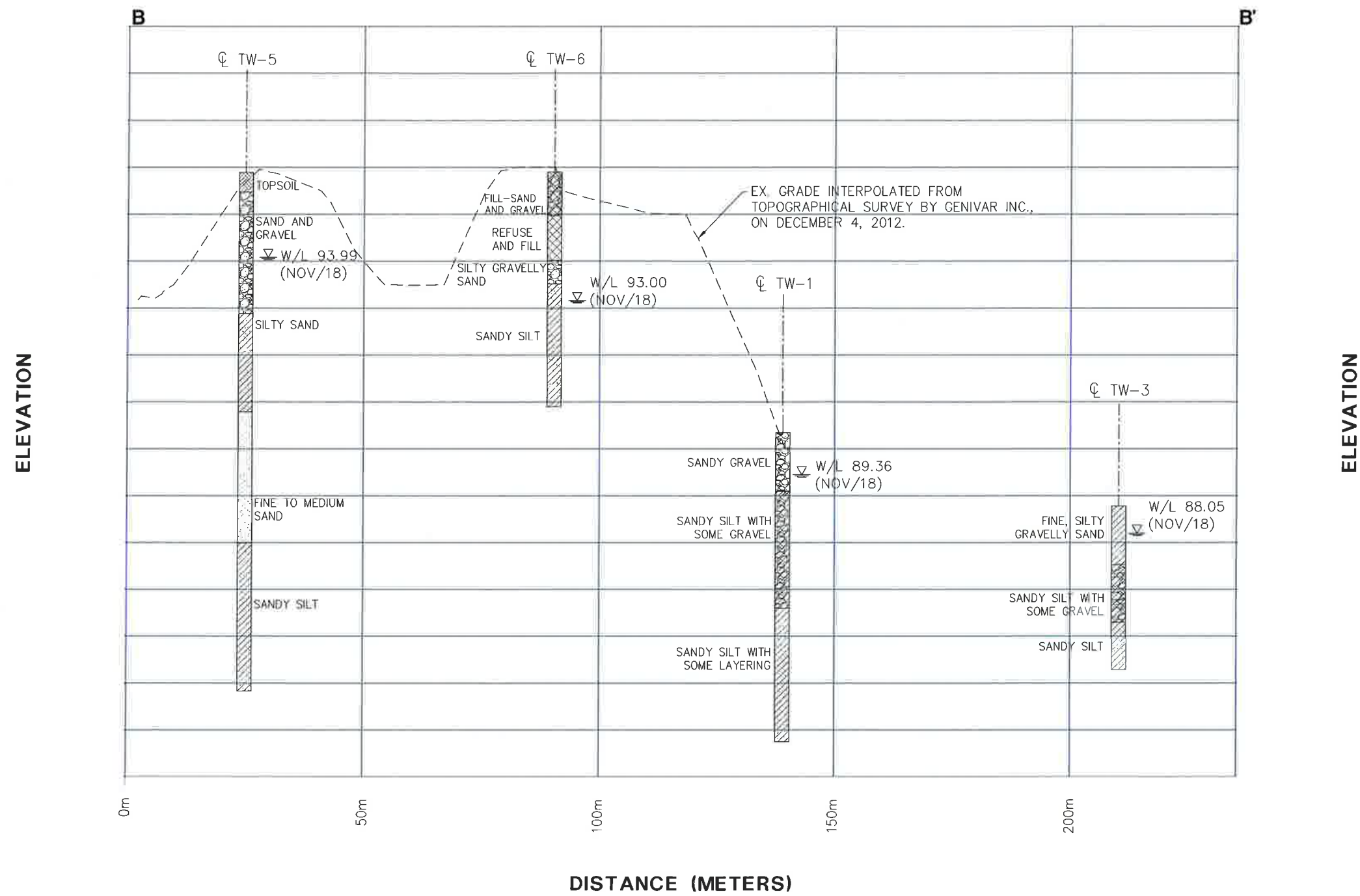
MARCH 2019

CROSS SECTION A-A'

Figure No. 5a

NOTES:

- 1. 10x VERTICAL EXAGGERATION.



ELEVATION

ELEVATION

DISTANCE (METERS)

NOTES:
 1. 10x VERTICAL EXAGGERATION.

Scale - 1:1000 Horiz.
 1:100 Vert.

MARCH 2019

CROSS SECTION B-B'

Figure No. 5b



FILE:Z:\Owen Sound\213-201\3213087 AMR - Normanby Landfill\Drawings\213087AMR\Fig5-5b.dwg LAYOUT:Figure 5b
 LAST SAVED BY:Elwring, 2/21/2019 5:24:46 PM PLOTTED BY:Lukas Heathers - GM BluePlan 3/7/2019 1:32:55 PM

**APPENDIX A:
CERTIFICATE OF APPROVAL NO. A262104**

File 101818



Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A262104

Notice No. 3

Issue Date: August 31, 2012

RECEIVED
SEP 10 2012

The Corporation of the Municipality of West Grey
Rural Route, No. 2
Durham, Ontario
N0G 1R0

Site Location: Normanby Landfill Site
221291 Grey Road 16 Part of Lot 7, Concession 14
West Grey Municipality, County of Grey
N0G 2M0

You are hereby notified that I have amended Approval No. A262104 issued on June 24, 2005, as amended for a Waste Disposal Site, covering a 2.8 hectare waste fill area, within a total Site area of 33 hectares, as follows:

SUBMISSION OF REPORT - DEVELOPMENT AND OPERATIONS REPORT, ADDENDUM No. 1

Pursuant to Condition 55 in Environmental Compliance Approval No. A262104, dated September 28, 2011, approval is hereby granted for the design and operation of the Waste Diversion/Transfer Facility at the Normanby Landfill Site, as presented in a report entitled "Development and Operations Report, Addendum No. 1", dated November, 2011, prepared by GENIVAR Inc., which is listed as Item 11 under Documentation below.

Documentation

The following item is hereby added to Schedule "A" and forms part of the Environmental Compliance Approval, No. A262104 :

11. Letter dated January 13, 2012 from Peter Brodzikowski to Tesfaye Gebrezghi, Director, Ministry of the Environment, with attached report entitled "Development and Operations Report, Addendum No. 1", Normanby Landfill, Municipality of West Grey", Waste Diversion and Transfer Facilities, dated November, 2011, prepared by GENIVAR Inc.

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

TERMS AND CONDITIONS

56. The operation of the Waste Diversion/Transfer Facility at the Normanby Landfill Site, for the acceptance, temporary storage, and transfer of solid non-hazardous waste, and recyclable waste, shall be operated in accordance with the report entitled "Development and Operations Report, Addendum No. 1", dated November, 2011, Item 11 in Schedule "A", attached to this Approval.
57. All waste storage containers at the Waste Diversion/Transfer Facility shall have labels or signs which clearly identifies the volume and type of waste.
58. The Owner/Operator shall ensure that at the end of each day's operation, the waste storage containers at the Transfer Station are covered with tarps, or other appropriate means, to prevent blowing litter, and to prevent interference of the waste by rodents, birds, vector/vermin, etc.
59. The Owner/Operator shall ensure that all waste is removed from the Transfer Station for disposal at the waste fill area of the Normanby Landfill site or an approved facility, at least once a week, as described in Item 11 in Schedule "A", attached to this Certificate, or more frequently as needed, to prevent odour effects. This Condition is not applicable to Recycleable materials, in which case, shall be removed as needed, based on the storage containers becoming full.

REASONS

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

The reasons for Conditions 56 to 59 are to ensure that the Site including the Waste Diversion and Transfer Facilities, is operated in accordance with the application and supporting documentation submitted by the Owner/Operator, and not in a manner which the Director has not been asked to consider, and that the site is maintained in an environmentally acceptable manner and does not result in a hazard or nuisance to any person or the natural environment.

This Notice shall constitute part of the approval issued under Approval No. A262104 dated June 24, 2005, as amended.

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

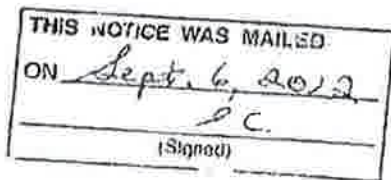
AND

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

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

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

DATED AT TORONTO this 31st day of August, 2012



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

DO/

c: District Manager, MOE Owen Sound
Peter Brdzikowski, P. Eng., GENIVAR ✓

CONTENT COPY OF ORIGINAL



Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A262104
Notice No. 2
Issue Date: September 28, 2011

The Corporation of the Municipality of West Grey
4028 13 Grey Road 4
West Grey, Ontario
N0G 1R0

Site Location: Normanby Landfill Site
221291 Grey Road 16 Part of Lot 7, Concession 14
West Grey Municipality, County of Grey
N0G 2M0

You are hereby notified that I have amended Provisional Certificate of Approval No. A262104 issued on June 24, 2005, as amended for a Waste Disposal Site, covering a 2.8 hectare waste fill area, within a total Site area of 33 hectares, as follows:

ALTERATION OF FINAL WASTE CONTOURS

Pursuant to Condition 4 in the Provisional Certificate of Approval dated June 24, 2005, approval is hereby granted for the alteration of the final waste contours to the southern third of the Normanby Landfill Site, as described in a letter dated November 10, 2010, from GENIVAR to the Ministry of the Environment, and shown on attached Drawing No. 0181813 - 2010FCW, dated November 1, 2010, which is listed as Item 10 under Documentation below.

Documentation

The following item is hereby added to Schedule "A" and forms part of the Provisional Certificate of Approval, No. A262104:

10. Letter dated November 10, 2010, from Peter S. Brodzikowski and Brian R. Scott, GENIVAR to the Director, Environmental Assessment and Approvals Branch, Ministry of the Environment, and attached Drawing No. 0181813 - 2010FCW, dated November 1, 2010 entitled "Proposed Final Contours (Top of Waste), Normanby Landfill Site, Municipality of West Grey".

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

TERMS AND CONDITIONS

Capacity

Condition 28 in the Provisional Certificate of Approval, No. A262104, dated June 24, 2005, is hereby revoked and replaced with new Condition 28 as follows:

28. No waste shall be landfilled at any time above the **final contours, shown on Drawing No. 0181813 - 2010FCW, dated November 1, 2010** entitled "Proposed Final Contours (Top of Waste), attached to Item 10, in Schedule "A" attached to this Certificate. The maximum elevation of the top of waste in the fill area, shall not exceed 100.00 metres above sea level. Final slopes above grade within the waste fill area at the time of site closure, shall be within the range of 4H:1V on the sideslopes and 20H:1V on the top flat areas.

CONTENT COPY OF ORIGINAL

Condition 43 is hereby revoked and replaced with new Condition 43 as follows:

43. The current monitoring programs for groundwater/leachate and surface water, as provided in Schedule "B", as amended (attached to this Certificate), and described in letter dated November 10, 2010 and the Development and Operations Report, Item 9 in Schedule "A", attached to the Certificate, and in accordance with any applicable legislation, shall be confirmed through the review of the Development and Operations Report (Item 9 in Schedule "A"), and subsequent Annual Monitoring Reports, by the District Manager.

The following new Condition is hereby added to the Certificate:

55. Within six (6) months of the date of this Notice, the Owner shall submit for the Director's approval, copied to the District Manager, an Updated Design and Operations Plan for the waste recycling/transfer facility at the Normanby Landfill Site. As a minimum, the Updated Design and Operations Plan shall identify the materials/items included in the program, storage locations shown on a full scale site operations drawing, storage capacities and quantities for each material, frequency of removal, record keeping and reporting, emergency response, etc. and shall address the operational impacts on the natural environment, including nuisance controls.

SCHEDULE "B"

Schedule "B" in the Provisional Certificate of Approval No. A262104, dated June 24, 2005, is hereby revoked and replaced with new Schedule "B" below, which forms part of the Provisional Certificate of Approval No. A262104, as amended:

Date	Sampling Location	Analytical Parameters
Water Levels: Spring, Fall	TW-1, TW-2, TW-3, TW-5, TW-5A, TW-6, OW-2 and OW-3	
Groundwater: Spring & Fall	TW-1, TW-2, TW-3, TW-5, TW-5A, TW-6, OW-2 and OW-3	QWC - Conductivity, Chlorides, Alkalinity, Iron, pH, Total Ammonia, Hardness, Sodium, Nitrate, Sulphate, TKN;
Surface Water: Spring & Fall	SW-1, SW-2, SW-3, SW-4, SW-5	Conductivity, Chloride, Iron, Alkalinity, pH, Total Ammonia, Total Phosphorous Phenols, Dissolved Oxygen, Temp. (in field);

Duplicates: 1 in 10 per water type (groundwater, surface water)

REASONS

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

1. The reason for Condition 28 is to ensure that the Site is operated to the approved capacity and that the closed site is graded appropriately to allow free surface water drainage.
2. The reasons for Condition 43 are to demonstrate that the landfill site is performing as designed, and that the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.
3. The reason for Condition 55 is to ensure that the Site is operated, inspected and maintained in an environmentally acceptable manner as approved by the Ministry, and does not result in a hazard or nuisance to any person or the natural environment.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A262104 dated June 24, 2005

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

CONTENT COPY OF ORIGINAL

shall state:

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

The Notice should also include:

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

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
555 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E3

AND

The Director
Section 39, Environmental Protection Act
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L3

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4586 or www.ert.gov.on.ca

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

DATED AT TORONTO this 28th day of September, 2011

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

DO/

c: District Manager, MOE Owen Sound
Peter Brodzikowski/Brian Scott, GENIVAR Consultants LP



MADE
PROCESSED
OCT 27 2008

Ministry of the Environment
Ministère de l'Environnement

**AMENDMENT TO PROVISIONAL CERTIFICATE OF
APPROVAL
WASTE DISPOSAL SITE
NUMBER A262104
Notice No. 1
Issue Date: October 18, 2008**

The Corporation of the Municipality of West Grey
Rural Route, No. 2
Durham, Ontario
N0G 1R0

Site Location: Normanby Landfill
Lot 7, Concession 14
West Grey Municipality, County of Grey

*You are hereby notified that I have amended Provisional Certificate of Approval No. A262104
issued on June 24, 2005 for a Waste Disposal Site, covering a 2.8 hectare waste fill area, within a total
Site area of 33 hectares, as follows:*

SUBMISSION OF DESIGN AND OPERATIONS REPORT

Pursuant to Condition 12 in Provisional Certificate of Approval No. A262104 dated June 24, 2005,
approval is hereby granted for the development and operation of the Normanby Landfill Site as presented in
a report entitled "Development and Operations Report" dated December 2006, prepared by Henderson
Paddon & Associates Limited, which is listed as Item 9 under Documentation below.

Documentation

*The following item is hereby added to Schedule "A" and forms part of the Provisional Certificate of
Approval, No. A262104 :*

9. Report entitled "Development and Operations Report" Normanby Landfill, Municipality of West Grey, dated December 2006, prepared by Henderson Paddon & Associates Limited.

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

TERMS AND CONDITIONS

Monitoring Program

Condition 43 is hereby revoked and replaced with new Condition 43 as follows:

43. The current monitoring programs for groundwater/leachate and surface water, as provided in Schedule "B" and described in the Development and Operations Report, Item 9 in Schedule "A", attached to this Certificate, and in accordance with any applicable legislation, shall be confirmed through the review of the Development and Operations Report (Item 9 in Schedule "A"), and subsequent Annual Monitoring Reports, by the District Manager.

The following new Conditions are hereby added to the Certificate:

50. A recommendation for proposed changes to the monitoring programs under this Certificate may be made in the Annual Monitoring Reports, based on the results to date, and may be implemented subject to the prior written concurrence of the District Manager.
51. Any groundwater/leachate monitoring wells included in the monitoring program that get damaged or in any way made inoperable for sampling, shall be assessed, repaired, replaced or decommissioned, as the case may be, by the landfill Owner.

Trigger Mechanisms and Contingency Plans

52. The Site specific Trigger Mechanism and Contingency Plans for groundwater/leachate, surface water and landfill gas, as described in Sections 8.2 to 8.3 in the Development and Operations Report, Item 9 in Schedule "A" attached to the Certificate, shall be confirmed through the review of the Development and Operations Report, by the District Manager.
53. In the event of contaminant concentration exceeding acceptable levels, relating to leachate mounding or groundwater and/or surface water impacts due to leachate or landfill gas, the Owner shall immediately notify the District Manager, and an investigation into the cause and the need to implement a remedial or contingency action shall be submitted for the written acceptance of the District Manager.
54. The Owner/Operator shall implement the accepted remedial or contingency action as soon as practicable to address the problem.

REASONS

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

1. The reason for amending Condition 43 is to reflect the monitoring programs for the Site, as provided in this Certificate and as described in the Development and Operations Report submitted by the Owner. Regular monitoring demonstrates that the landfill site is performing as designed and the impacts on the

- natural environment are acceptable, and allows for the analysis of trends over time to ensure that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.
2. The reason for Conditions 50 and 51 is to provide for regular review of the performance of the site design to demonstrate that impacts to the natural environment are within acceptable limits.
 3. The reasons for Conditions 52 to 54 are to ensure that the Owner follows a plan with an organized set of procedures for identifying and responding to unexpected but possible problems at the Site. A remedial action / contingency plan is necessary to ensure protection of the natural environment and public health and safety.

This Notice shall constitute part of the approval issued under Provisional Certificate of approval No. A262104 dated June 24, 2008

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

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

The Notice should also include:

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

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 13th Floor
Toronto, Ontario
M5G 1E5

AND

The Director
Section 39, Environmental Protection Act
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L3

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4500 or www.ert.gov.on.ca

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

DATED AT TORONTO this 16th day of October, 2008

THIS NOTICE WAS MAILED
ON Oct. 23, 2005
pc
(Signed)

Tes Gebrezghi

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

DO/

c: District Manager, MOE Owen Sound
Frank C. Ford, M.A.Sc., P.Eng., Henderson Paddon & Associates Limited ✓

CONTENT COPY OF ORIGINAL



Ontario

Ministry
of the
Environment

Ministère
de
l'Environnement

AMENDED PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A282104

The Corporation of the Municipality of West Grey
Rural Route, No. 2
Durham, Ontario
N0G 1R0

Site Location: Normanby Landfill
Lot 7, Concession 14
West Grey Municipality, County of Grey

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

the use and operation of a Waste Disposal Site consisting of a 2.8 hectare landfilling area

which included the use of the Site for disposal of the following categories of waste (NOTE: Use of the Site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval):

Municipal, commercial and solid non-hazardous industrial waste.

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

- a. "Anniversary Date" means the date on which waste is first received at the Site;
- b. "Certificate" means this entire provisional Certificate of Approval document, issued in accordance with section 39 of the EPA, and includes any schedules to it, the application and the supporting documentation listed in schedule "A";
- c. "Director" means any Ministry employee appointed in writing by the Minister pursuant to section 5 of the EPA as a Director for the purposes of Part V of the EPA;
- d. "District Manager" means the District Manager of the local district office of the Ministry in which the Site is geographically located;
- e. "EPA" means *Environmental Protection Act*, R.S.O. 1990, c. E. 19, as amended;
- f. "Operator" means any person, other than the Owner's employees, authorized by the Owner as having the charge, management or control of any aspect of the site and includes its successors or assigns;
- g. "Owner" means any person that is responsible for the establishment or operation of the site being approved by this Certificate, and includes the Municipality of West Grey, its successors and assigns;
- h. "OWRA" means the *Ontario Water Resources Act*, R.S.O. 1990, c. O-40, as amended from time to time;
- i. "PA" means the *Pesticides Act*, R.S.O. 1990, c. P-11, as amended from time to time;
- j. "Provincial Officer" means any person designated in writing by the Minister as a provincial officer pursuant to section 5 of the OWRA or section 5 of the EPA or section 17 of PA.
- k. "Regional Director" means the Regional Director of the local Regional Office of the Ministry in which the Site is located.
- l. "Regulation 347" or "Reg. 347" means Regulation 347, R.R.O. 1990, made under the EPA, as amended from time to time;

CONTENT COPY OF ORIGINAL

m. "Site" means the entire waste disposal site, including buffer lands located at Part of Lot 7, Concession 14, Township of Normanby, County of Grey, approved by this *Certificate*.

n. "Trained personnel" means knowledgeable in the following through instruction and/or practice:

- i. relevant waste management legislation, regulations and guidelines;
- ii. major environmental concerns pertaining to the waste to be handled;
- iii. occupational health and safety concerns pertaining to the processes and wastes to be handled;
- iv. management procedures including the use and operation of equipment for the processes and wastes to be handled;
- v. emergency response procedures;
- vi. specific written procedures for the control of nuisance conditions;
- vii. specific written procedures for refusal of unacceptable waste loads;
- viii. the requirements of this *Certificate*.

o. "white goods containing refrigerants" means appliances and equipment which contain, or may contain refrigerants, and which include, but are not restricted to, refrigerators, freezers, humidifiers and air-conditioning systems;

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

TERMS AND CONDITIONS

Compliance

1. This Provisional Certificate of Approval supersedes and replaces Provisional Certificate Number A262104 issued on February 2, 1987.
2. The *Owner* and *Operator* shall ensure compliance with all the conditions of this *Certificate* and shall ensure that any person authorized to carry out work on or operate any aspect of the *Site* is notified of this *Certificate* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
3. Any person authorized to carry out work on or operate any aspect of the *Site* shall comply with the conditions of this *Certificate*.

In Accordance

4. Except as otherwise provided for in this *Certificate*, the *Site* shall be designed, developed, built, operated and maintained in accordance with the application for this *Certificate* and the supporting documentation listed in Schedule "A".

Interpretation

5. Where there is a conflict between a provision of any document, including the application, referred to in this *Certificate*, and the conditions of this *Certificate*, the conditions in this *Certificate* shall take precedence.
6. Where there is a conflict between the application and a provision in any documents listed in Schedule "A", the application shall take precedence, unless it is clear that the purpose of the document was to amend the application and that the *Ministry* approved the amendment.
7. Where there is a conflict between any two documents listed in Schedule "A", other than the application, the document bearing the most recent date shall take precedence.
8. The conditions of this *Certificate* are severable. If any condition of this *Certificate*, or the application of any condition of this *Certificate* to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this *Certificate* shall not be affected thereby.

Other Legal Obligations

9. The issuance of, and compliance with, this *Certificate* does not:

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- a. relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or
- b. limit in any way the authority of the *Ministry* to require certain steps be taken or to require the *Owner* and *Operator* to furnish any further information related to compliance with this *Certificate*.

Adverse Effect

10. The *Owner* and *Operator* shall take steps to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality resulting from the *Site*, including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

11. Despite an *Owner*, *Operator* or any other person fulfilling any obligations imposed by this certificate, the person remains responsible for any contravention of any other condition of this *Certificate* or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.

Change of Owner

12. The *Owner* shall notify the *Director*, in writing, and forward a copy of the notification to the *District Manager*, within 30 days of the occurrence of any changes in the following information:

- a. the ownership of the *Site*;
- b. the *Operator* of the *Site*;
- c. the address of the *Owner* or *Operator*;
- d. the partners, where the *Owner* or *Operator* is or at any time becomes a partnership and a copy of the most recent declaration filed under the *Business Names Act*, R. S. O. 1990, c. B.17, shall be included in the notification.

13. No portion of this *Site* shall be transferred or encumbered prior to or after closing of the *Site* unless the *Director* is notified in advance and sufficient financial assurance is deposited with the *Ministry* to ensure that these conditions will be carried out. In the event of any change in *Ownership* of the works, other than change to a successor municipality, the *Owner* shall notify the successor of and provide the successor with a copy of this *Certificate*, and the *Owner* shall provide a copy of the notification to the *District Manager* and the *Director*.

Certificate of Requirement/ Registration on Title

14. The *Owner* shall:

- a. within 60 days of the date of this *Certificate*, submit to the *Director*, for *Director's* signature, two copies of a completed Certificate of Requirement containing a registerable description of the *Property*, in accordance with the attached form;
- b. within 10 calendar days of receiving the Certificate of Requirement signed by the *Director*, register the Certificate of Requirement in the appropriate Land Registry Office on title to the *Property* and submit to the *Director* the duplicate registered copy immediately following registration; and

15. Pursuant to Section 197 of the *EPA*, neither the *Owner* nor any person having an interest in the *Property* shall deal with the *Property* in any way without first giving a copy of this *Certificate* to each person acquiring an interest in the *Property* as a result of the dealing.

Inspections

16. No person shall hinder or obstruct a *Provincial Officer* from carrying out any and all inspections authorized by the *OWRA*, the *EPA*, or the *PA*, of any place to which this *Certificate* relates, and without limiting the foregoing:

- a. to enter upon the premises where the approved works are located, or the location where the records required by the conditions of this *Certificate* are kept;
- b. to have access to, inspect, and copy any records required to be kept by the conditions of this *Certificate*;
- c. to inspect the *Site*, related equipment and appurtenances;
- d. to inspect the practices, procedures, or operations required by the conditions of this *Certificate*; and
- e. to sample and monitor for the purposes of assessing compliance with the terms and conditions of this *Certificate* or the *EPA*, the *OWRA* or the *PA*.

CONTENT COPY OF ORIGINAL

Information and Record Retention

17. a. Any information requested, by the *Ministry*, concerning the *Site* and its operation under this *Certificate*, including but not limited to any records required to be kept by this *Certificate* shall be provided to the *Ministry*, upon request, in a timely manner.

b. Records shall be retained for contaminating life span of the *Site* except for as otherwise authorized in writing by the *Director*.

18. The receipt of any information by the *Ministry* or the failure of the *Ministry* to prosecute any person or to require any person to take any action, under this *Certificate* or under any statute, regulation or other legal requirement, in relation to the information, shall not be construed as:

a. an approval, waiver, or justification by the *Ministry* of any act or omission of any person that contravenes any term or condition of this *Certificate* or any statute, regulation or other legal requirement; or

b. acceptance by the *Ministry* of the information's completeness or accuracy.

Signs

19. A sign shall be installed and maintained at the main entrance/exit to the *Site* on which is legibly displayed the following information:

a. the name of the *Site* and *Owner*;

b. the number of the *Certificate*;

c. the name of the *Operator*;

d. the normal hours of operation;

e. the allowable and prohibited waste types;

f. the telephone number to which complaints may be directed;

g. a twenty-four (24) hour emergency telephone number (if different from above); and

h. a warning against dumping outside the *Site*.

Closure Plan

20. At least 2 years prior to the anticipated date of closure of this *Site*, the *Owner* shall submit to the *Director* for approval, with copies to the *District Manager*, a detailed site closure plan pertaining to the termination of landfilling operations at this *Site*, post-closure inspection, maintenance and monitoring, and end use. The plan shall include the following:

a. a plan showing *Site* appearance after closure;

b. a description of the proposed end use of the *Site*;

c. a descriptions of the procedures for closure of the *Site*, including:

i. advance notification of the public of the landfill closure;

ii. posting of a sign at the *Site* entrance indicating the landfill is closed and identifying any alternative waste disposal arrangements;

iii. completion, inspection and maintenance of the final cover and landscaping;

iv. site security;

v. removal of unnecessary landfill-related structures, buildings and facilities; and

vi. final construction of any control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;

vii. a schedule indicating the time-period for implementing sub-conditions i. to vi. above.

d. descriptions of the procedures for post-closure care of the *Site*, including:

i. operation, inspection and maintenance of the control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;

ii. record keeping and reporting; and

iii. complaint contact and response procedures;

e. an assessment of the adequacy of and need to implement the contingency plans for leachate and methane gas;

f. an updated estimate of the contaminating life span of the *Site*, based on the results of the monitoring programs to date.

CONTENT COPY OF ORIGINAL

21. The *Site* shall be closed in accordance with the closure plan as approved by the *Director*.

Operation

22. a. The *Site* shall be operated and maintained at all time including management and disposal of all waste in accordance with the *EPA, Regulation 347*, the conditions of this *Certificate*.
b. At no time shall the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted.

Vermin, etc.

23. The *Site* shall be operated and maintained such that the vermin, vectors, dust, litter, odour, noise and traffic do not create a nuisance.

Burning Waste Prohibited

24. a. burning of waste at the *Site* is prohibited, except for the burning of segregated brush, and unpainted, unstained and unpreserved lumber and in accordance with the Ministry Guideline C-7 "Burning at Landfill Sites" dated April 1994;
b. access to the burning area by the public and unauthorized personnel is prohibited when burning is being carried out;
c. no burning is to occur without the supervision of the operating authority; and
d. a sign shall be installed and maintained at the burn pile describing what is acceptable for depositing at the burn pile.

Waste Type

25. Only the following types of waste shall be accepted at the *Site*:

- a. Municipal Waste;
b. Non-hazardous Solid Industrial waste; and
c. Commercial waste.

26. The Owner shall ensure that:

- a. all *white goods containing refrigerants* accepted at the *Site*, are stored in a segregated area, in an upright position and in a manner which allows for the safe handling and removal of refrigerants as required by Ontario Regulation 189;
b. refrigerants shall be removed only by a licensed technician in accordance with Ontario Regulation 189;
c. if refrigerants are not removed on *Site*, then the *white goods containing refrigerants* may only be shipped to a facility which is licensed to remove refrigerants in accordance with Ontario Regulation 189;
d. *white goods containing refrigerants* stored on *Site* shall be clearly marked as to whether or not refrigerants have been removed; and
e. a detailed log of all *white goods containing refrigerants* received is maintained and includes the following information:

- i. date of the record;
ii. types, quantities and source of *white goods containing refrigerants* received;
iii. quantity and destination of the *white goods* transferred from the *Site* without prior removal of refrigerants;
iv. the details of on-*Site* removal of refrigerants, and the quantities and destination of the refrigerants transferred from the *Site*.

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

Capacity

28. The *Owner* shall only accept and deposit waste at the site as long as there is available capacity as defined by the final contours for the *Site* approved by this *Certificate* as shown in Drawing M-1170-4 prepared by Gamsby & Mannerow, dated January 1992 of Item 4 of Schedule "A".

29. The total approved waste disposal capacity of the Landfill shall be limited to 69,000 m³.

Service Area

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30. Only waste that is generated from within the geographical boundaries of the Municipality of West Grey shall be accepted at the *Site*.

Plan of Development and Operation Report

31. A Plan of Development and Operation (PDO) report shall be retained at the *Site* and kept up to date through periodic revisions; and be available for inspection by *Ministry* staff. Changes to the PDO report shall be submitted to the *Director* for approval.

32. The following information in the PDO report shall be updated as a minimum requirement within eighteen (18) months from the date of this *Certificate* and submitted to the *Director* for approval.

- a. location and description of the access road, the on-site roads at the *Site* and the impact of the increased traffic to the *Site*;
- b. description and location of the fencing and the gates;
- c. description of the fill method, the equipment used at the *Site*, the areas used for various fill methods of landfilling, and timelines for various phases of the *Site* development;
- d. the operating hours of the *Site* and the hours for the various activities to be undertaken at the *Site*, including waste compaction, waste coverage and burning;
- e. details on winter operations;
- f. review and update the thickness of the daily cover, frequency of the application, characteristics of the material used and the source of the material;
- g. review and update the thickness of the intermediate cover, frequency of the application, characteristics of the material used and the source of the material;
- h. frequency and the procedures for waste compaction;
- i. details on handling of other waste, including types and amounts of waste handled, storage locations, frequency of removal from the *Site*;
- j. details on housekeeping practices undertaken to control nuisances such as noise, dust, litter, odour, rodents, insects and other disease vectors, scavenging birds or animals;
- k. details on the closure of the *Site*, including the description of the final cover and its estimated permeability, its thickness, the source of the final cover material, the thickness of the top soil and the vegetation proposed for the closed waste mound, as well as the timeframe for the progressive waste coverage;
- l. updated monitoring program for the surface and groundwater;
- m. site-specific trigger mechanism program for the implementation of the groundwater and surface water contingency measures and a description of such measures;
- n. maintenance activities proposed for the *Site*, including the frequency of the activities and the personnel responsible for them;
- o. inspection activities proposed for the *Site*, including the frequency of the activities and the personnel responsible for them;
- p. details of training provided for the personnel responsible for the activities at the *Site*;
- q. contingency plan for the emergency situations that may occur at the *Site*; and
- r. any other information relevant to the design and operation of the *Site* or the information required by the *District Manager*.

Hours of Operation

33. Waste shall only be accepted at the *Site* during the following time periods:
Monday to Saturday from 7:00 am to 7:00 pm.

34. On-site equipment used for daily site preparation and closing activities shall only be used during the following time periods:
7:00 am to 7:00 pm - Monday to Saturday

35. With the prior written approval from the *District Manager*, the time periods may be extended to accommodate seasonal or unusual quantities of waste.

Site Security

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36. No waste shall be received, landfilled or removed from the *Site* unless a site supervisor or attendant is present and supervises the operations during operating hours. The *Site* shall be closed when a site attendant is not present to supervise landfilling operations.

37. The *Site* shall be operated and maintained in a secure manner. During non-operating hours, all *Site* entrances and exit gates shall be locked and the *Site* shall be secured against access by unauthorized persons.

Site Access

38. Access to and exit from the *Site* for the transportation of waste shall only be permitted from County Road 9, former Township of Normanby.

Employees and Training

39. A training plan for all employees that operate any aspect of the site shall be developed and implemented by the Operator. Only trained personnel shall operate any aspect of the *Site* or carry out any activity required under this Certificate.

Daily Inspections

40. An inspection of the entire *Site* and all equipment on the *Site* shall be conducted each day the *Site* is in operation to ensure that:

- a. the *Site* is secure;
- b. that the operation of the *Site* is not causing any nuisances;
- c. that the operation of the *Site* is not causing any adverse effects on the environment and that the site is being operated in compliance with this Certificate.
- d. any deficiencies discovered as a result of the inspection shall be remedied immediately, including temporarily ceasing operations at the *Site* if needed.

41. A record of the inspections shall be kept in a daily log book that includes:

- a. the name and signature of person that conducted the inspection;
- b. the date and time of the inspection;
- c. the list of any deficiencies discovered;
- d. the recommendations for remedial action; and
- e. the date, time and description of actions taken.

42. A record shall be kept in the daily log book of all refusal of waste shipments, the reason(s) for refusal, and the origin of the waste, if known.

Monitoring Program

43. Monitoring programs shall be carried out for groundwater and surface water in accordance with Schedule "B" attached to this Certificate.

Compliance Limits

44. The *Site* shall be operated in such a way as to ensure compliance with the following:

- a. Reasonable Use Guideline B-7 for the protection of the groundwater at the Site;
- b. Provincial Water Quality Objectives included in the July 1994 publication entitled *Water Management Policies, Guidelines, Provincial Water Quality Objectives*, as amended from time to time or limits set by the Regional Director, for the protection of the surface water at the Site.

Complaints Procedure

45. If at any time, the Owner receives complaints regarding the operation of the *Site*, the Owner shall respond to these complaints according to the following procedure:

CONTENT COPY OF ORIGINAL

- a. the *Owner* shall record and number each complaint, either electronically or in a log book, and shall include the following information: the nature of the complaint, the name, address and the telephone number of the complainant if the complainant will provide this information and the time and date of the complaint;
- b. the *Owner*, upon notification of the complaint, shall initiate appropriate steps to determine all possible causes of the complaint, proceed to take the necessary actions to eliminate the cause of the complaint and forward a formal reply to the complainant; and
- c. the *Owner* shall complete and retain on-site a report written within one (1) week of the complaint date, listing the actions taken to resolve the complaint and any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the recurrence of similar incidents.

Daily Log Book

46. A daily log shall be maintained in written format and shall include the following information:

- a. the type, date and estimation of the time all waste and cover material received at the *Site*;
- b. the area of the *Site* in which waste disposal operations are taking place;
- c. if waste shipment are refused, the reasons for refusal and the origin of the waste if known;
- d. a record of litter collection activities and the application of any dust suppressants;
- e. a record of the site inspections;

47. Any information requested, by the *Director* or a *Provincial Officer*, concerning the *Site* and its operation under this *Certificate*, including but not limited to any records required to be kept by this *Certificate* shall be provided to the *Ministry*, upon request.

Annual Report

48. A written report on the development, operation and monitoring of the *Site*, shall be completed annually (the "Annual Report"). The Annual Report shall be submitted to the *District Manager* each year by April 30th, and shall cover the preceding calendar year.

49. The Annual Report shall include the following:

- a. the results and an interpretive analysis of the results of all monitoring programs, including an assessment of the need to amend the monitoring programs;
- b. an assessment of the operation and performance of all engineered facilities, the need to amend the design or operation of the *Site*, and the adequacy of and need to implement the contingency plans;
- c. site plans showing the existing contours of the *Site*; areas of landfilling operation during the reporting period; areas of intended operation during the next reporting period; areas of excavation during the reporting period; the progress of final cover, vegetative cover, and any intermediate cover application; previously existing site facilities installed during the reporting period; and site preparations and facilities planned for installation during the next reporting period;
- d. calculations of the volume of waste, daily and intermediate cover, and final cover deposited or placed at the *Site* during the reporting period and a calculation of the total volume of *Site* capacity used during the reporting period;
- e. a calculation of the remaining capacity of the *Site* and an estimate of the remaining *Site* life;
- f. On a bi-annual basis, a field survey of the limit of fill area be completed to determine the quantity of waste received at the *Site*;
- g. the extent and effect of the recycling programs established by the *Owner* on the operation of the *Site*;
- h. a summary of any complaints received and the responses made;
- i. a discussion of any operational problems encountered at the *Site* and corrective action taken;
- j. any changes to the Plan of Development and Operations Report and the Closure Plan that have been approved by the *Director* since the last *Annual Report*;
- k. a report on the status of all monitoring wells and a statement as to compliance with Ontario Regulation 903; and
- l. any other information with respect to the *Site* which the *Regional Director* may require from time to time.

SCHEDULE "A"

This Schedule "A" forms part of this Certificate:

1. Application for a Certificate of Approval for a Waste Disposal Site dated October 17, 1973 signed by the Clerk Treasurer.

CONTENT COPY OF ORIGINAL

2. Application for a Certificate of Approval for a Waste Disposal Site (Landfill) dated July 18, 1989 signed by the Clerk Treasurer.

3. Normanby Township Landfill, Hydrogeologic Investigation and Plan of Development and Operation, prepared by Gamsby & Mannerow Limited, dated July 1991, revised January 1992.

4. Drawings prepared by Gamsby & Mannerow Limited, dated January 1992 consisting of:

- Dwg. No. M-1170-1: Site Plan;
- Dwg. No. M-1170-2: Groundwater Contours;
- Dwg. No. M-1170-3: Development Plan;
- Dwg. No. M-1170-4: Final Contour;
- Dwg. No. M-1170-5: Capacity Isopach Plan;

5. Letter to Mr. Ian Parrott, Supervisor, Ministry of the Environment, dated August 4, 2004 from Ken Gould, Public Works Manager, The Corporation of the Municipality of West Grey requesting to modify the service area of the Normanby Landfill to include the entire Municipality of West Grey.

6. Application for a Provisional Certificate of Approval for a Waste Disposal Site signed by Mr. Ken Gould, Public Works Manager, dated August 3, 2004.

7. Normanby Landfill Site, Service Area Modifications, prepared for Municipality of West Grey, prepared by Henderson Paddon & Associates Limited, dated October 2004.

8. Letter from Brian Scott, P.Eng. (Henderson Paddon & Associates Limited) to Richard Saunders (MOE) dated November 26, 2004 regarding the new operating hours of the Normanby Landfill and the adjacent property owner notification.

SCHEDULE "B"

This Schedule "B" forms part of this Certificate:

Date	Sampling Location	Analytical Parameters
Water Levels: Spring, Fall	TW-1, TW-2, TW-3, TW-5, TW-5A, TW-6, OW-2, and OW-3	
Groundwater: Spring & Fall	TW-1, TW-2, TW-3, TW-5, TW-5A, TW-6, OW-2, and OW-3	GWC - Conductivity, chlorides, alkalinity, iron, pH, total ammonia, hardness, sodium, nitrate, sulphate, TKN;
Surface Water: Spring & Fall	SW-1, SW-2, SW-3, SW-4, SW-5	Conductivity, chloride, iron, alkalinity, pH, total ammonia, total phosphorous phenol, dissolved Oxygen, Temp. (in field);

Duplicates: 1 in 10 per water type (groundwater, surface water)

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

REASONS

1. The reason for Condition 1 is to clarify that the previously issued Certificate of Approval No. A262104 issued on February 2, 1987 as amended on August 28, 1989 and September 17, 1992 are no longer in effect and have been replaced and superseded by the Terms and Conditions stated in this Certificate.

2. The reason for Conditions 2, 3, 5, 6, 7, 8, 9, 10, 11, 17 and 18 are to clarify the legal rights and responsibilities of the Owner and Operator under this Certificate of Approval.

CONTENT COPY OF ORIGINAL

3. The reasons for Conditions 4, 31 and 32 are to ensure that the *Site* is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the *Owner*, and not in a manner which the *Director* has not been asked to consider.
4. The reasons for Condition 12 are to ensure that the *Site* is operated under the corporate name which appears on the application form submitted for this approval and to ensure that the *Director* is informed of any changes.
5. The reasons for Condition 13 are to restrict potential transfer or encumbrance of the *Site* without the approval of the *Director* and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this *Certificate of Approval*.
6. Conditions 14, and 15 are included, pursuant to subsection 197(1) of the *EPA*, to provide that any persons having an interest in the *Site* are aware that the land has been approved and used for the purposes of waste disposal.
7. The reason for Condition 16 is to ensure that appropriate Ministry staff have ready access to the *Site* for inspection of facilities, equipment, practices and operations required by the conditions in this *Certificate of Approval*. This condition is supplementary to the powers of entry afforded a *Provincial Officer* pursuant to the *EPA* and *OWRA*.
8. The reason for Condition 19 is to ensure that users of the *Site* are fully aware of important information and restrictions related to *Site* operations and access under this *Certificate of Approval*.
9. The reasons for Conditions 20 and 21 are to ensure that final closure of the *Site* is completed in an aesthetically pleasing manner, in accordance with Ministry standards, and to ensure the long-term protection of the health and safety of the public and the environment.
10. The reasons for Conditions 22, 23, 26, 27, and 40 are to ensure that the *Site* is operated, inspected and maintained in an environmentally acceptable manner and does not result in a hazard or nuisance to the natural environment or any person.
11. The reason for Condition 24 is that open burning of municipal waste is unacceptable because of concerns with air emissions, smoke and other nuisance affects, and the potential fire hazard.
12. The reason for Conditions 25, 28, 29 and 30 is to specify the approved areas from which waste may be accepted at the *Site* and the types and amounts of waste that may be accepted for disposal at the *Site*, based on the *Owner's* application and supporting documentation.
13. The reasons for Conditions 33, 34 and 35 are to specify the hours of operation for the landfill *Site* and a mechanism for amendment of the hours of operation, as required.
14. The reasons for Conditions 36, 37 and 38 are to ensure that the *Site* is supervised by properly trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person and to ensure the controlled access and integrity of the *Site* by preventing unauthorized access when the *Site* is closed and no site attendant is on duty.
15. The reason for Condition 39 is to ensure that the *Site* is supervised and operated by properly trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person.
16. The reason for Conditions 41 and 42 is to ensure that detailed records of *Site* inspections are recorded and maintained for inspection and information purposes.
17. The reasons for Condition 43 are to demonstrate that the landfill site is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.
18. Condition 44 is included to provide the groundwater and surface water limits to prevent water pollution at the *Site*.
19. The reason for Condition 45 is to ensure that any complaints regarding landfill operations at this *Site* are responded to in a timely and efficient manner.

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20. The reason for Conditions 46 and 47 is to ensure that accurate waste records are maintained to ensure compliance with the conditions in this *Certificate of Approval* (such as fill rate, site capacity, record keeping, annual reporting, and financial assurance requirements), the *EPA* and its regulations.

21. Condition 48 requires the submission of an Annual Report by April 30th of each year.

22. The reasons for Condition 49 is to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.

This Provisional Certificate of Approval revokes and replaces Certificate(s) of Approval No. A262104 issued on February 2, 1987

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Director
Section 39, *Environmental Protection Act*
Ministry of Environment and Energy
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

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

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

DATED AT TORONTO this 24th day of June, 2005

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

RS/
c: District Manager, MOE Owen Sound
Brian Scott, P.Eng., Henderson Paddon & Associates Limited

**APPENDIX B:
CORRESPONDENCE**

Site Name:	Normanby Landfill
File No.	213089
Date:	14-Nov-2018
Inspector:	Corbin Sweet

GM BLUEPLAN ENGINEERING LIMITED

LANDFILL INSPECTION REPORT

	YES	NO	COMMENTS
1. Site Open:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
2. Access Control:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
3. Supervisor On-Site:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
4. Signs Posted:			
Entrance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Waste Disposal Area	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Tires	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Brush	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Appliances	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Metals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Other	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
5. Litter:			
On-Site	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
Off-Site	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
6. Rodent/Vector Evidence:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mice are nested in AW-6 + AW-5/5A
7. Scavenging:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
8. Monitoring Wells			

NOTES: _____



	<u>ACCEPTABLE</u>	<u>NOT ACCEPTABLE</u>	<u>COMMENTS</u>
9. Access Road Condition:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
10. Screening from Public View:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
11. Working Face:			
Compaction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Daily Cover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
12. Finished Areas:			
Final Cover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Seeding	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13. Segregation of Wastes:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
14. Leachate Management:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
15. Burning:			
Burn Pile Size	<input type="checkbox"/>	<input type="checkbox"/>	N/A
Wood Wastes Only	<input type="checkbox"/>	<input type="checkbox"/>	N/A
Ashes Removed	<input type="checkbox"/>	<input type="checkbox"/>	N/A
16. Recyclables:			
Tires	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Appliances	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Metals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Blue Box	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Other	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

NOTES: _____

Site Name:	Normanby
File No.	213087
Date:	Nov 27, 2017
Inspector:	AJU

GM BLUEPLAN ENGINEERING LIMITED

LANDFILL INSPECTION REPORT

	YES	NO	COMMENTS
1. Site Open:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
2. Access Control:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
3. Supervisor On-Site:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
4. Signs Posted:			
Entrance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Waste Disposal Area	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Tires	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Brush	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Appliances	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Metals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Other	<input type="checkbox"/>	<input type="checkbox"/>	_____
5. Litter:			
On-Site	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Off-Site	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
6. Rodent/Vector Evidence:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
7. Scavenging:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
8. Monitoring Wells			

NOTES: _____

	<u>ACCEPTABLE</u>	<u>NOT ACCEPTABLE</u>	<u>COMMENTS</u>
9. Access Road Condition:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
10. Screening from Public View:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
11. Working Face:			
Compaction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Daily Cover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
12. Finished Areas:			
Final Cover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Seeding	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
13. Segregation of Wastes:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
14. Leachate Management:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
15. Burning:			
Burn Pile Size	<input type="checkbox"/>	<input type="checkbox"/>	_____
Wood Wastes Only	<input type="checkbox"/>	<input type="checkbox"/>	_____
Ashes Removed	<input type="checkbox"/>	<input type="checkbox"/>	_____
16. Recyclables:			
Tires	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Appliances	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Metals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Blue Box	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Other	<input type="checkbox"/>	<input type="checkbox"/>	_____

NOTES:

**APPENDIX C:
DUTIES OF SITE SUPERVISOR & SITE ATTENDANT**

Attachment 1

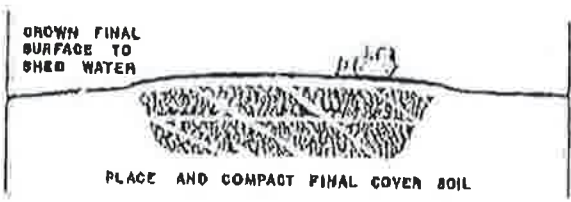
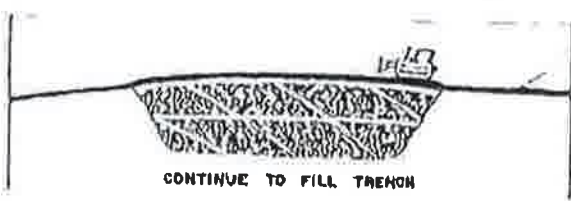
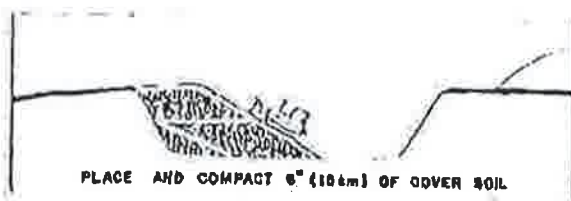
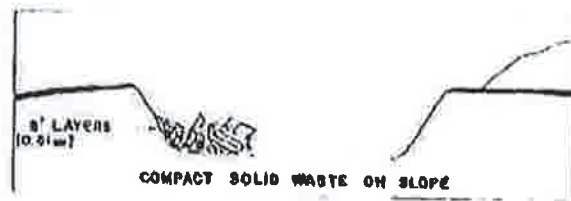
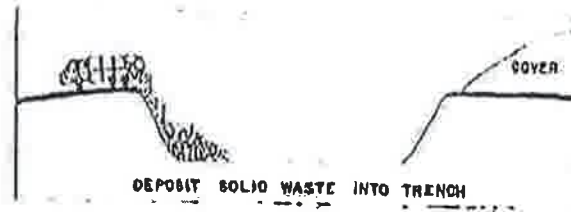
Duties of Site Supervisor

- (1) Knowledge of the Plan of Operation for the site.
- (2) Responsible for site access control.
- (3) Ensures deposition of waste in designated areas.
- (4) Ensures all burning on-site consists of clean dry wood waste of manageable size which does not adversely impact on neighbouring property owners at any time.
- (5) Ensures litter pickup on and off site on a weekly basis.

Where required by Council, the site supervisor shall also:

- (6) Ensure proper compaction and cover of material at the specified frequency;
- (7) Record volumes and types of waste material;
- (8) Maintain monitoring well security;
- (9) Identify on-site road maintenance problems to Council;
- (10) Discuss with Council waste site problems with respect to site users, types of waste etc.

112701



TRENCH METHOD

COMPACTION EFFORT

COMPACTION	EQUIPMENT	METHOD	DENSITY
Poor	None	Wastes dumped into trench	100 - 200 lb yd ³ 60 - 120 kgm m ³
Minimal	Tracked Machine	Waste dumped into trench. Equipment compacts surface of wastes	200 - 500 lb yd ³ 120 - 300 kgm m ³
Moderate	Tracked Machine	Wastes spread in layers. Each layer is compacted with one pass of the machine	500 - 800 lb yd ³ 300 - 475 kgm m ³
Good	Tracked Machine	Waste spread in thin layers. Each layer compacted with three to five passes of the machine	800 - 1000 lb yd ³ 475 - 600 kgm m ³
Excellent	Steel Wheeled Compactor	Wastes spread in thin layers. Each layer compacted with the machine with up to five passes	over 1000 lb yd ³

**GUIDELINE G-7
(formerly 14-08)**

Burning at Landfill Sites

Legislative Authority:

**Environmental Protection Act, RSO 1990, Sections 6, 14
and 27
Ontario Regulation 347, Sections 1 and 12.1**

Responsible Director:

Director, Program Development Branch

Last Revision Date:

April, 1994

Table of Contents

1.0 INTRODUCTION

2.0 GENERAL REQUIREMENTS

2.1 Other Agencies

2.2 Certificate of Approval

3.0 OPERATIONAL REQUIREMENTS

SYNOPSIS

The primary purpose of this guideline is to provide a set of operational requirements for the orderly burning of segregated clean wood and brush in a safe and environmentally acceptable manner at appropriate landfill sites. This guideline is intended for use by landfill operators in their operation of a landfill site, and by Ministry staff during their review and inspection of landfill operations. The operational requirements are provided in Section 4-21, "Open Burning of Waste", of Procedure G-8-1: "Guidance Manual for Landfill Sites Receiving Municipal Waste" (G-8-1).

The guideline shall be enforced by including appropriate conditions on a Certificate of Approval for a landfill site, and by the Regions during the normal course of their activities.

1.0 Introduction

The burning of municipal waste, except for a limited number of specific materials, is prohibited by O. Regulation 347, Section 12.1. Segregated clean wood and brush, however, may be burned at certain sites, subject to certain requirements. These requirements are detailed in Section 4.21 of Procedure G-8-1: "Guidance Manual for Landfill Sites Receiving Municipal Waste".

2.0 General Requirements

As part of an overall program to maximize waste capacity at existing landfill sites, thereby extending their life, burning of clean wood and brush may be allowed under strictly controlled conditions.

2.1 Other Agencies

The Ministry of Natural Resources and local municipal authorities shall be consulted to obtain any necessary permits. Specific regulations enforced by the Ministry of Natural Resources shall be complied with for burning wood and brush at landfills located north of Ontario's fire line.

2.2 Certificate of Approval

Burning of any kind is not permitted at new landfill sites unless specifically allowed in the Certificate of Approval.

3.0 Operational Requirements

The operational requirements are detailed under Section 4.21.J of the guidance manual under the headings of:

- (a) Weather and Atmospheric Conditions,
- (b) Supervision,
- (c) Environmental Controls,
- (d) Extinguishing Requirements,
- (e) Access Control, and
- (f) Resolution of Complaints.

4.2.1.3 Operational Requirements

a) Weather and Atmospheric Conditions

Burning should be carried out only when prevailing weather and atmospheric conditions are suitable. Burning should not be carried out when:

- i) the area has a high Air Quality Index (AQI);
- ii) rain or fog are present, since smoke cannot disperse properly and may be concentrated in one particular area; and
- iii) wind speeds are high or wind directions are changing frequently, because these conditions allow fires to spread rapidly.

b) Supervision

- i) Dry brush and clean wood wastes should be segregated and subsequently burned on a designated, cleaned area of the site, under supervision of the site operator.
- ii) The fire should be supervised continuously until completely extinguished.
- iii) The site operator should clear residual ashes from a fire and dispose of the ash with normal incoming waste as soon as practically possible. The ashes must be cold prior to mixing with waste. Residual ashes should not be allowed to accumulate at the designated burning area.

c) Environmental Controls

- i) Petroleum products, plastic, rubber or any other material that will cause excessive smoke or noxious fumes must not be mixed with or contaminate the wood or brush that may be burned.
- ii) Burning should not be carried out if there is sensitive land-use adjacent to the landfill site or if the nearest dwelling is less than 150 metres from the site.
- iii) A 30 metre fire break should be provided around the burning area.
- iv) Ontario Regulation 308, made under the EPA, contains provisions dealing with air pollution. Owners and site operators are advised to apprise themselves of the provisions contained therein.

d) Extinguishing Requirements

The area of burning on the landfill site must be restricted in order to enable the operator to extinguish the fire immediately if necessary due to a change in weather or other conditions or if so ordered by MOBE or Ministry of Natural Resources staff. The operator must also provide proof of this ability (i.e., on-site equipment or written agreement with local fire control agency) to extinguish the fire.

e) Access Control

- i) Access to the landfill site by the public and other unauthorized personnel must be restricted when burning is carried out.
- ii) Appropriate signs should be posted at all entrances to the site used by the public and waste haulers advising them of restricted access due to burning of waste.

f) Resolution of Complaints

- i) Complaints from local residents regarding smoke or odour emissions will have to be resolved by the operator. If this is not corrected satisfactorily, the operator would be required to stop burning.
- ii) When persistent problems are encountered with burning at existing sites, the operator may be requested either to stop burning or make a satisfactory proposal to control burning for incorporation in the Certificate of Approval for the site. This may involve a request for amendment of a current Certificate of Approval. If the operator does not comply voluntarily with such a request, formal action to halt burning may be taken under provisions of the EPA.

4.21 OPEN BURNING OF WASTE

4.21.1 Rationale

The burning of municipal waste, except a limited number of specific material, is prohibited by regulation in Ontario. Open burning of waste at a landfill site creates

- a) air emission concerns;
- b) public and environmental hazards;
- c) lack of site operational control;
- d) fire hazard; and
- e) nuisance.

Segregated, clean wood and brush, however, may be burned at certain isolated sites, subject to weather and atmospheric conditions and supervision requirements.

4.21.2 General Requirements

- a) As part of an overall program to maximize waste capacity at existing landfill sites, thereby extending their life, open burning of clean wood and brush may be allowed under strictly controlled conditions as discussed in this subsection.

The Ministry of Natural Resources and local municipal authorities should be consulted in order to obtain any necessary permits for burning. These agencies may require specific details on safety precautions and fire prevention measures that will be taken. Landfill site owner/operators are also advised to check for any municipal by-laws enforced by the local police and fire departments. Specific regulations enforced by the Ministry of Natural Resources must be complied with for burning north of Ontario's fire line. The fire line runs east from Lake Huron across the bottom of Georgian Bay and the top of Lake Simcoe down to Gananoque, then north and west to meet the Ottawa River north of Renfrew.

- b) Burning is not permitted at new landfill sites unless specifically allowed in the Certificate of Approval, usually conditional on the compliance with various environmental and safety considerations. Any permit to burn waste at new landfill sites would also be conditional on compliance with local municipal by-laws, and specific requirements of The Ministry of Natural Resources.

**APPENDIX D:
HISTORICAL GROUNDWATER QUALITY**

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TW1 1-Jun-89	TW1 1-Oct-89	TW1 1-May-90	TW1 1-Jan-91	TW1 1-Apr-91	TW1 1-Oct-91	TW1 1-Apr-92	TW1 1-Oct-92	TW1 1-May-93	TW1 1-Nov-93	TW1 1-May-94	TW1 1-Oct-94	TW1 1-May-95	TW1 1-Oct-95	TW1 1-May-96	TW1 1-Apr-97
Alkalinity (as CaCO ₃)	30 - 500 [OG]	355	201	202	211	208	215	198	225	225	215	195	195	225	203	208	243	202
Ammonia (as N)	1	nv	0.01	0.238	0.001	0.259	0.197	0.148	0.086	0.086	0.102	0.049	0.063	0.23	0.12	0.22		0.042
Barium	5 [IMAC]	1.31																
Boron		nv																
Calcium		127	5	4.9	4.4	5.7	4.9	5.3	5.9	5.9	5.5	4.5	4.2	5.3	4.4	4.8	2	4.49
Chloride	250 [AO]	nv	536	551	548	573	565	566	577	577	545	538	540	553	544	534	675	460
Conductivity - @25°C (µS/cm)	80-100 [OG]	183	277	259	275	255	255	254	252	252	272	282	276	279	263	278	297	344
Hardness (as CaCO ₃)	0.3 [AO]	0.36																
Iron		nv																
Magnesium		268	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.5	0.7	0.4	0.1	0.2	0.5	0.05	0.11
Nitrate (as N)	1 d	0.28	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.07	0.08	0.01		0.1
Nitrite (as N)	0.15	0.41	0.31	0.238	0.33	0.221	0.273	0.289	0.222	0.384	0.588	0.341	0.167	0.33	0.03	0.15		0.16
Organic Nitrogen	6.5-8.5 [OG]		7.59	7.71	7.86	8.05	7.97	7.78	7.92	7.92	7.86	7.91	8.15	8.1	7.86	7.95	7.33	7.7
pH		107													12.3	13.5	14.6	13.1
Sodium	200 [AO]	290													86	81.9	78.8	90.8
Sulphate	500 [AO]	nv	0.32	0.46	0.33	0.48	0.47	0.37	0.48	0.48	0.7	0.39	0.23	0.56	0.15	0.37		0.2
Total Kjeldahl Nitrogen (as N)																		

NOTES:
 1 All results expressed in mg/L unless otherwise noted.
 2 ODWS - Ontario Drinking Water Standards (see O. Reg. 18/03 as amended to O. Reg. 256/05)
 3 All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
 4 IMAC indicates an interim maximum acceptable concentration ODWS
 5 AO indicates an aesthetic objective ODWS, not health related
 6 OG indicates an operational guideline ODWS, not health related

Exceeds ODWS
 Exceeds RUC

BOLD

Municipality of West Grey
Groundwater Quality - Normanby Landfill

Chemical Parameter	MECP Guideline B-7 Reasonable Use Criteria	ODWS	TW1 1-Sep-97	TW1 1-May-98	TW1 1-Oct-98	TW1 1-May-99	TW1 1-Nov-99	TW1 9-Jun-00	TW1 Rep 9-Jun-00	TW1 005 18-Jul-01	TW1 006 19-Oct-01	TW1 003 26-Jun-02	TW1 010 23-Oct-02	TW1 008 27-May-03	TW1 008 30-Sep-03	TW1 008 3-Jun-04	TW1 006 22-Sep-04	TW1 008 27-Apr-05
Alkalinity (as CaCO ₃)	355	30 - 500 [OG]	199	320	197	158	184	215	216	198	214	210	204	198	199	177	204	200
Ammonia (as N)	nv	-	0.017	0.11	0.37	0.16	0.05	2.67	2.67	0.2	1.97	1.21	0.3	0.12	0.33	0.2	0.62	0.21
Barium	0.32	1						0.683	0.675	0.04	0.04	0.04	0.05	0.045	0.049	0.045	0.044	0.049
Boron	1.31	5 [IMAC]						0.19	0.19	0.08	0.08	0.07	0.08	0.07	0.06	0.07	0.061	0.063
Calcium	nv	-						60.4	59.8	53.5	55.1	51.6	59.3	57.1	57.2	57.7	50.5	61.2
Chloride	127	250 [AO]	5.33	2.73	3.85	1.87	8.6	3.7	3.9	4.3	5.4	4.7	4.5	4.4	4.1	4.4	4.7	4.2
Conductivity - @25°C (µS/cm)	nv	-	530	442	540	462	468	543	547	538	559	558	542	495	487	537	516	525
Hardness (as CaCO ₃)	183	80-100 [OG]	264	218	223	281	270	276	273	263	261	243	271	263	266	268	244	286
Iron	0.36	0.3 [AO]				0.01	0.01	0.38	0.38	0.07	0.26	0.13	0.47	0.375	0.375	0.065	0.448	0.178
Magnesium	nv	-						30.3	30	31.5	30	27.8	28.8	29.4	30	30.1	28.6	32.4
Nitrate (as N)	2.68	10 d	0.42	1.24	0.09	0.35	0.92	nd	nd	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	0.2	0.1
Nitrite (as N)	0.28	1 d	0.1	0.05	0.05	0.05	0.05	nd	nd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Nitrogen	0.41	0.15	0.56	0.6	3.03	1.7	3.4	1.53	1.53	0.63	0.07	0.24	0.48	0.05	0.2	0.16	0.38	0.07
pH	6.5 to 8.5	6.5-8.5 [OG]	8	7.34	8.1	7.98	7.87	7.34	7.34	7.92	7.67	7.28	8.52	7.9	7.79	8.33	7.58	7.79
Sodium	107	200 [AO]	22.1	14.9	23.7	16.8	29.3	29.6	29.2	14.9	13.3	12.3	22.6	16.3	12.4	11.4	11.3	10.5
Sulphate	290	500 [AO]	89.8	19.1	86.2	104	87.2	85.4	86.4	81.7	74.8	76.6	93	95	91	93	92	91
Total Kjeldahl Nitrogen (as N)	nv	-	0.38	0.71	3.4	1.9	3.5	4.6	4.5	0.83	2.04	1.45	0.78	0.17	0.53	0.36	1	0.28

NOTES:

- All results expressed in mg/L unless otherwise noted
- ODWS - Ontario Drinking Water Quality Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05).
- All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise.
- IMAC indicates an Interim maximum acceptable concentration ODWO.
- AO indicates an aesthetic objective ODWO, not health related.
- OG indicates an operational guideline ODWO, not health related.

BOLD
Exceeds ODWS
Exceeds RUC

Chemical Parameter	QDWS	MECP Guideline B-7 Reasonable Use Criteria	TW1 005 17-Oct-05	TW1 006 27-Apr-06	TW1 001 26-Oct-06	TW1 003 9-Apr-07	TW1 004 10-Oct-07	TW1 007 17-Apr-08	TW1 007 6-Oct-08	TW1 29-Apr-09	TW1 13-Oct-09	TW1 4-May-10	TW1 10-Nov-10	TW1 14-Apr-11	TW1 25-Oct-11	TW1 3-Apr-12	TW1 28-Sep-12
Alkalinity (as CaCO ₃)	30 - 500 [CG]	355	214	198	203	202	232	190	240	265	219	206	226	206	213	204	211
Ammonia (as N)	-	nv	0.28	0.17	0.31	<0.01	7.46	0.44	4.4	0.76	1.23	0.31	3.23	0.4	1.31	0.33	1.08
Barium	1	0.32	0.05	0.046	0.044	0.043	0.037	0.035	0.04	0.038	0.033	0.041	0.047	0.045	0.044	0.042	0.048
Boron	5 [IMAC]	1.31	0.069	0.074	0.056	0.07	0.068	0.061	0.065	0.068	0.058	0.065	0.075	0.024	0.062	0.072	0.068
Calcium	-	nv	57	61.6	55.7	55.8	53.6	54.7	54.7	59.2	52	54.6	56.2	57.4	56.1	51.2	57.8
Chloride	250 [AO]	127	4.4	4.4	5	4.8	4.7	4.9	5.1	4.4	4.7	4.6	4.8	4.7	4.5	4.8	4.8
Conductivity - @25°C (µS/cm)	-	nv	514	531	519	489	574	588	519	540	550	540	539	528	551	521	533
Hardness (as CaCO ₃)	80-100 [OG]	183	289	287	280	261	253	247	253	279	248	257	266	267	273	252	272
Iron	0.3 [AO]	0.36	0.421	0.02	0.025	<0.005	0.888	0.39	0.173	0.732	0.609	0.876	0.533	1.14	0.638	0.076	1.57
Magnesium	-	nv	30.7	32.3	29.5	29.6	28.9	27.9	28.4	31.3	28.7	29.2	30.9	30.1	32.2	30.1	31
Nitrate (as N)	10 d	2.68	0.1	0.1	0.1	0.1	0.1	<0.1	0.2	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Nitrite (as N)	1 d	0.28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Nitrogen	0.15	0.41	0.12	2.47	0.01	0.21	3.14	0.75	2.26	0.78	0.01	0.36	0.32	0.32	0.09	0.52	0.09
pH	6.5-8.5 [OG]	6.5 to 8.5	7.76	7.94	7.81	7.65	7.36	7.72	7.67	7.58	7.6	6.1	7.81	7.13	7.84	6.74	7.69
Sodium	200 [AO]	107	10	13.7	10.6	11.8	12.9	9.4	9.4	12.3	9.9	10.5	10.2	9.2	8.8	10.2	10.6
Sulphate	500 [AO]	290	83	89	88	94	74	76	67	59	77	84	68	77	73	84	84
Total Kjeldahl Nitrogen (as N)	-	nv	0.4	2.64	0.32	0.22	10.6	1.19	6.68	1.54	1.24**	0.69	1.74	0.72	1.4	0.85	1.17

NOTES:

- All results expressed in mg/L unless otherwise noted
- QDWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05)
- All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
- IMAC indicates an interim maximum acceptable concentration (ODWO)
- AO indicates an aesthetic objective (ODWO, not health related)
- OG indicates an operational guideline (ODWO, not health related)

BOLD Exceeds ODWS
Exceeds RUC

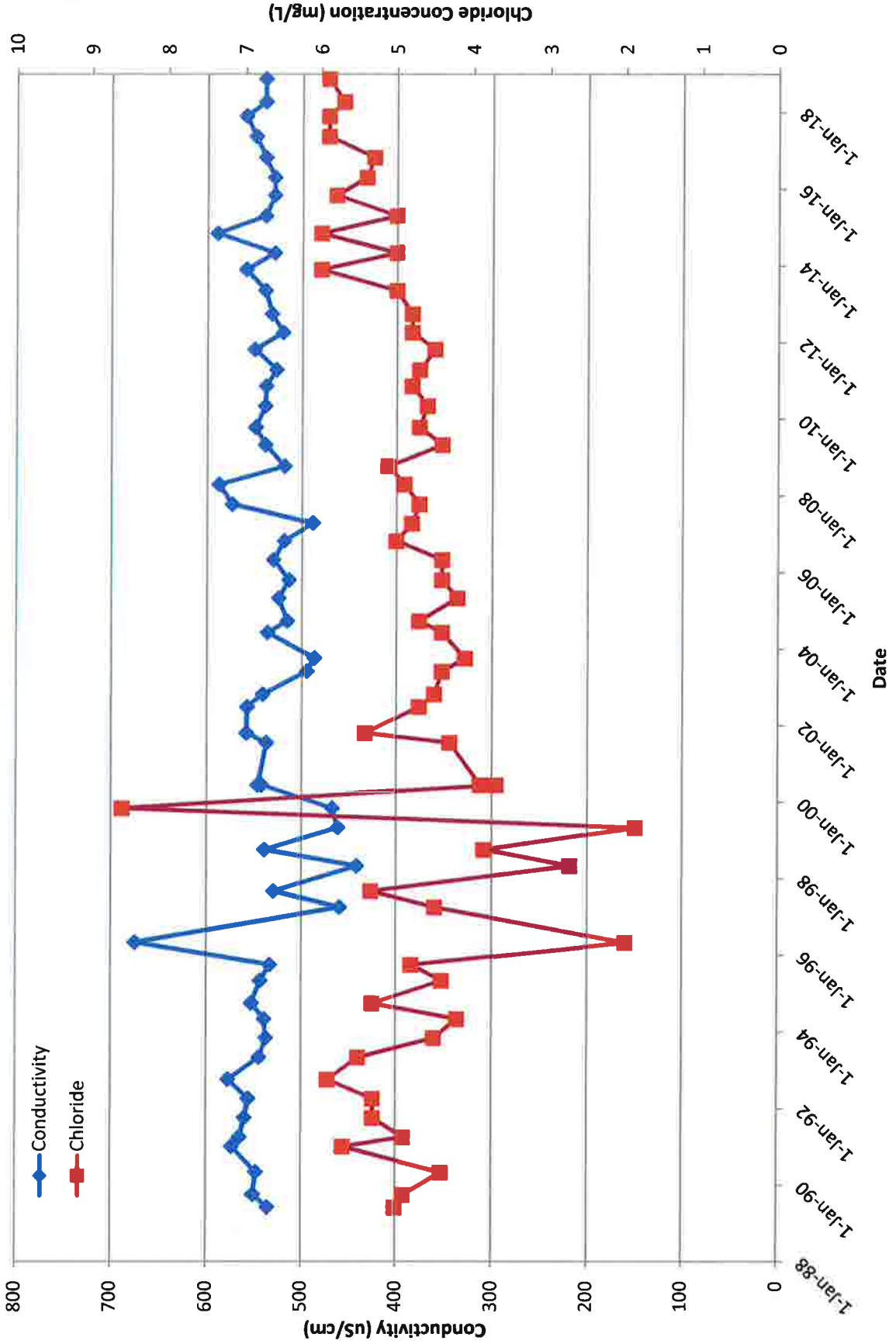
Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TW1 7-May-13	TW1 26-Nov-13	TW1 1-May-14	TW1 4-Nov-14	TW1 20-Apr-15	TW1 3-Nov-15	TW1 19-Apr-16	TW1 26-Oct-16	TW1 16-May-17	TW1 27-Nov-17	TW1 10-Apr-18	TW1 14-Nov-18
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	200	250	220	250	200	210	210	200	190	210	210	200
Ammonia(as N)	-	nv	0.38	4.9	1.2	12	1.2	0.27	0.19	0.34	0.18	0.11	0.94	0.11
Barium	1	0.32												
Boron	5 [IMAC]	1.31												
Calcium		nv	58	59	5	6	5	5.8	5.4	61	5.9	5.9	60	5.9
Chloride	250 [AO]	127	5	6	5	590	540	530	530	540	550	560	540	540
Conductivity - @25°C (µS/cm)	-	nv	540	560	530	590	540	530	530	540	550	560	540	540
Hardness(as CaCO ₃)	80-100 [OG]	183	270	280	270	250	280	300	280	280	280	280	280	280
Iron	0.3 [AO]	0.36	<0.1	<0.1	ND	0.06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	-	nv	31	32	<0.1	<0.1	0.35	<0.10	0.19	0.1	0.13	0.33	<0.10	0.29
Nitrate(as N)	10 d	2.68	<0.1	<0.1	<0.1	<0.1	0.082	<0.01	0.01	0.2	0.15	0.13	0.06	0.71
Nitrite(as N)	1 d	0.28	0.062	0.23	0.3	1	0.1	0.17	0.01	0.2	0.15	0.13	0.06	0.71
Organic Nitrogen	0.15	0.41	7.98	7.82	8.07	7.8	7.97	7.92	8.01	8.09	8.03	7.9	7.98	7.74
pH	6.5-8.5 [OG]	6.5 to 8.5	10	10	9.1	11	10	11	9.5	10	10	11	9.8	7.74
Sodium	200 [AO]	107	73	49	53	54	70	60	65	73	84	82	73	70
Sulphate	500 [AO]	290	73	49	53	54	70	60	65	73	84	82	73	70
Total Kjeldahl Nitrogen(as N)	-	nv	0.61	5.2	2.2	14	1.3	0.44	0.2	0.54	0.33	0.24	1	0.82

NOTES:

- All results expressed in mg/L unless otherwise noted
- ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05)
- All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
- IMAC indicates an interim maximum acceptable concentration ODWS
- AO indicates an aesthetic objective ODWS, not health related
- OG indicates an operational guideline ODWS, not health related

BOLD Exceeds ODWS
Exceeds RUC

Historical Groundwater Conductivity and Chloride Concentrations TW-1



Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TW2 1-Jan-91	TW2 1-Apr-91	TW2 1-Oct-91	TW2 1-Apr-92	TW2 1-Oct-92	TW2 1-May-93	TW2 1-Nov-93	TW2 1-May-94	TW2 1-Oct-94	TW2 1-May-95	TW2 1-Oct-95	TW2 1-Apr-97	TW2 1-Sep-97	TW2 1-May-98
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	383	332	290	331	323	271	215	263	357	306	346	303	263	510
Ammonia(as N)	-	nv	0.007	0.035	0.115	0.054	0.348	0.056	0.13	0.077		0.16	0.3	0.004	0.007	0.12
Barium	1	0.32														
Boron	5 [IMAC]	1.31														
Calcium	-	nv														
Chloride	250 [AO]	127	20.7	11	36.1	21.1	12	9.7	10.3	12.8	15	11.3	28.5	12	15.7	10.5
Conductivity - @25°C (µS/cm)	-	nv	856	772	888	806	791	668	608	750	680	719	850	620	680	523
Hardness(as CaCO ₃)	80-100 [OG]	183	591	373	447	405	283	347	340	385	376	369	431	418	363	312
Iron	0.3 [AO]	0.36														
Magnesium	-	nv														
Nitrate(as N)	10 d	2.68	4.2	1.9	0.1	5.1	0.2	1.3	0.1	1.1	0.1	0.6	0.6	1.65	0.45	0.65
Nitrite(as N)	1 d	0.28	0.01	0.02	0.01	0.03	0.01	0.01	0.01	0.01	0.03	0.04	0.01	0.1	0.1	0.05
Organic Nitrogen	0.15	0.41	0.563	0.495	0.385	0.606	0.532	0.474	0.84	0.353		0.39	0.23	0.29	0.24	1.2
pH	6.5-8.5 [OG]	6.5 to 8.5	8.03	7.88	7.75	7.65	7.75	7.80	7.92	8.07	8.19	8.07	7.69	7.60	7.80	7.27
Sodium	200 [AO]	107								12.5		15.7	15.5	9.52	19	12.1
Sulphate	500 [AO]	290										65.9	101	60.1	102	156
Total Kjeldahl Nitrogen(as N)	-	nv	0.57	0.53	0.5	0.66	0.88	0.53	0.77	0.41	0.6	0.55	0.53	0.29	0.24	1.32

NOTES:

- All results expressed in mg/L unless otherwise noted.
- ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05).
- All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise.
- IMAC indicates an interim maximum acceptable concentration ODWO.
- AO indicates an aesthetic objective ODWO, not health related.
- OG indicates an operational guideline ODWO, not health related.

BOLD Exceeds ODWS
Exceeds RUC

Chemical Parameter	ODWS	MECP Guidelines B-7 Reasonable Use Criteria	TW2 1-May-99	TW2 1-Nov-99	TW2 9-Jan-01	TW2 Rep 9-Jan-01	TW2 18-Jul-01	TW2 19-Oct-01	TW2 26-Jun-02	TW2 23-Oct-02	TW2 07-May-03	TW2 30-Sep-03	TW2 07-Jun-04	TW2 22-Sep-04	TW2 27-Apr-05	TW2 17-Oct-05
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	215	282	192	1974.5	DRY	409	DRY	309	375	337	405	267	368	352
Ammonia(as N)	-	nv	0.44	0.05	0.04	0.06	0.06	0.06	DRY	0.22	0.06	0.22	0.1	0.27	0.12	0.15
Barium	1	0.32	0.32	0.257	0.257	0.252	0.17	0.17		0.1	0.085	0.085	0.083	0.055	0.076	0.093
Boron	5 [IMAC]	1.31	nv	nv	0.17	0.17	0.17	0.17		0.154	0.15	0.154	0.227	0.11	0.162	0.189
Calcium	-	nv	9.4	40.9	55.3	54.9	54.9	127		154	121	111	116	73.1	105	104
Chloride	250 [AO]	127	9.4	40.9	4.5	4.5	4.5	37.7		29.6	62.4	28	16.1	14.6	9.2	19.6
Conductivity - @25°C (µS/cm)	-	nv	534	770	499	501	1014	1014		597	953	822	820	645	748	783
Hardness(as CaCO ₃)	80-100 [OG]	183	362	496	259	258	558	558		618	533	471	475	324	429	449
Iron	0.3 [AO]	0.36	0.01	0.01	0.06	0.06	0.06	0.06		0.19	0.37	0.132	0.062	0.106	0.046	0.077
Magnesium	-	nv	29.2	29.2	29.2	29.2	29.2	58.4		56.8	56.2	47.2	44.9	34.3	40.4	45.9
Nitrate(as N)	10 d	2.68	0.23	0.43	nd	nd	nd	<0.1		0.1	0.1	0.1	2	0.2	1.4	0.1
Nitrite(as N)	1 d	0.28	0.05	0.05	nd	nd	nd	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Nitrogen	0.15	0.41	1.7	2.7	nd	nd	nd	0.36		1.29	0.68	0.4	0.49	0.28	0.84	0.53
pH	6.5-8.5 [OG]	6.5 to 8.5	7.85	7.72	7.92	7.86	7.86	7.52		8.09	7.70	7.47	8.2	7.47	7.78	7.37
Sodium	200 [AO]	107	6.74	21	21.2	22.3	20.4	20.4		13.9	21.0	16.3	15.1	9.7	10.2	13.8
Sulphate	500 [AO]	290	144	118	84.5	85.3	97.6	97.6		208	135	120	59	106	40	92
Total Kjeldahl Nitrogen(as N)	-	nv	2.2	2.8	0.04	0.05	0.44	0.44		1.51	0.74	0.82	0.59	0.55	0.96	0.68

NOTES:

- All results expressed in mg/L unless otherwise noted.
- ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 285/05).
- All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise.
- IMAC indicates an interim maximum acceptable concentration ODWO.
- AO indicates an aesthetic objective ODWO, not health related.
- OG indicates an operational guideline ODWO, not health related.

BOLD Exceeds ODWS
DRY Exceeds RUC

Municipality of West Grey
Groundwater Quality - Normanby Landfill

TW2

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria													
		TW2 005 27-Apr-06	TW2 002 26-Oct-06	TW2 002 9-Apr-07	TW2 10-Oct-07	TW2 006 17-Apr-08	TW2 006 6-Oct-08	TW2 29-Apr-09	TW2 13-Oct-09	TW2 4-May-10	TW2 10-Nov-10	TW2 14-Apr-11	TW2 25-Oct-11	TW2 3-Apr-12	TW2 26-Sep-12
Alkalinity(as CaCO ₃)	30 - 500 [OG]	380	402	350	DRY	346	360	393	340	395	322	385	479	409	349
Ammonia(as N)	-	nv	0.03	<0.01		0.02	0.11	<0.01	0.07	<0.01	0.02	<0.01	<0.01	0.02	<0.01
Barium	1	0.32	0.08	0.074	0.071	0.068	0.075	0.062	0.088	0.08	0.073	0.054	0.080	0.059	0.096
Boron	5 [IMAC]	0.221	0.177	0.147	0.147	0.167	0.165	0.193	0.138	0.176	0.135	0.127	0.188	0.210	0.182
Calcium	-	111	111	93.6	93.6	96.3	94.3	104	86.4	98.6	87.6	100.0	124	89.4	113
Chloride	250 [AO]	127	13	36.1	10.9	11	16.4	12	18.4	13.2	14.2	12.2	10.0	15.1	21.5
Conductivity - @25°C (µS/cm)	-	783	830	689	689	813	752	828	801	844	741	814	969	840	877
Hardness(as CaCO ₃)	80-100 [OG]	432	477	367	367	394	395	419	377	411	364	410	526	388	479
Iron	0.3 [AO]	0.033	<0.005	<0.005	<0.005	<0.005	0.102	<0.005	0.012	<0.005	<0.005	<0.005	0.033	<0.005	<0.005
Magnesium	-	37.9	48.8	32.3	32.3	36.2	38.7	38.4	37.8	40	35.2	38.9	52.4	40.0	46.0
Nitrate(as N)	10 d	2.4	0.2	2.4	2.4	2.1	1.3	3.5	0.2	2.2	2.9	4.1	3.6	4.6	0.2
Nitrite(as N)	1 d	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Nitrogen	0.15	0.59	1.61	1.58	1.58	1.82	1.85	1.11	2.93	0.89	0.78	1.13	<1.28	0.75	1.49
pH	6.5-8.5 [OG]	7.96	7.66	7.53	7.53	7.52	7.46	7.62	7.36	6.99	7.72	7.11	7.72	7.99	7.77
Sodium	200 [AO]	12.8	18.4	10.7	10.7	11.4	12.2	11.5	12.1	11	9.4	10.5	9.8	12.0	14.8
Sulphate	500 [AO]	41	97	57	57	58	80	37	88	55	53	37	39	31	131
Total Kjeldahl Nitrogen(as N)	-	0.62	1.64	1.57	1.57	1.84	1.96	1.12	3	0.9	0.8	1.14	1.29	0.77	1.49

NOTES:

- All results expressed in mg/L unless otherwise noted
- ODWS - Ontario Drinking Water Standards (per C. Reg. 169/03 as amended to O. Reg. 255/05).
- All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
- IMAC indicates an interim maximum acceptable concentration ODWO.
- AO indicates an aesthetic objective ODWO, not health related.
- OG indicates an operational guideline ODWO, not health related.

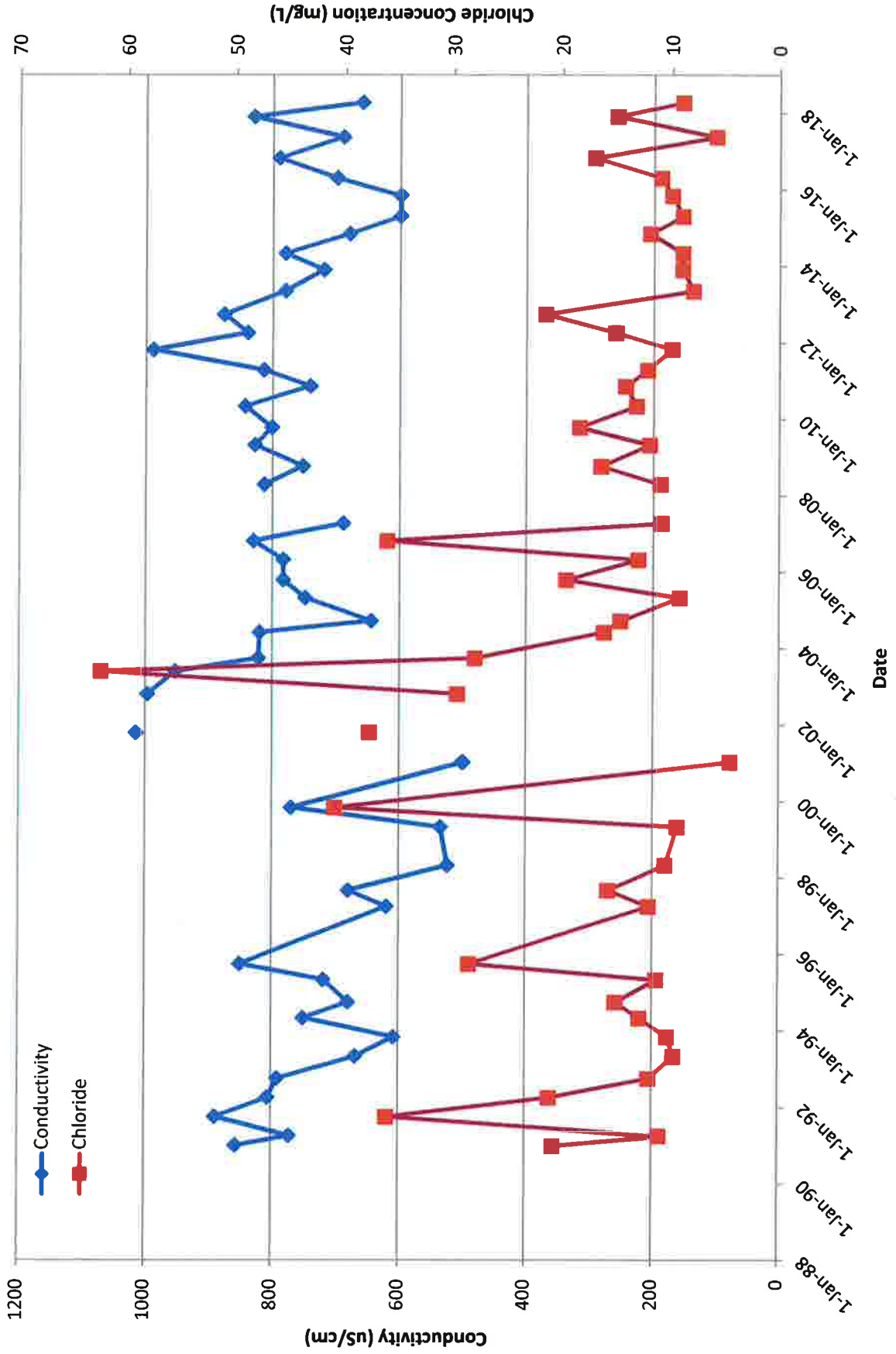
BOLD Exceeds ODWS
Exceeds RUC

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TW2											
			7-May-13	26-Nov-13	1-May-14	4-Nov-14	20-Apr-15	3-Nov-15	19-Apr-16	26-Oct-16	16-May-17	27-Nov-17	10-Apr-18	14-Nov-18
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	360	330	370	270	230	220	250	300	290	400	280	---
Ammonia(as N)	-	nv	0.16	0.095	0.48	0.2	0.11	0.11	0.071	0.49	0.12	0.093	0.31	---
Barium	1	0.32	97	87	9	12	9	10	11	100	5.9	15	80	---
Boron	5 [IMAC]	1.31	8	9	780	680	600	600	700	750	690	830	660	---
Calcium	250 [AO]	nv	420	380	400	380	340	340	380	420	370	440	340	---
Chloride	80-100 [OG]	183	<0.1	<0.1	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	---
Conductivity - @25°C (µS/cm)	0.3 [AO]	0.36	44.0	41	44.0	nv	44.0	41	<0.02	<0.02	<0.02	<0.02	<0.02	---
Hardness(as CaCO ₃)	-	nv	44.0	41	44.0	nv	44.0	41	<0.02	<0.02	<0.02	<0.02	<0.02	---
Iron	10 d	2.68	1.7	1.4	2.72	0.48	0.38	0.28	1.09	<0.1	0.66	0.44	1.34	---
Nitrate(as N)	1 d	0.28	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.13	0.47	0.59	0.16	0.89	---
Nitrite(as N)	0.15	0.41	2.34	1.21	3.44	1.80	0.73	0.63	0.13	0.47	0.59	0.16	0.89	---
Organic Nitrogen	6.5-8.5 [OG]	107	8.2	7.98	8.01	7.94	8.14	8.05	8.15	8.06	8.01	8.06	8.04	---
pH	200 [AO]	7.9	8.2	8.5	7.9	11	8.3	9.2	8.7	14	7.4	10	8	---
Sodium	500 [AO]	290	53	52	37	80	72	90	81	110	34	42	46	---
Sulphate	-	nv	2.5	1.3	3.9	<2	0.84	0.74	0.2	0.96	0.71	<0.50	1.2	---
Total Kjeldahl Nitrogen(as N)	-	nv	2.5	1.3	3.9	<2	0.84	0.74	0.2	0.96	0.71	<0.50	1.2	---

NOTES:
 1. All results expressed in mg/L unless otherwise noted
 2. ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05).
 3. All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise.
 4. IMAC indicates an interim maximum acceptable concentration ODWS.
 5. AO indicates an aesthetic objective ODWS, not health related.
 6. OG indicates an operational guideline ODWS, not health related.

BOLD Exceeds ODWS
--- Exceeds RUC

Historical Groundwater Conductivity and Chloride Concentrations TW-2



Municipality of West Grey
Groundwater Quality - Normanby Landfill

Chemical Parameter	ODWQS	MECP Guideline B-7 Reasonable Use Criteria	TW3															
			1-Jun-89	1-Oct-89	1-May-90	1-Jan-91	1-Apr-91	1-Oct-91	1-Apr-92	1-Oct-92	1-May-93	1-Nov-93	1-May-94	1-Oct-94	1-May-95	1-Oct-95	1-May-96	
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	0.062	368	277	367	335	375	309	410	396	372	308	437	350	421	387	
Ammonia(as N)	1	nv	0.044	0.044	0.226	0.02	0.031	0.094	0.053	0.025	0.06	0.093	0.067	0.282	0.14	0.32		
Barium	5 [IMAC]	1.31																
Boron	250 [AO]	nv	27.1	17.3	26.3	28.9	19	45.4	21.1	26.7	30.6	3.9	18.9	53.3	39.2	63.8	37.5	
Calcium	250 [AO]	127	767	925	663	782	677	877	651	804	774	1023	690	978	749	1055	905	
Chloride	250 [AO]	nv																
Conductivity - @25°C (µS/cm)	80-100 [OG]	183	387	476	302	344	328	414	328	283	375	505	333	458	358	469	391	
Hardness(as CaCO ₃)	0.3 [AO]	0.36																
Iron	10 d	nv	0.1	0.1	4.8	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.05	
Magnesium	1 d	268	0.02	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.04	0.01	0.01	
Nitrate(as N)	0.15	0.41	0.818	0.356	0.944	0.6	0.569	0.745	0.417	0.715	0.89	0.637	0.423	0.978	0.51	0.73	7.19	
Nitrite(as N)	6.5 to 8.5 [OG]	107	7	7.14	7.71	7.53	7.57	7.37	7.17	7.23	7.29	7.72	7.81	7.41	7.64	7.43	7.19	
Organic Nitrogen	200 [AO]	107																
pH	500 [AO]	290																
Sodium	nv	nv	0.68	0.4	1.17	0.62	0.59	0.84	0.46	0.74	0.95	0.72	0.49	1.26	0.65	1.05	12.2	
Sulphate																		
Total Kjeldahl Nitrogen(as N)																		

NOTES:

- All results expressed in mg/L unless otherwise noted
- ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 265/05)
- All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
- IMAC indicates an interim maximum acceptable concentration ODWO.
- AO indicates an aesthetic objective ODWO, not health related.
- OG indicates an operational guideline ODWO, not health related.

Exceeds ODWS
Exceeds RUC

Chemical Parameter	ODWQS	MECP Guideline B-7 Reasonable Use Criteria	TW3 1-Apr-97	TW3 1-Sep-97	TW3 1-May-99	TW3 1-Nov-99	TW3 9-Jan-01	TW3 011 12-Jul-02	TW3 002 23-Oct-02	TW3 005 27-May-03	TW3 006 30-Sep-03	TW3 006 3-Jun-04	TW3 002 22-Sep-04	TW3 (dup) 003 22-Sep-04	TW3 005 27-Apr-05	TW3 003 17-Oct-05
Alkalinity as CaCO ₃	30 - 500 [O ₆]	355	273	412	270	343	438	570	537	390	531	549	543	543	396	396
Ammonia (as N)	1	nv	0.077	0.198	0.21	0.11	0.07	0.25	0.13	0.04	0.06	0.27	0.01	<0.01	0.18	0.07
Barium	5 [IMAC]	0.32					0.5	0.23	0.075	0.072	0.089	0.088	0.093	0.093	0.06	0.076
Boron	250 [AO]	1.31					0.28	0.7	0.7	0.46	0.639	0.465	0.783	0.783	0.349	0.633
Calcium		nv	46.4	89.1	54.3	66.5	91.7	124	126	92.6	113	111	108	108	87.1	89.5
Chloride		127	740	1250	819	1000	637	1265	53.6	50.2	61.7	45.5	61.7	58	54	43.2
Conductivity - @25°C (µS/cm)		nv							1190	889	1120	1100	1240	933	865	933
Hardness as CaCO ₃	80-100 [OG]	183	518	436	450	590	426	564	588	420.971	518	513	512	512	405	406
Iron	0.3 [AO]	0.36			0.01	0.01	1.11	1.88	0.88	0.28	0.06	0.139	0.125	0.206	0.033	0.027
Magnesium		nv					47.8	61.9	66.4	46.1	57.3	57.1	58.9	59	45.0	44.4
Nitrate (as N)	10 d	268	0.1	0.1	0.2	0.32	nd	<0.1	<0.1	0.6	0.4	<0.1	8.1	8.8	<0.1	0.3
Nitrite (as N)	1 d	0.28	0.1	0.1	0.05	0.05	nd	<0.1	<0.1	0.2	0.1	<0.1	0.2	0.7	<0.1	0.2
Organic Nitrogen	0.15	0.41	0.56	0.97	2.2	6.1	0.76	0.92	0.98	1.33	0.8	0.74	0.98	0.97	1.71	1.24
pH	6.5-8.5 [OG]		7.3	7.3	7.93	7.4	7.45	6.92	8.41	7.47	7.2	8.14	7.06	7.1	7.41	7.32
Sodium	200 [AO]	107	39.6	0.072	32.5	50.1	38.4	57.3	51.6	46.5	57	46.8	51	51.2	32.6	44.7
Sulphate	500 [AO]	290	29.1	90.1	96.1	127.5	28	52.2	75	92	58	19	74	81	31	89
Total Kjeldahl Nitrogen (as N)		nv	0.64	1.17	2.4	5.2	0.83	1.37	1.11	1.87	0.86	1.01	1	0.97	1.89	1.31

NOTES:

- All results expressed in mg/L unless otherwise noted
- ODWQS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05)
- All ODWQS values expressed are Maximum Acceptable Concentration, unless indicated otherwise
- IMAC indicates an interim maximum acceptable concentration ODWQ
- AO indicates an aesthetic objective ODWQ, not health related
- OG indicates an operational guideline ODWQ, not health related

BOLD Exceeds ODWS
Exceeds RUC

Municipality of West Grey
Groundwater Quality - Normanby Landfill

TW3

Chemical Parameter	MECP Guideline B-7 Reasonable Use Criteria	ODWS	TW3												
			27-Apr-06 TW3 004	26-Oct-06 TW3 005	9-Apr-07 TW3 006	9-Apr-07 TW3 (dup) 007	10-Oct-07 TW3 003	17-Apr-08 TW3 003	6-Oct-08 TW3 004	29-Apr-09 TW3	13-Oct-09 TW3	Duplicate #1 13-Oct-09 TW3	4-May-10 TW3	10-Nov-10 TW3	14-Apr-11 TW3
Alkalinity(as CaCO ₃)	355	30 - 500 [OG]	402	488	448	450	501	362	448	410	502	453	431	408	336
Ammonia(as N)	nv	-	0.11	0.02	0.09	0.08	0.01	<0.01	0.12	0.08	0.03	0.05	0.1	0.06	0.04
Barium	0.32	1	0.059	0.079	0.059	0.059	0.072	0.05	0.062	0.043	0.069	0.06	0.06	0.047	0.056
Boron	1.31	5 [MAC]	0.369	0.546	0.296	0.293	0.632	0.327	0.628	0.325	0.574	0.404	0.495	0.257	0.505
Calcium	nv	-	85.4	106	90.6	89.4	109	79.8	95.5	84.3	106	99.5	104	91.4	92.7
Chloride	127	250 [AO]	26.2	43.5	33.1	33	37.1	30.7	38	23.3	36.9	36	30	24.6	26.9
Conductivity - @25°C (µS/cm)	nv	-	805	1120	846	833	1100	864	987	807	1090	967	930	838	895
Hardness(as CaCO ₃)	183	80-100 [OG]	350	483	417	411	459	359	419	351	469	433	450	399	401
Iron	0.36	0.3 [AO]	0.018	0.013	0.031	0.032	0.067	<0.005	0.034	0.084	0.026	0.08	0.354	0.265	0.284
Magnesium	nv	-	43	52.9	46.2	45.6	54.9	38.9	43.9	41.4	49.6	46.3	46.4	41.6	41.2
Nitrate(as N)	2.68	10 d	<0.1	0.3	<0.1	<0.1	1	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1
Nitrite(as N)	0.28	1 d	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Nitrogen	0.41	0.15	1.04	0.89	3.41	2.52	1.64	2.24	1.13	3.43	2.18	2.44	1.57	1.7	1.68
pH	6.5 to 8.5	6.5-8.5 [OG]	7.7	7.39	7.38	7.35	7.09	7.43	7.21	7.39	7.05	6.97	7.56	6.81	7.56
Sodium	107	200 [AO]	30.2	41.1	29.4	29	35.8	29.7	35.3	22	33.3	27.4	27.3	22.9	24.6
Sulphate	290	500 [AO]	20	116	26	26	87	81	84	11	86	32	48	27	105
Total Kjeldahl Nitrogen(as N)	nv	-	1.15	0.91	3.5	2.9	1.05	2.25	1.25	3.51	2.21	2.49	1.67	1.76	1.6

NOTES:

- All results expressed in mg/L, unless otherwise noted
- ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05)
- All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
- IMAC indicates an interim maximum acceptable concentration ODWO
- AO indicates an aesthetic objective ODWO, not health related
- OG indicates an operational guideline ODWO, not health related

BOLD Exceeds ODWS
Exceeds RUC

Municipality of West Grey
Groundwater Quality - Normanby Landfill

TW3

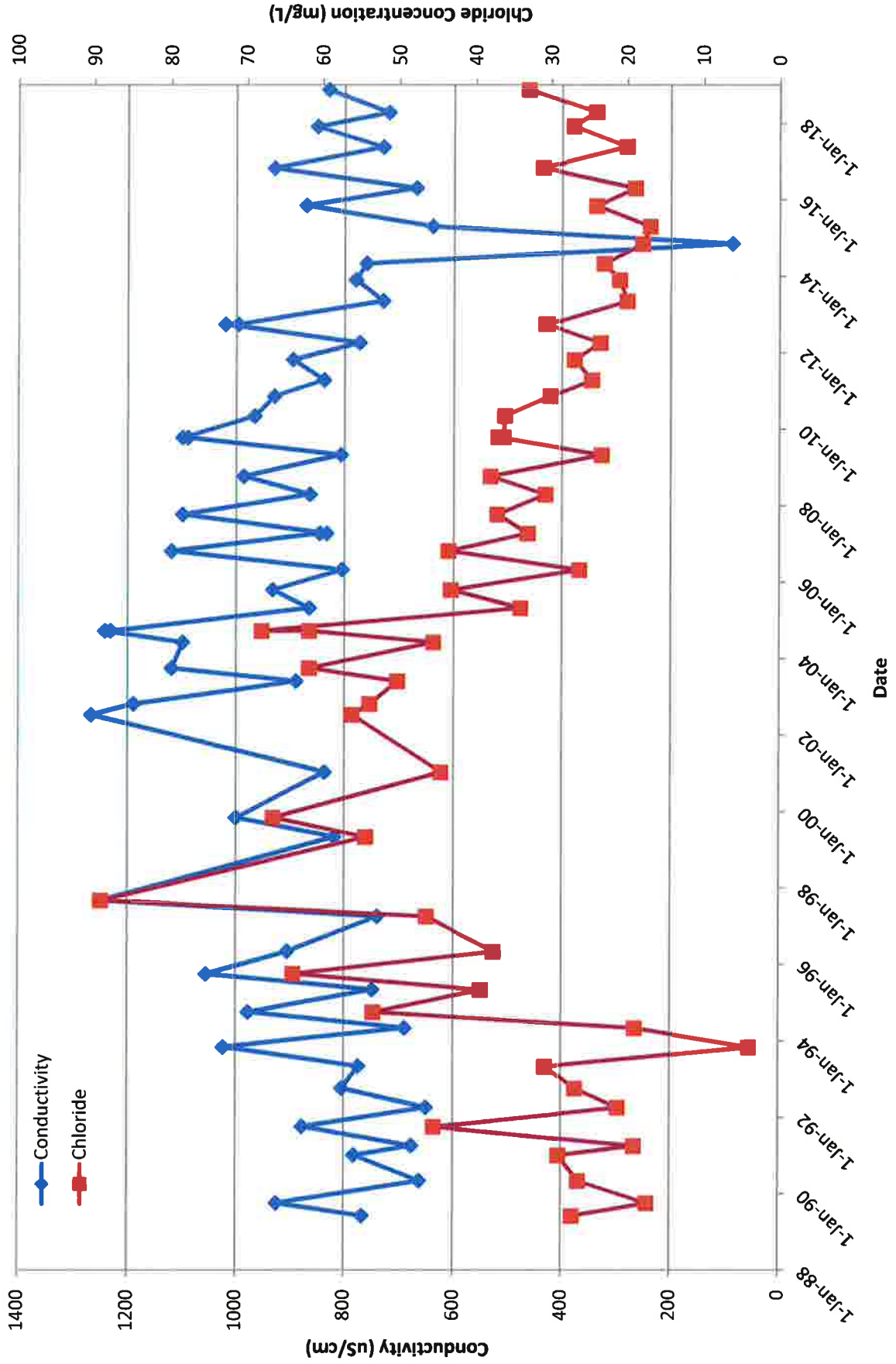
Chemical Parameter	ODWQS	MECP Guideline B-7 Reasonable Use Criteria	TW3 3-Apr-12	TW3 26-Sep-12	TW3 Duplicate #2 26-Sep-12	TW3 7-May-13	TW3 26-Nov-13	TW3 1-May-14	TW3 4-Nov-14	TW3 20-Apr-15	TW3 3-Nov-15	TW3 19-Apr-16	TW3 26-Oct-16	TW3 16-May-17	TW3 27-Nov-17	TW3 10-Apr-18	TW3 14-Nov-18
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	388	438	436	330	350	360	410	300	390	310	380	340	410	360	340
Ammonia(as N)	-	nv	0.07	0.03	0.03	0.13	0.11	0.25	0.075	0.088	0.17	0.12	0.11	0.077	0.1	0.29	0.28
Boron	1	0.32	0.044	0.073	0.072												
Calcium	5 [IMAC]	1.31	0.286	0.664	0.667												
Chloride	250 [AO]	127	76.5	113	114	76	87	23	18	17	24	19	110	20	27	86	33
Conductivity - @25°C (µS/cm)	-	nv	23.5	30.6	30.4	20	21	760	88	640	870	670	930	730	850	720	830
Hardness(as CaCO ₃)	80-100 [OG]	183	345	492	485	330	370	320	450	330	440	340	480	350	420	350	400
Iron	0.3 [AO]	0.36	0.309	0.084	0.072	<0.1	<0.1	ND	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
Magnesium	-	nv	37.3	51	51.3	33	38						44			33	0.15
Nitrate(as N)	10 d	2.88	<0.1	2.3	2.3	<0.1	<0.1	<0.1	0.13	<0.10	<0.10	<0.10	1.76	<0.10	<0.10	<0.10	0.15
Nitrite(as N)	1 d	0.28	<0.1	0.4	0.5	<0.01	<0.01										
Organic Nitrogen	0.15	0.41	1.1	1.06	0.88	1.27	2.79	4.35	1.93	0.522	0.83	0.1	0.57	0.453	0.34	0.18	0.3
pH	6.5-8.5 [OG]	107	7.91	7.82	7.94	7.87	7.81	8.03	7.69	8.04	7.93	7.79	7.97	7.9	7.55	7.76	7.58
Sodium	200 [AO]	107	207	29.9	30	22	23	18	26	15	26	14	28	18	25	20	20
Sulphate	500 [AO]	290	18	87	88	32	43	28	57	25	58	32	76	19	19	17	87
Total Kjeldahl Nitrogen(as N)	-	nv	1.17	1.09	0.91	1.4	2.9	4.5	<2	0.61	1	<0.10	0.68	0.57	0.44	0.47	0.58

NOTES:

- All results expressed in mg/L unless otherwise noted.
- ODWQS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05)
- All ODWQS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
- IMAC indicates an interim maximum acceptable concentration ODWQ
- AO indicates an aesthetic objective ODWQ, not health related
- OG indicates an operational guideline ODWQ, not health related

BOLD Exceeds ODWQS
Exceeds RUC

Historical Groundwater Conductivity and Chloride Concentrations TW-3



Municipality of West Grey
Groundwater Quality - Normanby Landfill

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TW5 1-Jun-89	TW5 1-Oct-89	TW5 1-May-90	TW5 1-Jan-91	TW5 1-Apr-91	TW5 1-Oct-91	TW5 1-Apr-92	TW5 1-Oct-92	TW5 1-May-93	TW5 1-Nov-93	TW5 1-May-94	TW5 1-Oct-94	TW5 1-May-95	TW5 1-Oct-95	TW5 1-May-96	TW5 1-Apr-97
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	0.028	0.012	0.029	0.015	0.049	0.043	0.028	0.016	0.072	0.072	0.031	0.225	0.35	0.54		1.49
Ammonia(as N)	1	nv																
Barium	5 [IMAC]	0.32																
Boron		1.31																
Calcium		nv	87.4	84.4	65.4	80.7	83	80.6	80.4	35.9	86.4	80.7	92.2	99.5	97.7	88.7	114	32.3
Chloride	250 [AO]	127	15.5	15.1	16.1	18	19.2	20.1	17.1	18.2	19.7	17.5	31.5	31.8	37.6	34.7	40.8	770
Conductivity - @25°C (µS/cm)		nv	669	678	688	715	705	681	657	677	697	667	809	816	893	852	1107	
Hardness(as CaCO ₃)	80-100 [OG]	183	354	346	349	346	339	338	344	234	354	345	399	424	430	402	493	478
Iron	0.3 [AO]	0.36																
Magnesium		nv	32.8	33.2	33	34.7	31.9	33.1	34.7	35	33.4	34.8	41	42.6	45.2	43.7	50	
Nitrate(as N)	10 d	2.68	9.6	9.1	9.1	8.6	9.2	8.9	8.3	7.9	7.6	6.4	1.5	0.3	6.6	7.6	0.05	6.66
Nitrite(as N)	1 d	0.28	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.01	0.026	0.01	0.04	0.05	0.02	0.1	
Organic Nitrogen	0.15	0.41	0.432	0.358	0.431	0.353	0.651	0.557	0.432	0.354	0.668	0.748	0.548	0.355	1.11	0.91	0.15	
pH	6.5 to 8.5	107	7.45	7.51	7.67	7.73	7.67	7.83	7.47	7.75	7.65	7.88	7.82	7.47	7.7	7.61	7.1	7.5
Sodium	200 [AO]	107																
Sulphate	500 [AO]	290																
Total Kjeldahl Nitrogen(as N)		nv	0.51	0.4	0.45	0.38	0.73	0.6	0.46	0.87	0.94	0.82	0.66	1.18	1.46	1.45	50.1	1.64

- NOTES:
- All results expressed in mg/L unless otherwise noted
 - ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05)
 - All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
 - IMAC indicates an interim maximum acceptable concentration ODWO
 - AO indicates an aesthetic objective ODWC, not health related
 - OG indicates an operational guideline ODWO, not health related

SOLID

Exceeds ODWS
Exceeds RUC

Municipality of West Grey
Groundwater Quality - Normanby Landfill

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TWS 1-Sep-97	TWS 1-May-98	TWS 1-May-99	TWS 1-Nov-99	TWS 9-Jun-00	TWS 001 18-Jul-01	TWS 001 19-Oct-01	TWS 010 28-Jun-02	TWS 001 23-Oct-02	TWS 001 27-May-03	TWS 002 (dup) 27-May-03	TWS 001 30-Sep-03	TWS 002 (dup) 30-Sep-03	TWS 001 3-Jun-04	TWS 002 (dup) 3-Jun-04	TWS 007 22-Sep-04
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	3.18	0.13	0.18	0.05	238	350	330	351	330	333	330	336	327	315	321	345
Ammoniat(as N)	-	nv					0.2	1.88	1.7	1.26	1.37	0.63	0.56	0.72	0.81	0.56	0.5	0.72
Barium	1	0.32	0.983	0.05	0.05	0.04	0.983	0.05	0.05	0.04	0.05	0.042	0.042	0.043	0.043	0.045	0.044	0.04
Boron	5 [IMAC]	1.31	0.27	0.45	0.44	0.6	0.27	0.45	0.44	0.6	0.51	0.41	0.41	0.398	0.4	0.515	0.513	0.448
Calcium	-	nv	89.1	1.83	0.01	0.01	67.5	108	97.6	89.6	105	91	91.2	95	95.4	99.6	97.8	86
Chloride	250 [AO]	127	920	348	1.91	5	1.8	23	21.1	19.1	19.6	18.5	18.5	19.1	19.3	19.1	19.1	18.7
Conductivity - @25°C (µS/cm)	-	nv	920	348	352	396	454	894	877	894	847	702	702	744	723	786	788	765
Hardness(as CaCO ₃)	80-100 [OG]	183	420	199	355	328	355	454	427	438	465	346.568	346.568	404	405	422	414	380
Iron	0.3 [AO]	0.36					0.31	0.02	<0.01	<0.01	<0.02	0.24	0.24	0.005	<0.005	<0.005	0.005	0.008
Magnesium	-	nv					23.3	44.6	44.6	46.1	46.9	38.8	39	40.5	40.6	42.2	41.3	40.2
Nitrate(as N)	10 d	2.68	5.95	1.61	0.74	0.97	0.7	7.2	7.3	5.5	5.9	5.3	5.3	4.8	4.8	4.7	4.7	4.7
Nitrite(as N)	1 d	0.28	0.21	0.05	0.05	0.05	nd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Nitrogen	0.15	0.41	0.01	1.07	2.1	3.5	0.8	0.42	0.7	0.17	0.34	2.09	2.02	0.58	0.54	0.81	0.85	0.66
pH	6.5-8.5 [OG]	6.5 to 8.5	7.4	7.5	7.68	7.59	7.6	7.28	7.37	7.14	8.26	7.31	7.32	7.27	7.22	8.1	8.19	7.17
Sodium	200 [AO]	107	37.5	5.11	2.8	7.66	16.4	15.3	14.7	14	16	13.5	13.5	13.7	14.9	14.6	14.6	12.6
Sulphate	500 [AO]	280	52.5	16.3	11.4	12.7	9	84.3	69.9	89.1	49	49	69	69	83	83	83	74
Total Kjeldahl Nitrogen(as N)	-	nv	3.19	1.2	2.3	3.7	1.1	2.3	2.4	1.43	1.71	2.72	2.58	1.36	1.37	1.35	1.35	1.28

NOTES:
 1. All results expressed in mg/L unless otherwise noted
 2. ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05)
 3. All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
 4. IMAC indicates an interim maximum acceptable concentration ODWO
 5. AO indicates an aesthetic objective ODWO, not health related
 6. OG indicates an operational guideline ODWO, not health related

BOLD Exceeds ODWS
 Exceeds RUC

Municipality of West Grey
Groundwater Quality - Normanby Landfill

TWS

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TWS 001 (dup) 27-Apr-05	TWS 002 27-Apr-05	TWS 008 17-Oct-05	TWS 009 (dup) 17-Oct-05	TWS 001 27-Apr-06	TWS 002 (dup) 27-Apr-06	TWS 012 26-Oct-06	TWS 013 (dup) 26-Oct-06	TWS 001 9-Apr-07	TWS 001 10-Oct-07	TWS (dup) 002 10-Oct-07	TWS 001 17-Apr-08	TWS (dup) 002 17-Apr-08	TWS 001 6-Oct-08	TWS (dup) 002 6-Oct-08
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	340	336	346	346	336	334	346	348	338	334	334	322	328	330	
Ammonia(as N)	1	nv	0.76	0.77	0.82	0.85	0.34	0.34	0.65	0.66	0.29	0.51	0.16	0.16	0.45	0.43	
Barium	5 [IMAC]	0.32	0.045	0.044	0.043	0.041	0.041	0.041	0.037	0.037	0.035	0.036	0.032	0.032	0.031	0.031	
Boron	nv	1.31	0.496	0.495	0.424	0.424	0.473	0.479	0.413	0.412	0.446	0.401	0.356	0.363	0.405	0.406	
Calcium	250 [AO]	nv	99.5	98.4	91.7	92	98.6	100	89.1	89.7	88.3	85.5	86	83.3	83.2	83.5	
Chloride	nv	127	17.9	17.9	16.6	18.9	19	18.9	19.7	19.5	18.8	17.9	17.8	19.2	19.6	19.5	
Conductivity - @25°C (µS/cm)	80-100 [OG]	183	425	421	388	399	418	423	375	361	375	745	743	696	719	728	
Hardness(as CaCO ₃)	0.3 [AO]	0.36	0.112	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Iron	nv	2.68	42.9	42.7	41.1	41.1	41.8	42	38.1	38.2	37.7	37	34.1	34.4	34.5	34.7	
Magnesium	10 d	0.28	3.8	3.8	3.7	3.7	1.1	4.1	4.6	4.6	4.9	4.8	5.9	5.8	5.8	5.8	
Nitrate(as N)	1 d	0.41	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Organic Nitrogen	0.15	6.5 to 8.5	0.5	0.47	0.61	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	
pH	6.5-8.5 [OG]	107	7.43	7.29	7.22	7.31	7.73	7.71	7.43	7.48	7.48	6.99	7.43	7.44	7.12	7.19	
Sodium	200 [AO]	290	13.8	13.6	13.1	13.1	14.1	14.2	13	12.9	12.6	12.4	12.6	12.5	12.1	12.2	
Sulphate	500 [AO]	nv	63	63	54	54	52	53	47	47	48	43	39	39	44	44	
Total Kjeldahl Nitrogen(as N)	nv	1.26	1.24	1.63	1.65	1.65	1.33	1.23	1.67	1.91	0.7	1.35	1.4	1.12	1.42	1.43	

NOTES:
 1 All results expressed in mg/L unless otherwise noted
 2 ODWS - Ontario Drinking Water Standards (per O Reg 169/03 as amended to O Reg 255/05)
 3 All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise.
 4 IMAC indicates an interim maximum acceptable concentration ODWS.
 5 AO indicates an aesthetic objective ODWS, not health related
 6 OG indicates an operational guideline ODWS, not health related

Exceeds ODWS
 Exceeds RUC

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TWS 29-Apr-09	TWS (dup) 25-Apr-09	TWS 13-Oct-09	TWS 4-May-10	TWS (dup) 4-May-10	TWS 10-Nov-10	TWS (dup) 10-Nov-10	TWS 14-Apr-11	TWS (dup) 14-Apr-11	TWS 25-Oct-11	TWS (dup) 25-Oct-11	TWS 3-Apr-12	TWS (dup) 3-Apr-12	TWS 25-Sep-12
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	338	357	327	329	329	317	317	325	326	324	324	335	331	338
Ammonia(as N)	1	nv	0.48	0.46	0.56	0.48	0.46	0.42	0.41	0.46	0.47	0.48	0.46	0.22	0.2	0.37
Barium	5 [IMAC]	0.32	0.031	0.031	0.029	0.034	0.034	0.037	0.037	0.035	0.035	0.034	0.033	0.032	0.032	0.036
Boron	1.31	1.31	0.441	0.44	0.33	0.404	0.41	0.448	0.45	0.435	0.439	0.375	0.376	0.41	0.414	0.423
Calcium	nv	nv	90.6	90.3	77.7	85.9	84.8	88.9	89	87.5	86.1	86.4	85.2	76.2	76.9	89
Chloride	250 [AO]	127	19.2	19	20.9	20.5	20.3	20.4	20.4	19.3	19.3	18.2	19.3	19.2	19.3	20.2
Conductivity - @25°C (µS/cm)	nv	nv	756	750	742	747	742	719	721	729	728	750	743	727	731	738
Hardness(as CaCO ₃)	80-100 [OG]	183	388	385	388	388	388	388	388	377	377	377	377	377	377	377
Iron	0.3 [AO]	0.36	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium	nv	nv	39.3	39	35.2	36.7	36.3	37.9	37.6	37.6	37.8	39.2	38.7	36.6	36.9	38.6
Nitrate(as N)	10 d	2.68	5.3	5.3	4.9	4.3	4.3	4.7	4.7	4.7	4.7	4.8	4.3	5	5	4.5
Nitrite(as N)	1 d	0.28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Nitrogen	0.15	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
pH	6.5 to 8.5	7.35	7.35	7.36	7.16	7.05	7.05	7.61	7.61	6.92	6.96	7.64	7.66	7.67	7.7	7.72
Sodium	200 [AO]	107	13.5	13.4	11.1	12.4	12.3	12.1	12.2	12.6	12.8	11	10.8	13.6	13.7	12.7
Sulphate	500 [AO]	290	38	38	34	34	34	33	33	31	25	25	28	28	28	28
Total Kjeldahl Nitrogen(as N)	nv	nv	2.54	2.64	1.21	1.82	1.83	1.08	1.11	0.86	0.9	1.19	1.22	1.24	1.2	1.37

NOTES:

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- IMAC indicates an interim maximum acceptable concentration ODWO
- AO indicates an aesthetic objective ODWO, not health related
- OG indicates an operational guideline ODWO, not health related

BOLD

Exceeds ODWS
Exceeds RUC

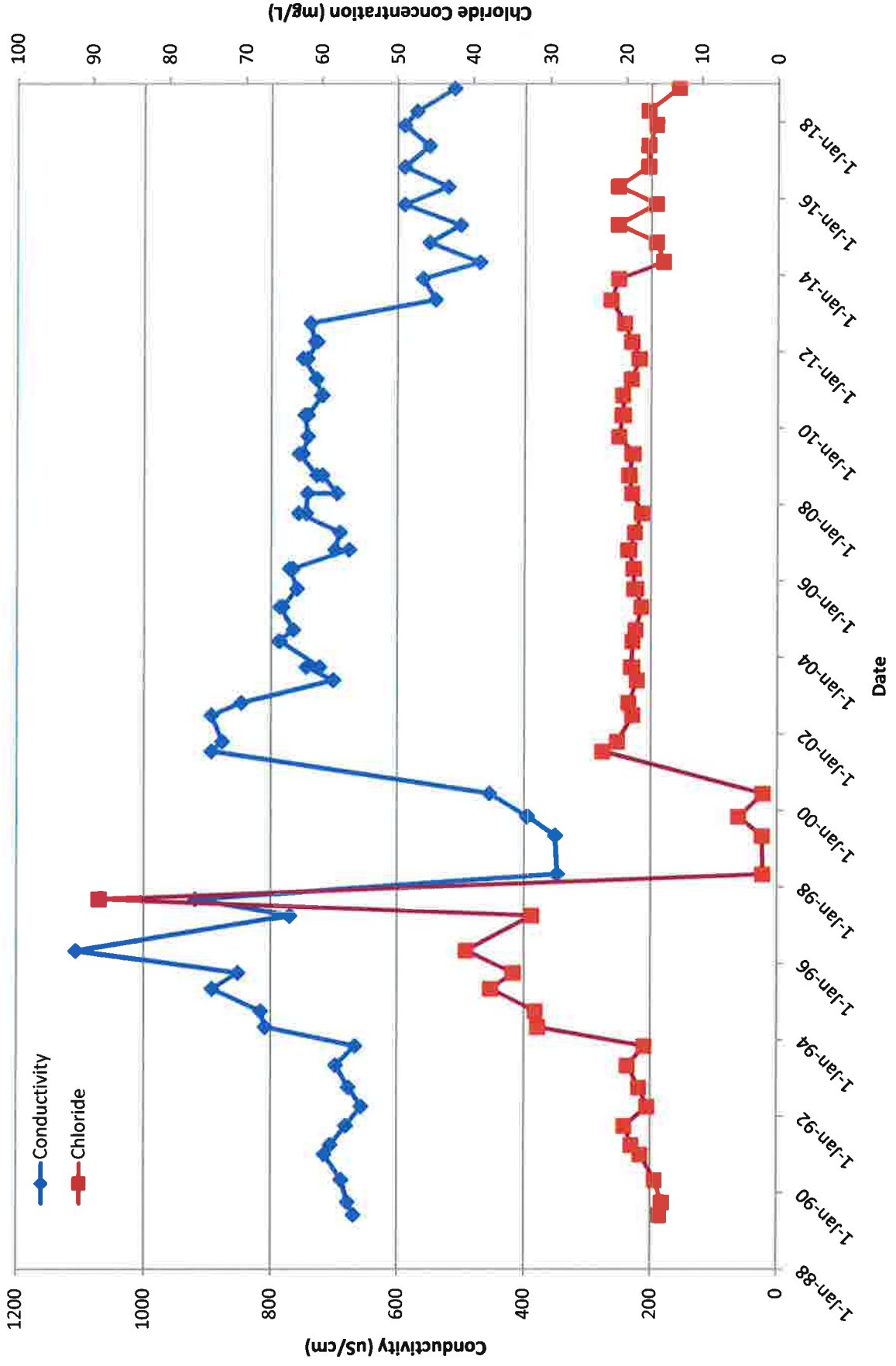
Municipality of West Grey
Groundwater Quality - Normanby Landfill

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TW5												
			7-May-13	26-Nov-13	1-May-14	4-Nov-14	20-Apr-15	3-Nov-15	19-Apr-16	26-Oct-16	16-May-17	27-Nov-17	10-Apr-18	14-Nov-18	
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	240	250	220	260	220	220	280	230	280	250	290	270	290
Ammonia(as N)	1	nv	0.12	0.065	0.13	0.086	<0.050	<0.050	<0.050	0.078	0.36	2.0	0.62	1.3	0.41
Barium	5 [IMAC]	1.31	68	76	nv	nv	nv	nv	nv	nv	nv	nv	nv	nv	nv
Boron	250 [AO]	127	22	21	15	16	21	16	17	21	17	17	16	17	13
Calcium	80-100 [OG]	183	270	300	230	310	280	340	370	280	300	280	300	290	300
Chloride	0.3 [AO]	0.36	<0.1	<0.1	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
Conductivity - @25°C (µS/cm)	10 d	2.68	25	27	1.27	0.98	0.81	0.34	0.35	0.88	0.35	1.51	1.68	1.71	2.21
Hardness(as CaCO ₃)	1 d	0.28	0.023	<0.01	1.37	1.91	0.58	0.5	<0.10	<0.10	0.45	1.90	1.18	2.89	0.23
Iron	0.15	0.41	2.38	2.335	8.15	7.87	8.04	8.02	8.09	8.09	8.09	8.02	7.79	7.95	7.81
Magnesium	6.5-8.5 [OG]	107	8.06	8.01	4.2	5.3	5.8	6.4	6.2	6.2	6.7	6.1	5.8	5.2	6.8
Nitrate(as N)	200 [AO]	290	7.1	6.4	9	10	7	10	13	13	17	13	12	15	8.8
Nitrite(as N)	500 [AO]	nv	12	11	1.5	<2	0.73	0.65	<0.10	<0.10	0.81	3.9	1.8	4.1	0.64
Organic Nitrogen			2.5	2.4											
pH															
Sodium															
Suphate															
Total Kjeldahl Nitrogen(as N)															

NOTES:
 1. All results expressed in mg/L, unless otherwise noted.
 2. ODWS - Ontario Drinking Water Standards (per O. Reg. 160/03 as amended to O. Reg. 255/05)
 3. All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise.
 4. IMAC indicates an interim maximum acceptable concentration ODWS.
 5. AO indicates an aesthetic objective ODWS, not health related.
 6. OG indicates an operational guideline ODWS, not health related.

BOLD Exceeds ODWS
 Exceeds RUC

Historical Groundwater Conductivity and Chloride Concentrations TW-5



Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TWSA 1-Jun-89	TWSA 1-Jan-91	TWSA 1-Apr-91	TWSA 1-Oct-91	TWSA 1-Apr-92	TWSA 1-Oct-92	TWSA 1-May-93	TWSA 1-Nov-93	TWSA 1-May-94	TWSA 10-Oct-94	TWSA 1-May-95	TWSA 1-Apr-97	TWSA 1-Sep-97	TWSA 9-Jun-00	TWSA 9-Jan-01
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	0.29	245	231	231	215	242	247	233	171	263	255	230	241	353	367
Ammonia(as N)	1	nv		0.014	0.008	0.028	0.04	0.022	0.034	0.119	0.097	0.13	0.22	0.071	0.024	4.11	1.41
Barium	5 [IMAC]	1.31														0.634	0.047
Boron		nv														0.61	0.44
Calcium	250 [AO]	127	8.1	7.9	7.4	9.4	8.7	8.1	8.6	7.3	5	7	6.1	4.48	5.15	112	99.3
Chloride		nv	504	526	484	536	514	526	498	465	459	520	535	390	480	30.3	28.5
Conductivity - @25°C (µS/cm)	80-100 [OG]		374	355	343	377	266	194	263	263	248	233	277	276	230	476	436
Hardness(as CaCO ₃)	0.3 [AO]	0.36														0.04	0.01
Iron		nv														47.7	43.2
Magnesium	10 d	2.68	2.5	1.9	2.1	1.6	2.7	1.8	2.2	1.4	1.5	1.5	1.2	1.19	1.17	7.4	8
Nitrate(as N)	1 d	0.28	0.01	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.04	0.04	0.1	0.1	nd	nd
Nitrite(as N)	0.15	0.41	0.231	0.268	0.482	0.262	0.35	0.51E	0.73E	1.321	0.253	0.45	0.81	0.27	0.17	nd	0.58
Organic Nitrogen	6.5-8.5 [OG]		7.61	8.08	8.08	8.04	7.88	7.97	7.89	8.16	8.07	8.16	8.11	7.7	8.2	7.34	7.72
pH	200 [AO]	107												3.13	5.63	30.1	20.6
Sulphate	500 [AO]	290												12	123	74.6	81.4
Total Kjeldahl Nitrogen(as N)		nv	0.32	0.3	0.47	0.31	0.32	0.54	0.81	1.44	0.35	0.68	0.83	0.34	0.19	2.21	1.98

NOTES:
1 All results expressed in mg/L unless otherwise noted.
2 ODWS - Ontario Drinking Water Standards (per O. Reg. 168/03 as amended to O. Reg. 255/05)
3 All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise.
4 IMAC indicates an interim maximum acceptable concentration ODWS
5 AO indicates an aesthetic objective ODWS, not health related.
6 OG indicates an operational guideline ODWS, not health related.

BOLD Exceeds RUC
Exceeds ODWS

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TW5A 002 18-Jul-01	TW5A 002 12-Oct-01	TW5A 012 23-Oct-02	TW5A 003 27-May-03	TW5A 003 30-Sep-03	TW5A 003 3-Jun-04	TW5A 003 22-Sep-04	TW5A 003 27-Apr-05	TW5A 007 17-Oct-05	TW5A 015 27-Apr-06	TW5A 014 25-Oct-06	TW5A 015 17-Apr-08	TW5A 5-Oct-08
Alkalinity/as CaCO ₃	30 - 500 [OG]	355	249	240	245	227	246	231	DRY	238	266	244	286	DRY	DRY
Ammonia(as N)	-	nv	0.31	<0.01	0.02	0.01	0.01	0.03	0.07	0.07	0.04	0.03	<0.01	0.04	0.04
Barium	1	0.32	0.02	0.01	0.02	0.014	0.017	0.015	0.015	0.015	0.018	0.016	0.016	0.014	0.014
Boron	5 [IMAC]	1.31	0.03	0.02	0.02	<0.01	0.019	0.013	<0.005	<0.005	0.022	0.013	0.03	0.009	0.009
Calcium	-	nv	65.2	63.2	76.8	63.2	69	68.4	66.3	68.5	68.5	71.7	69.3	58.9	58.9
Chloride	250 [AO]	127	4.1	4.3	5.7	5.8	7.2	6.2	6.6	6.7	13.3	14.5	14.5	15.8	15.8
Conductivity - @25°C (µS/cm)	-	nv	502	467	523	426	458	485	484	485	515	489	528	528	528
Hardness/as CaCO ₃	80-100 [OG]	183	354	352	366	349-342	271	272	268	271	283	283	240	240	240
Iron	0.3 [AO]	0.36	0.02	0.03	<0.02	0.14	<0.005	<0.005	<0.005	0.009	0.006	<0.005	<0.005	<0.005	<0.005
Magnesium	-	nv	24.5	22.8	27.7	22.2	23.9	24.6	24.9	24.4	26.4	23.2	22.6	22.6	22.6
Nitrate(as N)	10 d	2.68	1.6	1.2	1.2	1.5	1.4	1.2	1	0.9	1.2	0.8	0.8	1.1	1.1
Nitrite(as N)	1 d	0.28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Nitrogen	0.15	0.41	1.3E	0.22	0.48	4.81	0.07	0.28	1.47	0.30	1.59	4.05	8.79	8.79	8.79
pH	6.5 to 8.5	7.7	7.7	7.85	8.26	7.72	7.47	8.29	7.77	7.63	7.91	7.76	7.47	7.47	7.47
Sodium	200 [AO]	107	3.6	2.6	5	4.2	3.9	4.6	4.7	5.8	6.5	7.6	10	12	12
Sulphate	500 [AO]	290	13.8	11.4	17	12	11	14	12	11	13	10	12	12	12
Total Kjeldahl Nitrogen(as N)	-	nv	1.69	0.22	0.48	4.62	0.08	0.31	1.54	0.4	1.62	4.06	8.63	8.63	8.63

NOTE: Results expressed in mg/l, unless otherwise noted.
 1. ODWS - Ontario Drinking Water Standard, Reg. 169/03 as amended by O. Reg. 265/05.
 2. AO ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise.
 3. IMAC indicates an interim maximum acceptable concentration ODWS.
 4. AO indicates an aesthetic objective ODWS, not health related.
 5. AO indicates an operational guideline ODWS, not health related.
 6. OG indicates an operational guideline ODWS, not health related.

NOTE: Results expressed in mg/l, unless otherwise noted.
 1. ODWS - Ontario Drinking Water Standard, Reg. 169/03 as amended by O. Reg. 265/05.
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NOTE: Results expressed in mg/l, unless otherwise noted.

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Municipality of West Grey
Groundwater Quality - Normanby Landfill

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TWSA 29-Apr-09	TWSA 13-Oct-09	TWSA 4-May-10	TWSA 10-Nov-10	TWSA 14-Apr-11	TWSA 25-Oct-11	TWSA 3-Apr-12	TWSA 25-Sep-12	TWSA 7-May-13	TWSA 26-Nov-13	TWSA 1-May-14	TWSA 4-Nov-14	TWSA 20-Apr-15	TWSA 3-Nov-15	TWSA 19-Apr-16	TWSA 26-Oct-16	TWSA 16-May-17	TWSA 27-Nov-17
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	247	262	241	252	234	262	272	257	320	310	320	360	340	350	350	360	340	360
Ammonia(as N)	-	nv	<0.01	<0.01	0.5	0.09	0.07	0.44	0.28	0.02	0.27	0.31	0.46	1.2	1.0	1.4	0.81	1.4	0.95	1.30
Barium	1	0.32	0.012	0.015	0.017	0.02	0.016	0.03	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
Boron	5 [IMAC]	1.31	0.014	0.019	0.016	0.045	<0.005	0.036	0.025	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019
Calcium	-	nv	67.8	68.2	63.2	74.5	68.8	76	62.3	74.4	90	97	25	23	24	36	100	34	30	27
Chloride	250 [AO]	127	16.7	17.4	17.5	19.9	18.3	15.5	21.2	19.8	22	22	22	25	24	28	36	34	30	27
Conductivity - @25°C (µS/cm)	-	nv	529	544	517	534	513	564	528	528	750	760	770	820	780	820	860	880	830	850
Hardness(as CaCO ₃)	80-100 [OG]	183	275	270	253	272	271	299	258	268	380	410	370	430	420	440	410	440	400	420
Iron	0.3 [AO]	0.36	<0.005	<0.005	0.006	<0.005	<0.005	0.062	<0.005	0.052	<0.1	<0.1	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	-	nv	25.6	24.2	23.2	25.6	24	26.4	24.9	27.2	38	40	8.1	5.93	5.68	5.61	5.6	5.58	6.01	8.23
Nitrate(as N)	10 d	2.68	1.2	0.8	1.3	1.4	0.1	0.8	1.8	0.8	5.8	8.3	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
Nitrite(as N)	1 d	0.28	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.027	0.073	1.24	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Organic Nitrogen	0.15	0.41	6.55	2.74	7.6	6.54	3.29	4.42	7.81	3.52	1.13	1.59	1.24	7.73	8.01	7.96	7.8	7.95	7.88	7.7
pH	6.5-8.5 [OG]	7.25	7.32	7.25	7.75	7.44	7.44	7.85	7.96	7.7	7.84	7.81	7.97	7.97	8.01	7.96	7.8	7.95	7.88	7.7
Sulfate	200 [AO]	107	6	5.8	6.6	5.9	5.6	5.2	6.8	5.1	14	15	15	18	17	19	22	25	22	21
Sulfate	500 [AO]	290	11	11	11	11	11	10	12	13	26	27	32	36	35	36	36	35	33	37
Total Kjeldahl Nitrogen(as N)	-	nv	6.56	2.75	8.1	6.63	3.36	4.86	8.09	3.54	1.4	1.4	1.7	1.1	2.5	2.1	1.2	2.1	1.3	1.4

NOTES:

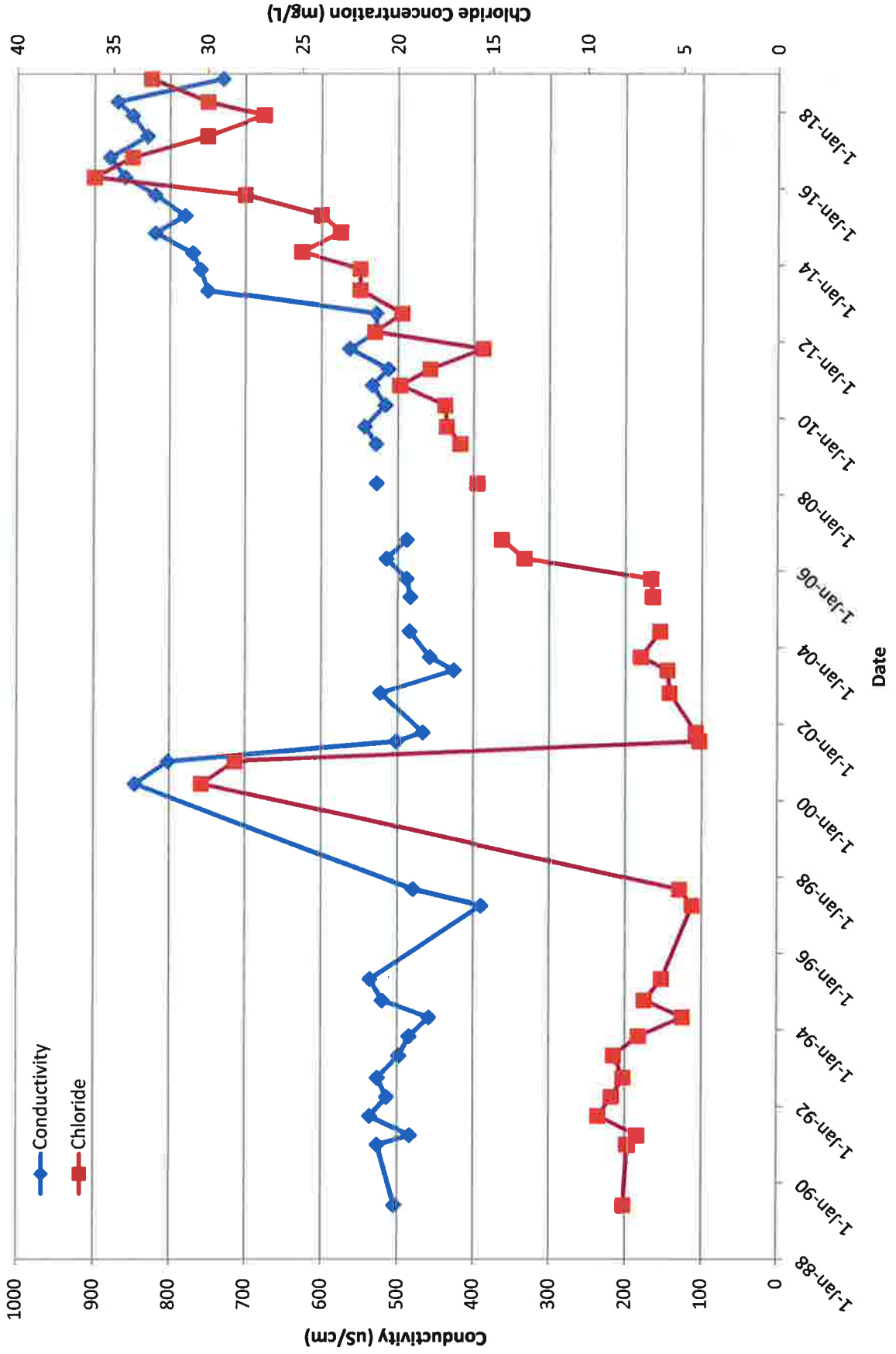
- All results expressed in mg/L unless otherwise noted
- AO - Above Operational Guideline
- ALODWS - Above Limit of Drinking Water Standards (per O. Reg. 265/05)
- ALODWS - Above Limit of Drinking Water Standards (per O. Reg. 265/05)
- IMAC - Indicates an interim maximum acceptable concentration (ODWO)
- AO - Indicates an aesthetic objective (ODWO, not health related)
- OG - Indicates an operational guideline (ODWO, not health related)

Exceeds ODWS
Exceeds RUC

BOLD

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TW5A	
			10-Apr-18	14-Nov-18
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	370	370
Ammonia(as N)	-	nv	1.6	2.00
Barium	1	0.32		
Boron	5 [IMAC]	1.31		
Calcium	250 [AO]	nv	100	33
Chloride	-	127	870	730
Conductivity - @25°C (µS/cm)	-	nv		
Hardness(as CaCO ₃)	80-100 [OG]	183		470
Iron	0.3 [AO]	0.36	<0.02	<0.02
Magnesium	-	nv	42	
Nitrate(as N)	10 d	2.68	8.86	8.55
Nitrite(as N)	1 d	0.28		
Organic Nitrogen	0.15	0.41		
pH	6.5-8.5 [OG]	6.5 to 8.5	7.75	7.69
Sodium	200 [AO]	107	21	
Sulphate	500 [AO]	290	38	37
Total Kjeldahl Nitrogen(as N)	-	nv	1.9	1.7

Historical Groundwater Conductivity and Chloride Concentrations TW-5A



Municipality of West Grew
Groundwater Quality - Normansby Landfill

TW6

Chemical Parameter	QDWS	MECP Guideline B-7 Reasonable Use Criteria	1-Jun-89	1-Oct-89	1-May-90	1-Jun-91	1-Apr-91	1-Oct-91	1-Apr-92	1-Oct-92	1-Nov-93	1-May-94	1-Oct-94	1-May-95	1-Apr-97	1-Sep-97	1-May-98
Ammonia (as N)	30 - 500 [OG]	385	1.7	0.415	1.5	1050	1015	619	847	859	702	772	984	920	658	741	380
Barium	1	nv					2	2.1	6.509	1.9	2.2	1.5	2.69	3.08	5.31	2.92	0.14
Boron	5 [IMAC]	0.32															
Calcium	250 [AO]	nv	175	244	180	82.7	130	224	134	8.5	109	112	138	121	13.8	71	13
Chloride	250 [AO]	nv	238	621	152	84.8	58.3	768	63.8	56.1	57	22	66.3	23.4	13.8	71	13
Conductivity @25°C (µS/cm)	80-100 [OG]	nv	2630	3340	2330	2030	2070	3190	1920	1930	1620	1670	1780	1670	1300	670	1224
Hardness (as CaCO ₃)	0.3 [AO]	183	1121	1372	1039	307	441	1154	820	839	616	646	681	646	793	659	874
Iron	10 d	2.68	166	185	155	146	149	162	142	146	132	135	129	131	0.1	0.1	1.6
Nitrate (as N)	1 d	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.05
Organic Nitrogen	0.15	0.4	0.9	0.01	0.01	0.22	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.05	0.1	0.1	0.05
pH	6.5 to 8.5	nv	7.1	7.03	7.31	7.51	7.34	7.42	7.15	7.36	8.04	7.74	7.45	7.5	20.1	59.3	7.03
Sulfate	200 [AO]	107															
Total Kjeldahl Nitrogen (as N)	500 [AO]	280	2.6	0.64	2.42	3.3	3.5	2.2	3.2	4.3	3.2	8.7	3.76	5.06	14.7	32.7	17.2
Mercury	0.031 [IMAC]	nv															

NOTES:

- All results expressed in mg/L unless otherwise noted
- AO indicates an aesthetic objective ODWO, not health related
- IMAC indicates an interim maximum acceptable concentration ODWO
- OG indicates an operational guideline ODWO, not health related
- CG indicates an operational guideline ODWO, not health related

Exceeds ODWS

Exceeds RUC

BOLD

Municipality of West Grey
Groundwater Quality - Normandy Landfill

TW6

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	TW6 9-Jun-00	TW6 5-Jun-01	TW6 18-Jul-01	TW6 003 19-Oct-01	TW6 004 (dup) 19-Oct-01	TW6 004 27-Jun-02	TW6 004 23-Oct-02	TW6 004 27-May-03	TW6 004 30-Sep-03	TW6 004 3-Jun-04	TW6 013 22-Sep-04	TW6 009 27-Apr-05	TW6 006 17-Oct-05	TW6 008 27-Apr-06	TW6 006 25-Oct-06
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	887	852	838	814	827	760	711	762	854	723	810	870	810	810	838
Ammonia(as N)	1	nv	3.51	5.19	3.87	3.25	4.56	4.24	2.69	4.12	2.64	4.48	1.88	3.42	1.86	2.04	1.57
Barium	5 [IMAC]	0.32	0.988	0.133	0.14	0.12	0.14	0.13	0.17	0.183	0.165	0.198	0.131	0.178	0.148	0.174	0.131
Boron	250 [AO]	1.3	0.57	0.35	0.37	0.4	0.39	0.34	0.27	0.33	0.338	0.392	0.359	0.385	0.427	0.44	0.453
Cadmium	1.4	nv	143	126	116	137	128	114	171	158	162	170	135	178	163	177	153
Chloride	250 [AO]	127	36.2	14.4	29.2	13.8	14.5	23.3	190	17.2	56.1	12.9	67.6	8.3	44.5	29.4	26.3
Conductivity @25°C (µS/cm)	80-100 [OG]	183	1410	1220	1508	1435	1435	1467	1840	1450	1550	1400	1740	1540	1610	1650	1430
Hardness(as CaCO ₃)	0.3 [AO]	0.36	803	711	664	731	760	514	684	622.44	724	674	773	690	629	699	643
Iron	10.4	nv	3.88	3.4	6.71	2.46	8.21	5.84	5.43	10.8	6.63	13.3	4.4	11	6.13	4.31	5.03
Magnesium	10.4	nv	106	98	50.8	82	80.2	104	104	104	103	109	106	106	111	111	112
Nitrate(as N)	1.4	0.4	nv	nv	0.5	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	<0.1	0.1
Nitrite(as N)	0.4	0.4	nv	nv	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Nitrogen	6.5-8.5 [OG]	107	1.39	0.71	2.55	2.3	1.53	0.97	1.02	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
pH	200 [AO]	290	7.22	7.28	7.41	7.19	7.29	6.8	6.26	6.95	6.87	7.22	6.91	6.84	6.83	7.28	7.12
Sodium	500 [AO]	290	51.1	19.7	29.9	24.7	21.3	23.6	110	24.1	64	18.7	7.3	17.4	58.2	125	40.8
Sulphate	290	nv	32	12.5	26	17	17.1	36	72	97	61	169	164	164	122	125	89
Total Kjeldahl Nitrogen(as N)	0.001 [IMAC]	nv	4.5	5.9	6.22	6.18	6.11	5.21	3.93	4.79	3.56	5.71	4.51	2.96	3.61	2.68	

NOTE:
1 All results expressed in mg/L, unless otherwise noted.
2 ODWS Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 252/05)
3 MECP Maximum Acceptable Concentration (MAC) unless indicated otherwise
4 IMAC indicates an interim maximum acceptable concentration (ODWS)
5 AO indicates an aesthetic objective (ODWS, not health related)
6 CG indicates an operational guideline (ODWS, not health related)

BOLD Exceeds ODWS
Exceeds RUC

Chemical Parameter	ODWS:	MECP Guideline B-7 Reasonable Use Criteria	TW6 008 9-Apr-07	TW6 005 10-Oct-07	TW6 008 17-Apr-08	TW6 008 8-Oct-08	TW6 25-Apr-09	TW6 13-Oct-09	TW6 4-May-10	TW6 10-Nov-10	TW6 14-Apr-11	TW6 25-Oct-11	TW6 3-Apr-12	TW6 28-Sep-12
Aluminum(as CaCO ₃)	30 - 500 [DO]	355	624	900	740	890	954	939	941	909	790	838	808	612
Ammonia(N)	-	NV	2.17	1.39	1.5	4.48	1.47	3.3	1.01	1.63	1.07	0.95	0.78	1.98
Barium	1	0.32	0.152	0.119	0.147	0.116	0.134	0.105	0.146	0.15	0.141	0.188	0.128	0.112
Boron	5 [IMAC]	1.3	0.353	0.397	0.338	0.37	0.355	0.400	0.38	0.528	0.36	0.541	0.346	0.303
Calcium	-	NV	165	132	153	146	177	138	166	159	174	156	136	135
Chloride	250 [AO]	127	10.8	106	14.9	79.5	0.5	43.7	32.3	52.1	16.6	13.5	25.5	92.3
Conductivity @25°C (µS/cm)	-	NV	1420	1840	1290	1650	1510	1790	1640	1710	1490	1630	1490	1710
Hardness(as CaCO ₃)	60-100 [OG]	183	769	769	764	719	838	765	880	876	619	860	624	759
Iron	0.3 [AO]	0.36	7.61	0.736	3	2.74	3.84	5.38	2.25	0.647	1.64	1.57	3.01	3.16
Magnesium	-	NV	91.3	112	84.3	85.9	96.2	107	108	116	92.6	146	83.5	106
Nitrate(as N)	10 d	2.68	<0.1	0.5	<0.1	0.9	0.5	3.1	0.1	0.3	<0.1	<0.1	0.2	2.2
Nitrite(as N)	1 d	0.3	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Nitrogen	0.4	0.4	1.11	0.6	1.07	1.32	2.82	3.85	1.8	3.44	1.12	0.71	1.54	1.17
pH	6.5-8.5 [OG]	6.5 to 8.5	7.03	7.09	7.03	7.24	6.90	6.79	6.76	7.37	6.99	7.28	7.26	7.05
Sodium	200 [AO]	107	17.7	95.7	19.7	65.4	16.9	72.3	94	55.5	17.5	33.7	36.9	11.6
Sulphate	500 [AO]	290	112	57	121	55	98	41	94	71	89	53	83	72
Total Kjeldahl Nitrogen(gas N)	-	NV	3.28	2.15	2.37	8.75	4.23	5.95	2.61	4.07	2.24	1.66	2.32	3.15

NOTES:
 1 All results expressed in mg/L unless otherwise noted.
 2 TW6 008 Drinking Water Minimums (per O Reg. 160/02 as amended to O Reg. 250/05)
 3 All ODWS are in mg/L unless otherwise noted.
 4 IMAC indicates an interim maximum acceptable concentration ODWS.
 5 AO indicates an aesthetic objective ODWS, not health related.
 6 OG indicates an operational guideline ODWS, not health related.

BOLD Exceeds RUC

Municipality of West Grey
Groundwater Quality - Normanby Landfill

TW6

Chemical Parameter	DDWS	MECP Guideline B-7 Reasonable Use Criteria	7-May-13	25-Nov-13	1-May-14	4-Nov-14	20-Apr-15	3-Nov-15	19-Apr-16	26-Oct-16	16-May-17	27-Nov-17	10-Apr-18	14-Nov-18
Aluminium (As N)	30 - 500 [OG]	355	760	970	790	890	800	920	730	800	730	870	790	870
Ammonia (As N)	1	nv	0.31	1.6	0.57	1.6	0.14	2.2	0.69	0.77	0.77	0.8	0.25	1.8
Boron	5 [IMAC]	0.32	200	200	200	200	0.16	0.39	0.43	0.43	0.43	0.14	0.13	0.13
Calcium	250 [AO]	nv	1500	1700	1500	1700	7	19	25	4.3	200	200	180	0.5
Chloride	250 [AO]	nv	1500	1700	1500	1700	15	7	1500	1500	1700	1700	1500	1500
Conductivity - @25°C (µS/cm)	80-100 [OG]	183	800	940	770	800	500	950	740	840	840	840	810	870
Hardness (As CaCO ₃)	0.3 [AO]	0.36	<0.1	<0.1	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.11
Iron	10 d	2.68	85	110	ND	ND	0.3	3.38	0.9	1.08	1.08	2.09	1.14	0.32
Magnesium	1 d	0.4	0.18	<0.1	ND	ND	0.3	0.48	0.51	0.85	0.85	0.9	0.58	0.8
Nitrate (As N)	0.15	0.4	0.025	0.026	ND	ND	0.3	0.48	0.51	0.85	0.85	0.9	0.58	0.8
Organic Nitrogen	6.5 to 8.5	107	7.68	7.55	7.6	7.61	7.92	7.84	8.04	7.75	7.75	7.55	7.65	7.7
pH	200 [AO]	14	14	27	15	18	18	18	17	17	18	18	18	18
Sulfate	500 [AO]	250	110	110	86	86	86	78	23	130	130	110	110	110
Total Kjeldahl Nitrogen (As N)	0.001 [MAC]	nv	1.5	3.6	2.3	0.82	0.82	3.5	1.3	0.95	1.1	0.93	0.93	2.8

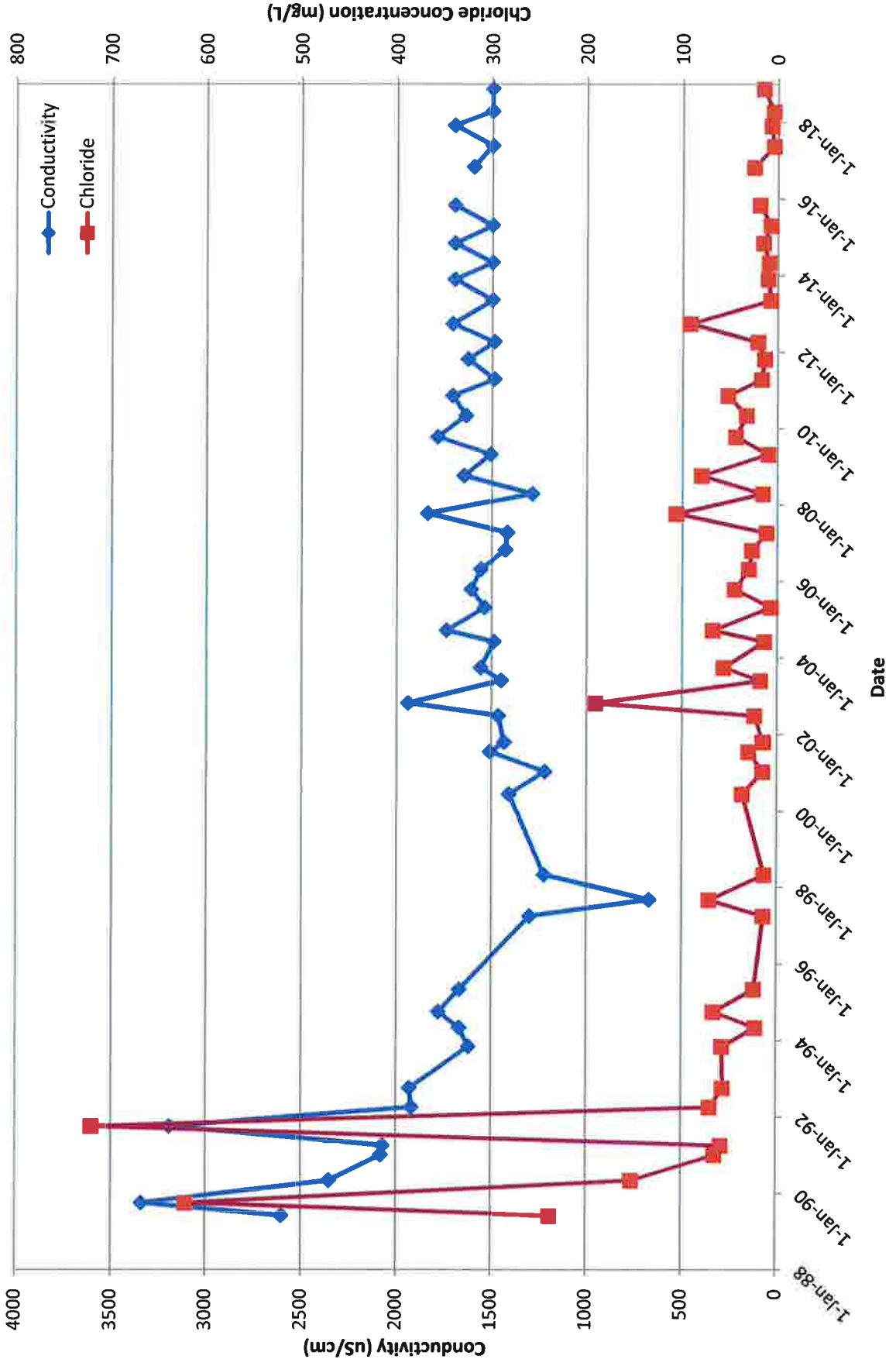
DDWS:

- All results submitted in mg/L unless otherwise noted.
- DDWS - Current Drinking Water Standards (DW-C) (B10) as amended in C-Reg. 205/03.
- MECP - Maximum Contaminant Level Goal (MCL-G) as defined in the Environmental Protection Act, 1999.
- IMAC - Interim Maximum Contaminant Level (IMCL) as defined in the Environmental Protection Act, 1999.
- AO - Action Level (AL) as defined in the Environmental Protection Act, 1999.
- OG - Other Guideline (OG) as defined in the Environmental Protection Act, 1999.
- nv - Not Valid (NV) as defined in the Environmental Protection Act, 1999.
- ND - Not Detected (ND) as defined in the Environmental Protection Act, 1999.

MECP: Estrook ODWS
Estrook RUC

DDWS: Estrook RUC

Historical Groundwater Conductivity and Chloride Concentrations TW-6



Municipality of West Grey
Groundwater Quality - Normanby Landfill

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	OWZ 1-May-93	OWZ 1-Nov-93	OWZ 1-May-94	OWZ 1-Oct-94	OWZ 1-Oct-95	OWZ 1-Apr-97	OWZ 1-May-98	OWZ 1-Nov-99	OWZ 004 18-Jul-01	OWZ 013 (dup) 18-Jul-01	OWZ 007 19-Oct-01	OWZ 002 27-Jun-02	OWZ 23-Oct-02	OWZ 009 27-May-03	OWZ 009 30-Sep-03	OWZ 009 3-Jun-04	OWZ 004 22-Sep-04
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	369	0.091	270	261	308	259	112	266	272	329	371	348	DRY	333	375	356	375
Ammonia(as N)	1	0.32	0.091	0.036	0.051	0.279	0.18	0.622	0.13	0.05	0.57	<0.01	0.79	2.46	0.1	0.14	1.52	0.37	
Boron	5 [IMAC]	1.31	0.091	0.036	0.051	0.279	0.18	0.622	0.13	0.05	0.04	0.03	0.06	0.07	0.073	0.085	0.124	0.11	
Calcium	250 [AO]	127	30.6	12.6	11.3	9.2	22.2	31.8	31.1	30.9	64	73.1	101	67	85.6	94	89.1	86.6	
Chloride	250 [AO]	127	722	696	586	657	699	530	570	604	19.6	22.5	31.3	22.4	42.8	29.9	37.8	36.1	
Conductivity @25°C (µS/cm)	80-100 [OG]	183	348	405	306	340	387	315	299	372	274	365	427	300	350.041	377	349	822	
Hardness(as CaCO ₃)	0.3 [AO]	0.36	0.091	0.036	0.051	0.279	0.18	0.622	0.13	0.05	0.29	<0.01	<0.01	1.46	0.22	0.054	0.065	0.078	
Iron	10 d	2.68	0.2	0.1	1.6	0.3	0.6	1.97	1.8	0.61	27.7	44.4	42.4	32.3	33.1	34.6	35.7	35.7	
Nitrate(as N)	1 d	0.28	0.01	0.01	0.01	0.03	0.01	0.1	0.05	0.05	<0.1	4.7	0.6	0.6	0.8	0.2	0.2	0.2	
Nitrite(as N)	0.15	0.41	0.859	0.414	0.325	0.651	0.39	0.31	1.08	4.2	0.49	0.18	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Organic Nitrogen	6.5-8.5 [OG]	107	7.77	8.12	7.66	7.96	7.74	7.6	7.18	7.71	7.47	7.96	7.52	7.19	7.72	7.51	8.33	7.26	
pH	200 [AO]	107	7.77	8.12	7.66	7.96	7.74	7.6	7.18	7.71	7.47	7.96	7.52	7.19	7.72	7.51	8.33	7.26	
Sodium	500 [AO]	290	0.99	0.45	0.98	0.94	51.4	19	16.1	72.3	17.5	31.8	66.7	16.2	34	23.5	29.3	24	
Sulphate	500 [AO]	290	0.99	0.45	0.98	0.94	51.4	19	16.1	72.3	17.5	31.8	66.7	16.2	34	23.5	29.3	24	
Total Kjeldahl Nitrogen(as N)	-	FTV	0.99	0.45	0.98	0.94	51.4	1.53	1.21	4.3	1.06	0.58	0.87	3.48	2.67	0.79	2.58	1.04	

NOTES:
 1 All results expressed in mg/L unless otherwise noted
 2 ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05)
 3 All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
 4 IMAC indicates an interim maximum acceptable concentration ODWO
 5 AO indicates an aesthetic objective ODWO, not health related
 6 OG indicates an operational guideline ODWO, not health related

Exceeds ODWS
Exceeds RUC

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	OW2 004 27-Apr-05	OW2 001 17-Oct-05	OW2 007 27-Apr-06	OW2 003 26-Oct-06	OW2 004 9-Apr-07	OW2 005 10-Oct-07	OW2 005 17-Apr-08	OW2 005 6-Oct-08	OW2 29-Apr-09	OW2 13-Oct-09	OW2 4-May-10	OW2 10-Nov-10	OW2 14-Apr-11	OW2 25-Oct-11	OW2 3-Apr-12	OW2 26-Sep-12	OW2 7-May-13
Alkalinity (as CaCO ₃)	30 - 500 [OG]	355	324	342	312	362	398	DRY	324	412	352	357	332	383	343	363	342	314	330
Ammonia (as N)	-	nv	0.7	0.02	0.29	<0.01	0.47		0.39	<0.01	0.49	0.02	<0.01	<0.01	0.1	<0.01	<0.01	0.15	0.13
Barium	1	0.32	0.093	0.095	0.081	0.072	0.077		0.059	0.111	0.054	0.054	0.071	0.059	0.053	0.061	0.041	0.05	
Boron	5 [IMAC]	1.31	0.269	0.254	0.283	0.218	0.338		0.266	0.265	0.23	0.263	0.247	0.19	0.238	0.304	0.18	0.177	
Calcium	-	nv	82.1	96.4	84.1	96.8	94.5		78	125	89	87.5	96.8	101	88	98.4	75.8	84.9	88
Chloride	250 [AO]	127	24.7	29.4	24.6	28.4	30.8		24.9	25.1	23.7	22.3	23.8	20.8	21.3	24	22.3	17.7	22
Conductivity @25°C (µS/cm)	-	nv	756	774	718	763	831		740	799	779	769	742	779	753	817	732	679	760
Hardness (as CaCO ₃)	80-100 [OG]	183	340	389	348	385	395		322	505	367	357	402	407	352	404	327	355	350
Iron	0.3 [AO]	0.36	0.024	0.019	0.015	<0.005	0.014		<0.005	4.32	<0.005	0.024	9.21	0.172	0.082	0.065	0.03	0.054	<0.1
Magnesium	-	nv	32.7	36	33	34.8	38.6		30.9	47	35.3	33.6	38.8	37.7	34.5	38.4	33.5	34.7	33
Nitrate (as N)	10 d	2.68	3.4	0.7	4.2	0.3	6.4		5.9	0.9	3.9	0.3	3	0.6	4.4	0.5	2.7	0.7	3.9
Nitrite (as N)	1 d	0.28	<0.1	0.2	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01
Organic Nitrogen	0.15	0.41	2.33	1.54	1.35	0.58	1.03		0.88	0.78	1.22	0.73	0.56	0.45	0.72	<0.69	0.75	1.51	1.67
pH	6.5-8.5 [OG]	6.5 to 8.5	7.64	7.29	7.65	7.81	7.51		7.55	7.16	7.25	7.15	7	7.59	6.99	7.53	7.67	7.97	7.96
Sodium	200 [AO]	107	22.8	19.5	21.7	18.4	29.4		24.7	27	23.7	13.8	16	14.9	21.2	15.5	19	12.7	21
Sulphate	500 [AO]	290	31	71	30	54	33		32	31	27	44	30	21	24	40	25	38	30
Total Kjeldahl Nitrogen (as N)	-	nv	3.03	1.56	1.64	0.57	1.5		1.27	0.79	1.77	0.75	0.57	0.47	0.82	0.7	0.75	1.76	1.8

NOTES:
 1. All results expressed in mg/L, unless otherwise noted.
 2. ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 265/05)
 3. All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
 4. IMAC indicates an interim maximum acceptable concentration ODWS
 5. AO indicates an aesthetic objective ODWS, not health related
 6. OG indicates an operational guideline ODWS, not health related

BOLD Exceeds ODWS
 Exceeds RUC

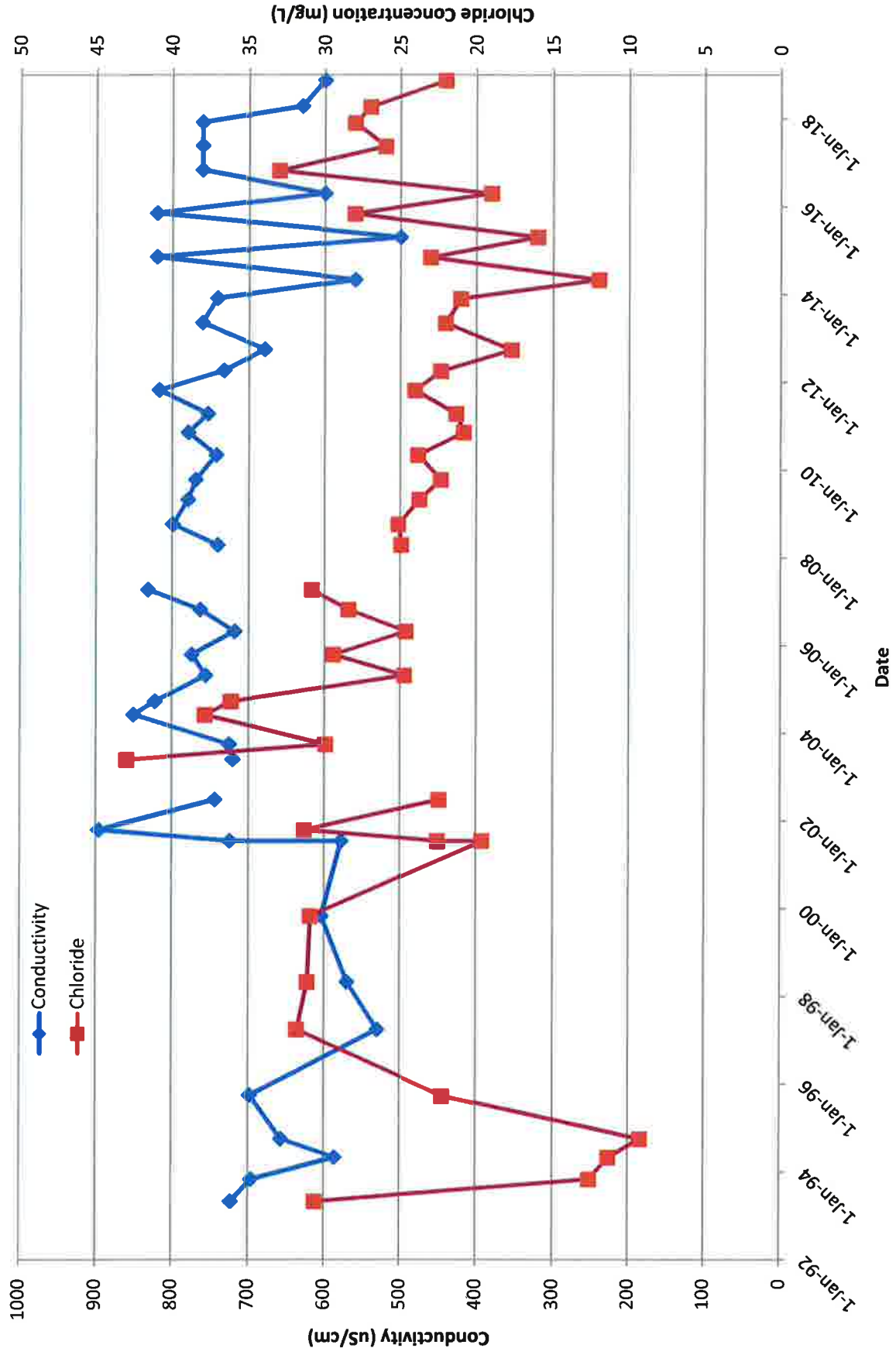
Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	26-Nov-13	1-May-14	4-Nov-14	10-Apr-15	3-Nov-15	19-Apr-16	26-Oct-16	16-May-17	27-Nov-17	10-Apr-18	14-Nov-18
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	340	260	380	210	370	270	300	340	340	260	270
Ammonia(as N)	1	nv	0.067	0.24	<0.05	0.054	0.15	0.095	0.38	<0.050	<0.050	<0.050	0.18
Barium	1	nv											
Boron	5 [IMAC]	0.32											
Calcium	1	1.31	94										
Chloride	250 [AO]	nv	21	12	23	16	28	19	33	26	28	27	22
Conductivity @25°C (µS/cm)	1	nv	740	560	820	500	820	600	760	760	760	630	600
Hardness(as CaCO ₃)	80-100 [OG]	183	380	360	430	250	440	280	380	370	380	310	350
Iron	0.3 [AO]	0.36	<0.1	0.03	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium	10 d	nv	35										
Nitrate(as N)	1 d	2.68	2.3	3.25	0.58	2.44	0.43	2.39	0.25	2.07	1.87	4.95	<0.10
Nitrite(as N)	1 d	0.28	<0.01										
Organic Nitrogen	0.15	0.41	0.853	1.06	0.62	0.476	0.33	0.725	0.61	0.74	0.13	0.305	0.04
pH	6.5 to 8.5	7.9	7.9	8.02	7.88	8.05	8.04	8.06	8.06	7.95	7.65	7.9	7.87
Sodium	200 [AO]	107	20	13	21	12	23	14	20	24	22	17	22
Sulphate	500 [AO]	290	26	20	34	22	38	20	56	26	27	23	72
Total Kjeldahl Nitrogen(as N)	nv	0.93	0.93	1.3	0.67	0.53	0.48	0.22	0.99	0.79	0.15	0.35	0.22

NOTES:

- All results expressed in mg/L, unless otherwise noted
- ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05)
- All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
- IMAC indicates an interim maximum acceptable concentration ODWO
- AO indicates an aesthetic objective ODWO, not health related
- OG indicates an operational guideline ODWO, not health related

BOLD Exceeds ODWS
Exceeds RUC

Historical Groundwater Conductivity and Chloride Concentrations OW-2



Municipality of West Grey
Groundwater Quality - Normanby Landfill

Chemical Parameter	MECP Guideline B-7 Reasonable Use Criteria	ODWS	OW3 1-May-93	OW3 1-Nov-93	OW3 1-May-94	OW3 1-Oct-94	OW3 1-May-95	OW3 1-Oct-95	OW3 1-May-96	OW3 1-Apr-97	OW3 1-Sep-97	OW3 1-May-98	OW3 1-Nov-99	OW3 9-Jun-00	OW3 006 18-Jul-01	OW3 008 19-Oct-01	OW3 001 27-Jun-02
Alkalinity(as CaCO ₃)	355	30 - 500 [OG]	365	0.068	303	493	336	356	359	296	406	342	365	414	314	475	444
Ammonia(as N)	NV	1			0.039	0.107	0.23	0.13		0.656	0.031	0.14	0.05	0.12	<0.01	0.01	0.35
Barium	0.32	5 [IMAC]												0.56	0.03	0.05	0.34
Boron	1.31													0.61	0.27	0.45	0.62
Calcium	127		32.6	57	21.5	44.2	30.4	37.8	37.4	33.2	60.9	48	47.4	104	71.6	116	90.5
Chloride	NV	250 [AO]	890	1066	717	1013	775	895	985	650	1250	884	930	39.3	22	39.3	31.2
Conductivity - @25°C (µS/cm)	NV		427	571	383	504		454					557	901	720	1078	995
Hardness(as CaCO ₃)	183	80-100 [OG]															424
Iron	0.36	0.3 [AO]											0.01	0.09	<0.01	<0.01	0.03
Magnesium	NV	10 d	4.2	0.1	3.1	0.1	4.8	3.4	0.05	4.06	4.45	2.19	0.93	57.8	40.4	66.2	48.2
Nitrate(as N)	2.68		0.01	0.01	0.01	0.03	0.05	0.01	0.05	0.1	0.1	0.05	0.05	3.9	4.7	1.5	8
Nitrite(as N)	0.28	1 d	0.632	0.34	0.401	0.353	0.57	0.57						nd	<0.1	<0.1	<0.1
Organic Nitrogen	0.41	0.15	7.64	7.75	8.07	7.58	7.78	7.57	7.23	7.6	7.3	7.1	7.68	7.37	0.33	0.41	0.52
pH	6.5 to 8.5				15.1		24.7	19	26	28.8	60.6	38.2	30.8	40	14.4	7.54	7.01
Sodium	107	200 [AO]					42.1	74.5	60.3	52.9	62.2	15.5	91.7	50	31.3	64.3	26.5
Sulphate	280	500 [AO]	0.7	0.36	0.44	0.46	0.6	0.7		0.98	0.4	1.82	-3.1	1.3	0.33	0.42	38.9
Total Kjeldahl Nitrogen(as N)	NV																0.87

NOTES:
 1. All results expressed in mg/L unless otherwise noted
 2. ODWS - Ontario Drinking Water Standards (per C. Reg. 16903 as amended to C. Reg. 25505)
 3. All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
 4. IMAC indicates an interim maximum acceptable concentration ODWO
 5. AO indicates an aesthetic objective ODWO, not health related
 6. OG indicates an operational guideline ODWO, not health related

Exceeds ODWS
 Exceeds RUC

BOLD

Municipality of West Grey
Groundwater Quality - Normanby Landfill

OW3

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	OW3														
			003 23-Oct-02	006 27-May-03	005 30-Sep-03	005 3-Jun-04	001 22-Sep-04	006 27-Apr-05	002 17-Oct-05	003 27-Apr-06	004 26-Oct-06	005 9-Apr-07	004 17-Apr-08	003 5-Oct-08	003 29-Apr-09	003 13-Oct-09	
Alkalinity (as CaCO ₃)	30 - 500 [OG]	355	331	402	504	378	453	358	358	436	384	555	358	360	486	362	461
Ammonia (as N)	-	nv	0.01	0.07	0.01	0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Barium	1	0.32	0.045	0.051	0.076	0.048	0.055	0.041	0.041	0.052	0.045	0.051	0.035	0.037	0.053	0.032	0.047
Boron	5 [IMAC]	1.31	0.31	0.42	0.627	0.449	0.375	0.422	0.422	0.559	0.481	0.479	0.354	0.375	0.552	0.331	0.491
Calcium	-	nv	105	108	119	99.9	96.4	88	88	100	103	118	89	88.3	103	60.9	97.5
Chloride	250 [AO]	127	38.6	41.9	53.5	24.8	33.6	18.8	18.8	33.9	23.9	27.2	18.5	21.5	36.4	19.5	34.2
Conductivity - @25°C (µS/cm)	-	nv	925	965	1140	873	982	792	792	963	853	956	709	872	1000	776	984
Hardness (as CaCO ₃)	80-100 [OG]	183	487	498.518	558	441	464	395	395	457	445	538	390	382	449	384	432
Iron	0.3 [AO]	0.36	<0.02	0.33	0.013	0.011	0.007	0.017	0.017	0.018	<0.005	<0.005	0.01	0.01	<0.005	<0.005	0.011
Magnesium	-	nv	54.7	55.6	63.5	47.1	53.1	42.5	42.5	50.4	47.9	58.8	40.1	39.1	46.2	40.6	45.8
Nitrate (as N)	10 d	2.68	4	15.9	14.1	8.4	5.9	5.9	5.9	7.4	7.7	1.8	6.5	7.9	6	6.3	4.5
Nitrite (as N)	1 d	0.28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Nitrogen	0.15	0.41	0.72	2.34	0.65	0.64	0.87	1.64	1.64	1.02	0.81	1.58	0.68	2.32	0.82	0.88	0.88
pH	6.5-8.5 [OG]	8.38	7.58	7.29	8.25	7.24	7.48	7.48	7.48	7.35	7.85	7.63	7.49	7.41	7.18	7.34	7.08
Sodium	200 [AO]	107	23.9	34.1	46.4	19.7	19.1	16.1	16.1	30.8	20.1	28.4	12.9	14.9	28.8	14.9	27.5
Sulphate	500 [AO]	290	69	84	70	43	70	34	34	56	37	55	38	44	37	30	43
Total Kjeldahl Nitrogen (as N)	-	nv	0.73	2.41	0.66	0.65	0.67	1.65	1.65	1.03	0.62	1.59	0.67	2.33	0.63	0.69	0.69

NOTES:
 1 All results expressed in mg/L unless otherwise noted
 2 ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05)
 3 All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
 4 IMAC indicates an interim maximum acceptable concentration ODWO
 5 AO indicates an aesthetic objective ODWO, not health related
 6 OG indicates an operational guideline ODWO, not health related

Exceeds ODWS
Exceeds RUC

BOLD

Municipality of West Grey
Groundwater Quality - Normanby Landfill

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	OW3	OW3	OW3	OW3	OW3	OW3	OW3	OW3	OW3	OW3	OW3	OW3	OW3	OW3	OW3	OW3
			4-May-10	10-Nov-10	14-Apr-11	25-Oct-11	3-Apr-12	25-Sep-12	7-May-13	26-Nov-13	1-May-14	4-Nov-14	20-Apr-15	3-Nov-15	19-Apr-16	26-Oct-16	16-May-17	27-Nov-17
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	448	443	351	419	442	363	390	480	240	400	170	400	320	410	490	540
Ammonia(as N)	1	nv	<0.01	<0.01	<0.01	<0.01	0.11	<0.01	<0.05	<0.05	0.083	<0.05	<0.050	<0.050	<0.050	<0.050	0.1	<0.050
Barium	5 [IMAC]	0.32	0.055	0.059	0.037	0.048	0.047	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043
Boron	1.31	1.31	0.574	0.494	0.218	0.412	0.497	0.336	0.336	0.336	0.336	0.336	0.336	0.336	0.336	0.336	0.336	0.336
Calcium	nv	nv	104	111	89.9	98.8	89.3	94.8	100	130	10	24	11	28	15	30	27	30
Chloride	250 [AO]	127	33.6	30.7	17.2	20.4	29.5	26.5	20	29	10	24	11	28	15	30	27	30
Conductivity - @25°C (µS/cm)	nv	nv	1020	973	768	907	987	811	900	1100	540	910	400	910	710	950	1100	1200
Hardness(as CaCO ₃)	80-100 [OG]	183	457	484	330	447	425	424	470	570	240	440	200	450	350	470	520	570
Iron	0.3 [AO]	0.36	0.01	<0.005	<0.005	0.005	<0.005	<0.005	<0.1	<0.1	ND	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02
Magnesium	nv	nv	48.1	50.4	40.2	48.7	49	45.4	52	61	3.43	7.84	4.69	3.71	3.3	1.24	8.05	9.24
Nitrate(as N)	10 d	2.68	9.8	6.3	4.7	3.7	10.9	1.9	5.1	8.9	3.43	7.84	4.69	3.71	3.3	1.24	8.05	9.24
Nitrite(as N)	1 d	0.28	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.01	<0.01	3.43	7.84	4.69	3.71	3.3	1.24	8.05	9.24
Organic Nitrogen	0.41	0.41	0.5	0.48	0.33	<0.33	0.66	0.58	0.58	0.65	0.257	0.26	0.5	0.38	0.21	0.26	0.51	0.23
pH	6.5 to 8.5	6.92	6.92	7.55	7.04	7.61	7.66	8.03	8.11	7.88	8.14	7.75	7.95	7.98	7.97	8.08	7.9	7.67
Sodium	200 [AO]	107	28	26	13.2	17.8	25.5	18.2	19	30	7.9	28	11	30	13	21	30	36
Sulphate	500 [AO]	290	39	35	30	34	31	58	38	45	24	33	12	37	32	58	47	36
Total Kjeldahl Nitrogen(as N)	nv	nv	0.81	0.49	0.34	0.34	0.77	0.58	0.58	0.65	0.35	0.26	0.6	0.36	0.21	0.26	0.71	<0.50

NOTES:

- All results expressed in mg/L unless otherwise noted
- ODWS - Ontario Drinking Water Standards (per O. Reg. 169/03 as amended to O. Reg. 255/05).
- All ODWS values expressed are Maximum Acceptable Concentrations, unless indicated otherwise
- IMAC indicates an interim maximum acceptable concentration ODWS.
- AO indicates an aesthetic objective ODWS, not health related
- OG indicates an operational guideline ODWS, not health related

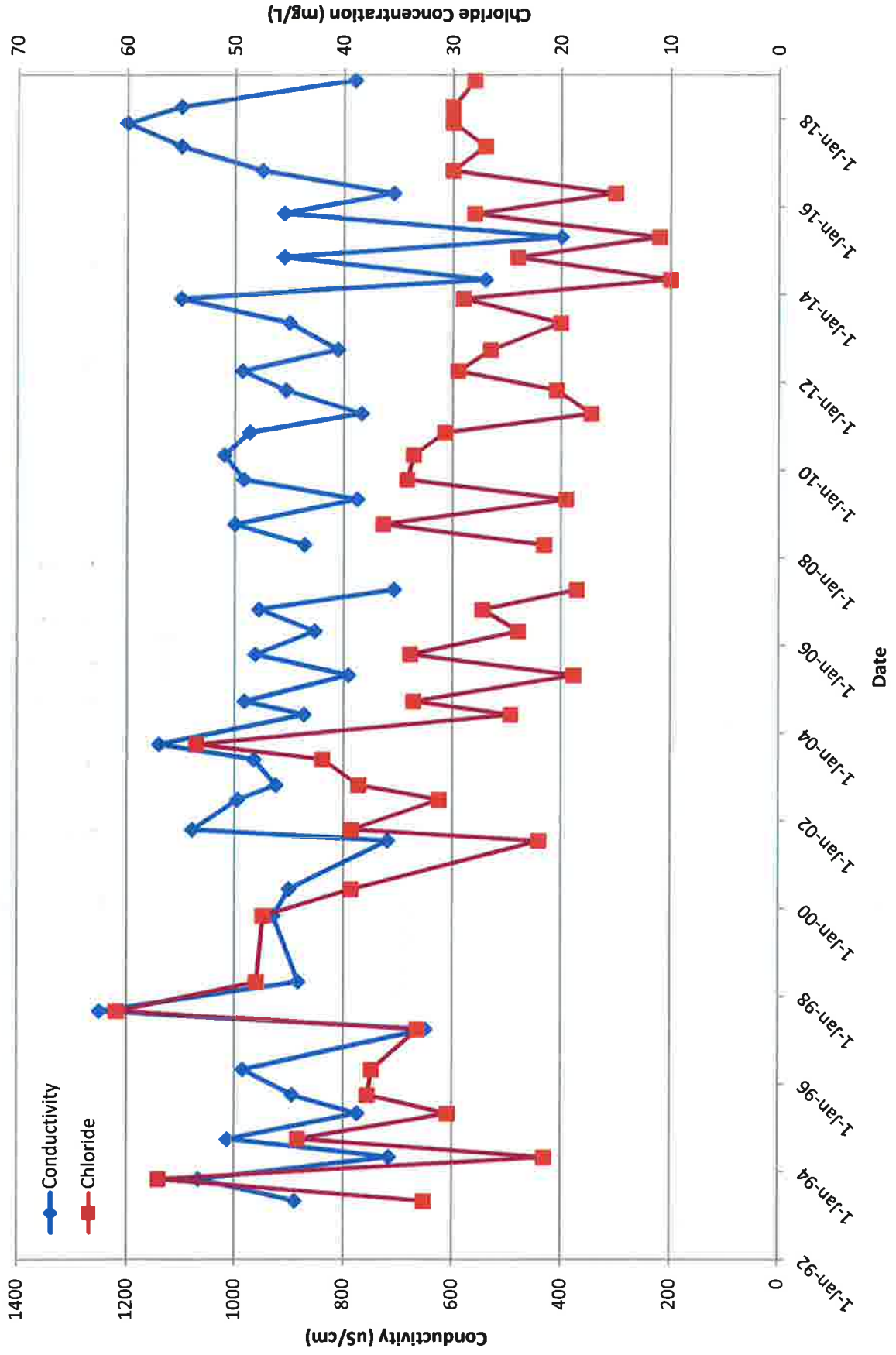
Exceeds ODWS
Exceeds RUC

Municipality of West Grey
Groundwater Quality - Normanby Landfill

OW3

Chemical Parameter	ODWS	MECP Guideline B-7 Reasonable Use Criteria	OW3	
			10-Apr-18	14-Nov-18
Alkalinity(as CaCO ₃)	30 - 500 [OG]	355	510	390
Ammonia(as N)		nv	2.3	<0.050
Barium	1	0.32		
Boron	5 [IMAC]	1.31		
Calcium		nv	110	
Chloride	250 [AO]	127	30	28
Conductivity - @25°C (µS/cm)		nv	1100	780
Hardness(as CaCO ₃)	80-100 [CG]	183	510	400
Iron	0.3 [AO]	0.36	<0.02	
Magnesium		nv	56	
Nitrate(as N)	10 d	2.68	11.9	5.04
Nitrite(as N)	1 d	0.28		
Organic Nitrogen	0.15	0.41	0.5	0.03
pH	6.5-8.5 [OG]	6.5 to 8.5	7.86	7.75
Sodium	200 [AO]	107	30	
Sulphate	500 [AO]	290	36	34
Total Kjeldahl Nitrogen(as N)		nv	2.9	<0.10

Historical Groundwater Conductivity and Chloride Concentrations OW-3



**APPENDIX E:
HISTORICAL SURFACE WATER QUALITY**

Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW1

Chemical Parameter	PWQO	SW1 Jun-89	SW1 Oct-89	SW1 May-90	SW1 Jan-91	SW1 Apr-91	SW1 Oct-91	SW1 Apr-92	SW1 Oct-92	SW1 May-94	SW1 Oct-94	SW1 May-95	SW1 Oct-95	SW1 May-96	SW1 Apr-97	SW1 Sept-97
Alkalinity (as CaCO ₃)	345		275	258	294	262						300	316	346	284	305
Total Ammonia (as N)		0.004	0.005	0.006	0.003	0.03	0.015	0.036	0.001	0.016	0.048	0.09	0.24		0.004	0.004
Chloride		13.8	18.9	15.7	14.4	12.8	20.7	14	12.8	11.3	16.2	12.8	23.5	15.4	12.6	15.6
Conductivity - @25°C (µS/cm)		620	673	601	632	581	652	589	668	596	657	652	711	716	530	640
Iron	0.3															
pH	6.5-8.5	7.70	7.93	7.92	8.07	8.05	8.16	7.86	7.75	8.21	7.90	8.07	8.03	7.57	7.80	8.10
Phosphorus, Total	0.001															
Field Temperature (C°)																

NOTES:

1. All results in mg/L unless otherwise noted.
 2. > means greater than.
 3. < means less than.
 4. PWQO indicates Provincial Water Quality Objectives
- Exceeds PWQO
Results up to 2012 are summarized and presented from previous Annual Reports completed by Others

Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW1

Chemical Parameter	PWQO	SW1 Apr-98	SW1 Sep-98	SW1 May-99	SW1 Nov-99	SW1 010 18-Jul-01	SW1 011(dup) 18-Jul-01	SW1 009 19-Oct-01	SW1 010(dup) 19-Oct-01	SW1 009 15-Jun-02	SW1 009 23-Oct-02	SW1 014 27-May-03	SW1 014 30-Sep-03	SW1 014 3-Jun-04	SW1 012 22-Sep-04	SW1 015 27-Apr-05	SW1 010 17-Oct-05
Alkalinity (as CaCO ₃)	345	370	224	220	294	313	314	309	308	294	294	270	321	288	339	278	312
Total Ammonia (as N)		0.11	0.08	0.26	0.07	0.02	0.01	0.03	0.03	0.01	0.03	0.01	0.03	0.03	0.01	0.01	0.01
Chloride		17.7	55.4	16.6	30.6	14.5	16.6	14.7	14.9	13.7	18.3	16.5	16.5	15.4	16.1	14.6	19.1
Conductivity - @25°C (µS/cm)		516	658	529	622	678	658	673	674	649	662	641	681	644	676	599	641
Iron	0.3					0.03	0.03	0.03	0.02	<0.01	0.03	0.2	0.034	0.077	0.019	0.022	0.04
pH	6.5-8.5	7.47	7.92	7.92	7.75	7.9	7.89	7.82	7.77	7.69	8.16	8.04	8.52	7.83	8.42	7.97	7.77
Phenols	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus Total						0.01	0.01	<0.01	<0.01	0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01
Field Temperature (C°)														12.7	13.9	7.6	12.1

NOTES:

1. All results in mg/L unless otherwise noted.
2. > means greater than.
3. < means less than.
4. PWQO indicates Provincial Water Quality Objectives.

⚡ Exceeds PWQO

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Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW1

Chemical Parameter	PWQO	SW1 013 27-Apr-06	SW1 (dup) 014 27-Apr-06	SW1 010 26-Oct-06	SW1 (dup) 011 26-Oct-06	SW1 014 9-Apr-07	SW1 009 10-Oct-07	SW1 014 17-Apr-08	SW1 013 6-Oct-08	SW1 27/6	SW1 13-Oct-09	SW1 4-May-10	SW1 10-Nov-10	SW1 14-Apr-11	SW1 25-Oct-11
Alkalinity (as CaCO ₃)	345	268	266	314	322	284	286	240	327	276	313	292	325	278	294
Total Ammonia (as N)		< 0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Chloride		15.9	15.9	18.1	18.1	14.7	18.6	15.1	14.9	14.1	16.3	16.7	15.7	14.1	14.5
Conductivity - @25°C (µS/cm)		589	591	648	630	572	619	599	634	595	643	633	665	588	644
Iron	0.3	0.018	0.014	0.028	0.028	0.044	0.057	0.032	0.029	0.023	0.02	0.014	0.011	0.092	0.066
pH	6.5-8.5	8.03	8.02	8.01	8.01	7.99	7.86	8.1	7.92	7.81	7.68	7.62	7.94	7.50	7.97
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, Total		<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Field Temperature (C°)		11.4	11.4	9.3		4.6	12.5	12.1	12.1	12.5	10.2	11.1	10.2	10.5	11.1

NOTES:

1. All results in mg/L unless otherwise noted.
2. > means greater than
3. < means less than
4. PWQO indicates Provincial Water Quality Objectives.

Exceeds PWQO

Results up to 2012 are summarized and presented from previous Annual Reports completed by Others

Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW1

Chemical Parameter	PWQO	SW1 3-Apr-12	SW1 25-Sep-12	SW1 25-Sep-12 Dup#1	SW1 9-May-13	SW1 26-Nov-13	SW1 1-May-13	SW1 4-Nov-13	SW1 20-Apr-15	SW1 3-Nov-15	SW1 19-Apr-16	SW1 26-Oct-16	SW1 16-May-17	SW1 27-Nov-17	SW1 10-Apr-18	SW1 14-Nov-18
Alkalinity (as CaCO ₃)	345	285	298	297	260	290	280	310	300	310	270	280	260	310	300	300
Total Ammonia (as N)		< 0.01	17.6	17.6	<0.05	<0.05	0.064	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride		15.6	17.6	17.6	16	19	14	16	16	24	18	23	16	21	21	22
Conductivity - @25°C (µS/cm)		606	623	637	620	650	600	670	660	710	600	670	620	710	680	660
Iron	0.3	0.042	0.016	0.038	<0.02	0.04	<0.02	0.03	<0.02	0.03	<0.02	0.03	0.03	0.04	0.04	<0.02
pH	6.5-8.5	8.11	8.22	8.19	8.1	8.12	8.2	8.06	8.02	8.15	8.15	8.36	8.24	8.12	8.16	8.08
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus, Total		<0.01	<0.01	<0.01	0.004	<0.01	0.005	0.007	0.007	0.009	0.005	<0.1	0.005	0.006	0.015	<0.004
Field Temperature (C ^o)		8.1	12.8		12	4	9.5	10.23	7.57	13.5	6.38	9.31	10.4	8	6.23	6.54

NOTES:

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- < means less than.
- PWQO indicates Provincial Water Quality Objectives.

Exceeds PWQO

Results up to 2012 are summarized and presented from previous Annual Reports completed by Others

SWZ

Municipality of West Grey
Surface Water Quality - Normanby Landfill

Chemical Parameter	PWQO	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	SWZ	
		1-Jun-89	1-Oct-89	1-May-90	1-Jan-91	1-Apr-91	1-Oct-91	1-Apr-92	1-Oct-92	1-May-93	1-Nov-93	1-May-94	1-Oct-94	1-May-95	1-Oct-95	1-May-96	1-Apr-97	1-Sep-97	SWZ
Alkalinity (as CaCO ₃)	345		323	280	326	292								277	292	372	291	293	412
Total Ammonia (as N)		0.019	0.002	0.016	0.013	0.036	0.008	0.015	0.082	0.012	0.042	0.021	0.034	0.08	0.19		<0.004	0.072	0.12
Chloride		13.4	13.3	16.5	20.7	14.7	24	15.8	17	13.1	17.4	13.8	18.1	14.8	5	16.7	14.9	17	18.9
Conductivity - @25°C (µS/cm)		584	669	583	707	608	636	598	667	635	615	607	631	640	609	784	540	580	538
Iron	0.3																		
pH	6.5-8.5	8.15	7.44	8.39	8.23	8.38	8.38	8.15	8.3	8.39	8.34	8.44	8.33	8.45	8.29	8.09	8.1	8.1	8.01
Phenols																			
Phosphorus, Total	0.001																		
Field Temperature (C°)																			

NOTES:

1. All results in mg/L, unless otherwise noted.
 2. > means greater than
 3. < means less than
 4. PWQO indicates Provincial Water Quality Objectives.
 5. Exceeds PWQO
- Results up to 2012 are summarized and presented from previous Annual Reports completed by Others

SW2

Municipality of West Grey
Surface Water Quality - Normanby Landfill

Chemical Parameter	PWQO	SW2 1-May-99	SW2 1-Nov-99	SW2 9-Jun-00	SW2 9-Jun-00	SW2 9-Jan-01	SW2 9-Jan-01	SW2 Rep 9-Jan-01	SW2 012 18-Jul-01	SW2 011 19-Oct-01	SW2 008 15-Jun-02	SW2 008 23-Oct-02	SW2 013 27-May-03	SW2 013 30-Sep-03	SW2 013 3-Jun-04	SW2 011 22-Sep-04	SW2 014 27-Apr-05	SW2 17-Oct-05
Alkalinity (as CaCO ₃)	345	196	235	302	300	301	300	300	314	312	312	309	267	315	282	282	246	DRY
Total Ammonia (as N)		0.14	0.05	0.06	0.07	0.05	0.05	0.05	0.01	0.01	0.02	<	0.01	0.01	0.02	<	0.03	
Chloride		21	33.4	19.3	19.6	18.2	17.6	17.6	22.2	15.3	14.9	16.3	18.9	23.9	15.8	19.4	14.2	
Conductivity - @25°C (µS/cm)		496	626	648	644	612	618	618	640	681	647	654	613	674	622	616	540	
Iron	0.3		0.1	0.11	0.11	0.22	0.22	0.22	0.03	0.03	0.21	0.42	0.27	0.111	0.212	0.509	0.15	
pH	6.5-8.5	7.98	7.75	7.9	7.94	7.93	7.99	7.99	8.31	7.79	8.03	7.91	8.21	8.55	8.45	8.34	8.26	
Phenols	0.001			nd	nd	nd	nd	nd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Phosphorus, Total				0.017	0.015	0.29	0.29	0.29	0.1	<0.01	0.05	0.06	0.01	0.01	0.02	0.04	0.02	
Field Temperature (C°)															17.8	17.6	8.2	

NOTES:

- All results in mg/L unless otherwise noted
- > means greater than
- < means less than
- PWQO indicates Provincial Water Quality Objectives

Exceeds PWQO

Results up to 2012 are summarized and presented from previous Annual Reports completed by Others

SW2

Municipality of West Grey
Surface Water Quality - Normanby Landfill

Chemical Parameter	PWQO	SW2 012 27-Apr-06	SW2 009 26-Oct-06	SW2 013 9-Apr-07	SW2 013 10-Oct-07	SW2 013 17-Apr-08	SW2 011 6-Oct-08	SW2 (dup) 012 6-Oct-08	SW2 29-Apr-09	SW2 13-Oct-09	SW2 Duplicate #2 13-Oct-09	SW2 4-May-10	SW2 10-Nov-10	SW2 14-Apr-11	SW2 25-Oct-11
Alkalinity (as CaCO ₃)	345	<	0.01	0.01	DRY	264	336	342	298	325	328	308	334	298	307
Total Ammonia (as N)		<	0.01	0.01		16.9	16.7	16.8	15.1	20.4	<	0.01	0.01	<	<
Chloride		16.9	20.9	17.1		688	547	629	611	690	20.3	14.7	16	14.9	15.4
Conductivity - @25°C (µS/cm)	0.3	0.019	0.02	0.032		0.018	0.034	0.032	0.015	0.019	0.015	0.037	0.016	0.169	0.093
Iron		8.15	8.1	8.18		8.19	7.96	7.97	8.18	7.84	7.86	7.73	8.05	7.74	8.09
pH		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, Total	0.001	<0.01	<0.01	<0.01		<0.01	<0.01	0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01	<0.01
Field Temperature (C°)		11.6	7.3	3.6		13.1	10.3		12.9	8.1		15.6	6.4	11.1	9.5

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 - Exceeds PWQO
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Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW2

Chemical Parameter	PWQO	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2
		3-Apr-12	25-Sep-12	9-May-13	26-Nov-13	1-May-14	4-Nov-14	20-Apr-15	3-Nov-15	19-Apr-16	26-Oct-16	16-May-17	27-Nov-17	10-Apr-18	14-Nov-18		
Alkalinity (as CaCO ₃)	345	316	308	290	310	270	330	280	310	300		300	340	320	310		
Total Ammonia (as N)		< 0.01	0.01	<0.05	<0.05	0.053	<0.05	<0.050	<0.050	<0.050		<0.050	<0.050	0.056	0.052		
Chloride		14.9	13.9	20	19	18	20	20	21	18		19	19	17	19		
Conductivity - @25°C (µS/cm)		643	620	650	690	590	690	620	690	670		670	710	650	660		
Iron	0.3	0.049	0.019	<0.02	0.04	0.07	0.04	0.17	0.05	0.06		0.05	0.15	0.06	0.06		
pH		8.32	7.99	8.4	8.31	8.4	8.3	8.24	8.33	8.31		8.35	8.29	8.39	8.25		
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010		
Phosphorus, Total		0.02	<0.01	0.013	0.008	0.013	0.006	0.023	0.009	0.007		0.008	0.02	0.013	0.006		
Field Temperature (C°)		7.0	12.5	14.0	14.0	11.4	8.6	10.18	11.84	7.28		11.07	5.9	7.88	3.53		

NOTES:

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Exceeds PWQO.

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SW3

Municipality of West Grey
Surface Water Quality - Normanby Landfill

Chemical Parameter	PWQO	SW3 Jun-89	SW3 Oct-89	SW3 May-90	SW3 Jan-91	SW3 Apr-91	SW3 Oct-91	SW3 Apr-92	SW3 Oct-92	SW3 May-93	SW3 Nov-93	SW3 May-94	SW3 Oct-94	SW3 May-95	SW3 Oct-95	SW3 Apr-97	SW3 Sep-97	SW3 Apr-98	SW3 May-99
Alkalinity (as CaCO ₃)	345		291	277	319	291								278	305	290	298	421	214
Total Ammonia (as N)		0.021	0.004	0.014	0.001	0.04	0.005	0.013	0.015	0.007	0.03	0.04	0.006	0.15	0.38	0.004	0.004	0.1	0.34
Chloride		13.2	18.5	16.5	20.5	14.6	22.3	15.6	16.1	13.1	16.9	14.4	18.1	14.7	19.5	14.9	16.8	20.2	19.2
Conductivity @25°C (µS/cm)		590	672	587	703	610	636	589	667	624	620	592	643	644	652	530	600	558	495
Iron	0.3																		
pH	6.5-8.5	8.02	7.97	8.34	8.04	8.39	8.34	8.16	8.22	8.36	8.31	8.44	8.27	8.42	8.24	8.30	8.20	7.80	7.91
Phenols	0.001																		
Phosphorus, Total																			
Field Temperature (C°)																			

NOTES:

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SW3

Municipality of West Grey
Surface Water Quality - Normanby Landfill

Chemical Parameter	PWQO	SW3 Nov-99	SW3 9-Jun-00	SW3 9-Jan-01	SW3 007 18-Jul-01	SW3 012 19-Oct-01	SW3 006 15-Jun-02	SW3 (dup) 007 15-Jun-02	SW3 007 23-Oct-02	SW3 011 27-May-03	SW3 012 (dup) 27-May-03	SW3 011 30-Sep-03	SW3 (dup) 012 30-Sep-03	SW3 011 3-Jun-04	SW3 (dup) 012 3-Jun-04	SW3 009 22-Sep-04	SW3 (dup) 010 22-Sep-04	SW3 012 27-Apr-05
Alkalinity (as CaCO ₃)	345	253	319	324	311	304	303	309	300	270	270	315	315	279	285	339	336	250
Total Ammonia (as N)		0.05	0.05	0.05	<0.01	<0.01	0.01	0.01	<0.01	0.01	<0.01	0.02	0.02	0.11	0.06	<	0.01	0.03
Chloride		32	19.9	18.7	16.3	17	14.5	14.6	18.2	18.4	18.1	22.6	22.1	15.8	15.7	16.5	16.5	14.2
Conductivity - @25°C (µS/cm)		635	642	637	646	666	655	654	663	618	634	673	676	635	625	663	672	544
Iron	0.3		0.17	0.05	0.06	0.04	0.11	0.09	0.4	0.25	0.24	0.363	0.18	0.131	0.232	0.017	0.031	0.141
pH	6.5-8.5	7.78	8.13	8.13	8.23	7.93	7.93	7.9	8.11	8.13	8.19	8.49	8.48	8.49	8.44	8.37	8.43	8.21
Phenols	0.001		nd	nd	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus Total			2	3								0.01	0.02	0.01	0.01	<0.01	<0.01	<0.001
Field Temperature (C°)														16.6	15.2			8

NOTES:

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Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW3

Chemical Parameter	PWQO	SW3 (dup) 013 27-Apr-05	SW3 012 17-Oct-05	SW3 (dup) 013 17-Oct-05	SW3 011 27-Apr-06	SW3 008 26-Oct-06	SW3 012 9-Apr-07	SW3 007 10-Oct-07	SW3(dup) 008 10-Oct-07	SW3 011 17-Apr-08	SW3 (dup) 012 17-Apr-08	SW3 010 6-Oct-08	SW3 29-Apr-09	SW3 13-Oct-09
Alkalinity (as CaCO ₃)	345	254	316	312	286	320	286	300	294	244	286	330	294	323
Total Ammonia (as N)		0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chloride		14.2	19.5	19.6	16.5	20	16.7	18	18.2	16.7	16.6	16	15	19.1
Conductivity - @25°C (µS/cm)		544	641	642	600	675	561	627	631	629	625	615	601	672
Iron	0.3	0.23	0.027	0.015	0.023	0.026	0.047	0.064	0.068	0.026	0.02	0.031	0.008	0.019
pH	6.5-8.5	8.23	8.12	8.02	8.14	8.02	8.14	7.71	7.81	8.01	8.04	7.96	8.15	7.86
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus Total		0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Field Temperature (C°)			11.4		11.1	8.0	3.9	12.4		12.3		10.8	12.4	8.7

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Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW3

Chemical Parameter	PWQO	SW3 4-May-10	SW3 (dup) Duplicate #2 4-May-10	SW3 10-Nov-10	SW3 (dup) Duplicate #2 10-Nov-10	SW3 14-Apr-11	SW3 25-Oct-11	SW3 (dup) Duplicate #2 25-Oct-11	SW3 3-Apr-12	SW3 (dup) Duplicate #2 3-Apr-12	SW3 25-Sep-12
Alkalinity (as CaCO ₃)		305	305	333	332	295	308	309	307	310	301
Total Ammonia (as N)		<	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Chloride		15.1	15	16	16	14.8	15.3	15.1	15.0	15.0	17.8
Conductivity - @25°C (µS/cm)		613	611	690	684	620	667	671	640	641	632
Iron		0.056	0.024	0.013	0.014	0.034	0.043	0.041	0.045	0.032	0.023
pH		7.97	7.93	8.1	8.11	7.77	8.10	8.10	8.31	8.33	8.24
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, Total		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Field Temperature (C°)		15.0		7.2		10.7	9.5		7.2		13.5

NOTES:

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Exceeds PWQO

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Municipality of West Grey
Surface Water Quality - Normanby Landfill

Chemical Parameter	PWQO	SW-3											
		9-May-13	26-Nov-13	1-May-14	4-Nov-14	20-Apr-15	3-Nov-15	19-Apr-16	26-Oct-16	16-May-17	27-Nov-17	10-Apr-18	14-Nov-18
Alkalinity (as CaCO ₃)	345	230	310	270	330	280	310	300	290	300	340	320	310
Total Ammonia (as N)		0.086	<0.05	0.054	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride		20.0	19	18.0	20	20	22	17	22	19	19	17	19
Conductivity - @25°C (µS/cm)		660	680	590	690	620	700	670	670	670	710	660	660
Iron	0.3	<0.02	0.04	0.26	0.03	0.19	0.02	0.05	<0.02	0.05	0.11		0.04
pH	6.5-8.6	8.38	8.3	8.4	8.28	8.24	8.32	8.3	8.34	8.38	8.3	8.38	8.25
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus, Total		0.007	<0.01	0.038	0.006	0.018	0.011	0.007	<0.1	0.008	0.015	0.022	0.006
Field Temperature (C°)		15	4	11.3	8.3	10	11.83	7.02	7.28	10.85	6	7.65	3.48

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Exceeds PWQO

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Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW4

Chemical Parameter	PWQO	SW4 27-Apr-06	SW4 25-Oct-06	SW4 09-Apr-07	SW4 10-Oct-07	SW4 09-Apr-08	SW4 17-Apr-08	SW4 6-Oct-08	SW4 29-Apr-09	SW4 13-Oct-09	SW4 4-May-10	SW4 10-Nov-10	SW4 14-Apr-11	SW4 25-Oct-11	SW4 3-Apr-12	
Alkalinity (as CaCO ₃)	345	< 0.01	DRY	< 0.01	DRY	286	DRY	250	DRY	320	DRY	DRY	< 0.01	303	361	334
Total Ammonia (as N)		21.1		17.3		17.3		19.6		17.4			15.8	20.0	< 0.01	< 0.01
Chloride		690		613		683		679		679			650	803	803	19.2
Conductivity - @25°C (µS/cm)	0.3	0.031		0.127		0.042		0.005		<0.005			0.022	0.039	0.039	687
Iron	6.5-8.5	8.05		7.78		7.51		7.51		8.99			7.48	7.97	7.97	8.13
pH	0.001	<0.001		<0.001		<0.001		<0.001		<0.001			<0.001	<0.001	<0.001	<0.001
Phosphorus Total		<0.01		<0.01		<0.01		<0.01		<0.01			<0.01	<0.01	<0.01	<0.01
Field Temperature (C°)		11.7		2.8		12.1		10.9		10.9			9.7	8.9	8.9	6.7

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 Exceeds PWQO

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Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW4

Chemical Parameter	PWQO	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4
		25-Sep-12	9-May-13	26-Nov-13	1-May-14	4-Nov-14	20-Apr-15	3-Nov-15	19-Apr-16	26-Oct-16	16-May-17	27-Nov-17	10-Apr-18	14-Nov-18		
Alkalinity (as CaCO ₃)	345	DRY	290	300	270	320	280	DRY	270		300	340	320	310		
Total Ammonia (as N)			0.055	<0.05	0.069	<0.05	<0.050		<0.050		<0.050	<0.050	<0.050	<0.050		
Chloride			19	19	18	20	20		24		19	19	17	19		
Conductivity - @25°C (µS/cm)			650	680	590	690	620		620		670	710	650	650		
Iron	0.3		0.03	0.04	0.08	0.18	0.14		<0.02		0.05	0.11	0.11	0.04		
pH	6.5-8.5		8.39	8.31	8.37	8.29	8.25		8.11		8.41	8.31	8.39	8.28		
Phenols	0.001		<0.001	<0.001	<0.001	<0.001	0.0012		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010		
Phosphorus, Total			0.012	0.004	0.015	0.014	0.018		0.005		0.008	0.011	0.017	0.005		
Field Temperature (C°)			15	4	11.2	9	10		5.45		10.84	5.5	7.35	3.02		

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- 5 Exceeds PWQO

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Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW5

Chemical Parameter	PWQO	SW5 May-93	SW5 Nov-93	SW5 May-94	SW5 May-95	SW5 Oct-95	SW5 May-96	SW5 Apr-97	SW5 Sep-97	SW5 Apr-98	SW5 Sep-98	SW5 May-99	SW5 Nov-99	SW5 Jun-00	SW5 9-Jan-01
Alkalinity (as CaCO ₃)	345				298	305	361	290	299	452	197	216	255	317	323
Total Ammonia (as N)		0.005	0.068	0.035	0.08	0.36		0.004	0.004	0.22	0.37	0.15	0.05	0.08	0.09
Chloride		13.1	17.2	14.9	14.6	19.1	15.7	14.6	17.8	18.5	3.85	19.5	32.7	20.7	17.4
Conductivity - @25°C (µS/cm)		628	613	608	644	646	803	540	600	541	540	500	636	640	633
Iron	0.3														
pH	6.5-8.5	8.35	8.30	8.46	8.39	8.28	8.03	8.10	8.30	7.90	8.10	8.12	7.74	8.18	8.13
Phenols	0.001													nd	nd
Phosphorus, Total														nd	nd
Field Temperature (C°)														0.014	0.004

NOTES:

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Exceeds PWQO

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Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW5

Chemical Parameter	PWQO	SW5 009 18-Jul-01	SW5 014 19-Oct-01	SW5 005 15-Jun-02	SW5 005 23-Oct-02	SW5 (dup) 006 23-Oct-02	SW5 010 27-May-03	SW5 010 30-Sep-03	SW5 010 3-Jun-04	SW5 008 22-Sep-04	SW5 010 27-Apr-05	SW5 011 17-Oct-05	SW5 010 27-Apr-06	SW5 007 26-Oct-06
Alkalinity (as CaCO ₃)	345	323	290	309	294	297	276	318	282	315	250	314	288	332
Total Ammonia (as N)		<0.01	<0.01	0.02	0.02	0.02	<0.01	0.09	0.02	0.01	0.04	<0.01	<0.01	<0.01
Chloride		16.5	17	14.6	18.1	18.0	18.6	21.6	15.7	17.9	14.3	19.6	16.6	20.3
Conductivity - @25°C (µS/cm)		641	669	657	662	663	622	676	627	624	542	638	603	668
Iron	0.3	0.02	0.02	0.36	<0.02	0.02	0.34	0.236	0.193	0.032	0.174	0.054	0.022	0.061
pH	6.5-8.5	8.3	8.03	7.92	8.18	8.08	8.16	8.5	8.46	8.29	8.2	8.13	8.13	8.15
Phenols	0.001	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, Total		0.01	0.01	0.09	0.01	0.01	0.02	<0.01	0.02	0.02	0.02	0.01	<0.01	<0.01
Field Temperature (C°)									16.8	16.4	7.7	11.1	10.4	7.7

NOTES:

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Chemical Parameter	PWQO	SW5 010 9-Apr-07	SW5 (dup) 011 9-Apr-07	SW5 006 10-Oct-07	SW5 010 17-Apr-08	SW5 009 6-Oct-08	SW5 29-Apr-09	SW5 Duplicate #2 29-Apr-09	SW5 13-Oct-09	SW5 4-May-10	SW5 10-Nov-10	SW5 14-Apr-11
Alkalinity (as CaCO ₃)	345	288	284	278	250	333	308	299	319	304	334	296
Total Ammonia (as N)		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01
Chloride		16.7	16.8	17.5	16.8	16.1	15.1	15	18.8	15	16	14.8
Conductivity - @25°C (µS/cm)		583	549	612	639	619	604	607	670	615	682	619
Iron	0.3	0.054	0.042	0.046	0.04	0.059	0.01	0.007	0.014	0.032	0.211	0.037
pH	6.5-8.5	8.11	8.16	7.69	7.92	7.97	8.04	8.1	7.92	7.93	8.17	7.72
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, Total		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01
Field Temperature (C°)		3.7		12.4	11.5	10.6	12.0		8.5	14.8	7.1	10.4

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Municipality of West Grey
Surface Water Quality - Normanby Landfill

SW5

Chemical Parameter	PWQO	SW5 Duplicate #2 14-Apr-11	SW5 25-Oct-11	SW5 3-Apr-12	SW5 25-Sep-12	SW5 9-May-13	SW5 26-Nov-13	SW5 1-May-14	SW5 4-Nov-14	SW5 20-Apr-15	SW5 3-Nov-15	SW5 19-Apr-16	SW5 26-Oct-16	SW5 16-May-17	SW5 27-Nov-17
Alkalinity (as CaCO ₃)	345	295	310	309	292	290	310	270	330	280	310	300	290	300	340
Total Ammonia (as N)		0.01	0.01	<	0.01	0.073	<0.05	0.093	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride		14.8	15.2	15.0	17.2	19.0	19	17.0	20	19	22	18	21	19	19
Conductivity - @25°C (µS/cm)		619	668	640	631	650	690	590	690	630	690	660	670	670	710
Iron	0.3	0.045	0.033	0.028	0.019	<0.02	0.04	0.07	<0.02	0.2	0.02	0.12	0.02	0.05	0.12
pH	6.5-8.5	7.73	8.14	8.36	8.28	8.4	8.31	8.39	8.31	8.22	8.33	8.29	8.26	8.38	8.32
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus, Total		<0.01	<0.01	<0.01	<0.01	0.011	0.007	0.014	0.005	0.024	0.011	0.013	<0.1	0.011	0.012
Field Temperature (C°)			9.8	7.3	12.1	15	4	11.3	8.7	10.14	11.57	6.52	6.02	10.73	5.9

NOTES:

1. All results in mg/L unless otherwise noted.
2. > means greater than
3. < means less than
4. PWQO indicates Provincial Water Quality Objectives.

Results up to 2012 are summarized and presented from previous Annual Reports completed by Others

Municipality of West Grey
Surface Water Quality - Normanby Landfill

Chemical Parameter	PWQO	SW-5 10-Apr-18	SW-5 14-Nov-18
Alkalinity (as CaCO ₃)	345	320	300
Total Ammonia (as N)		<0.050	<0.050
Chloride		18	19
Conductivity - @25°C (uS/cm)		660	670
Iron	0.3		0.04
pH	6.5-8.5	8.38	8.19
Phenols	0.001	<0.0010	<0.0010
Phosphorus, Total		0.027	0.005
Field Temperature (C°)		7.19	3.6

**APPENDIX F:
LABORATORY CERTIFICATE OF ANALYSIS**

Attention: Reporting Contacts

GM BluePlan Engineering Limited
1260 - 2nd Ave E
Unit 1
Owen Sound, ON
CANADA N4K 2J3

Report Date: 2018/04/19
Report #: R5084661
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B882080

Received: 2018/04/12, 08:56

Sample Matrix: Water
Samples Received: 13

Analyses	Quantity	Date		Laboratory Method	Reference
		Extracted	Analyzed		
Alkalinity	13	N/A	2018/04/16	CAM SOP-00448	SM 23 2320 B m
Chloride by Automated Colourimetry	13	N/A	2018/04/16	CAM SOP-00463	EPA 325.2 m
Conductivity	13	N/A	2018/04/16	CAM SOP-00414	SM 23 2510 m
Hardness (calculated as CaCO ₃)	8	N/A	2018/04/18	CAM SOP 00102/00408/00447	SM 2340 B
Mercury	1	2018/04/16	2018/04/18	CAM SOP-00453	EPA 7470A m
Lab Filtered Metals Analysis by ICP	7	2018/04/16	2018/04/16	CAM SOP-00408	EPA 6010D m
Lab Filtered Metals Analysis by ICP	1	2018/04/16	2018/04/18	CAM SOP-00408	EPA 6010D m
Total Metals Analysis by ICP	2	2018/04/14	2018/04/16	CAM SOP-00408	EPA 6010D m
Total Metals Analysis by ICP	3	2018/04/16	2018/04/17	CAM SOP-00408	EPA 6010D m
Total Ammonia-N	13	N/A	2018/04/19	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO ₃) and Nitrite (NO ₂) in Water (1)	8	N/A	2018/04/13	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	13	N/A	2018/04/16	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	5	N/A	2018/04/13	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	8	N/A	2018/04/16	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids	1	2018/04/13	2018/04/17	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water	8	2018/04/16	2018/04/17	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	5	2018/04/17	2018/04/17	CAM SOP-00407	SM 23 4500 P B H m
Total Phosphorus (Colourimetric)	1	2018/04/17	2018/04/17	CAM SOP-00407	SM 23 4500 P B H m
Total Suspended Solids	1	2018/04/13	2018/04/17	CAM SOP-00428	SM 23 2540D m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed

Your Project #: Normanby Landfill (213087)
Your C.O.C. #: 657347-01-01, 657347-02-01

Attention: Reporting Contacts

GM BluePlan Engineering Limited
1260 - 2nd Ave E
Unit 1
Owen Sound, ON
CANADA N4K 2J3

Report Date: 2018/04/19
Report #: R5084661
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B882080

Received: 2018/04/12, 08:56

or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key



Ashton Gibson
Project Manager
19 Apr 2018 17:42:13

Please direct all questions regarding this Certificate of Analysis to your Project Manager:

Ashton Gibson, Project Manager

Email: AGibson@maxxam.ca

Phone# (905) 817-5700

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

RESULTS OF ANALYSES OF WATER

Maxxam ID		GLC802	GLC803		GLC804		GLC805		
Sampling Date		2018/04/10 02:55	2018/04/10 03:00		2018/04/10 03:25		2018/04/10 02:30		
COC Number		657347-01-01	657347-01-01		657347-01-01		657347-01-01		
	UNITS	TW-1	TW-2	QC Batch	TW-3	QC Batch	TW-5	RDL	QC Batch

Calculated Parameters

Hardness (CaCO3)	mg/L	280	340	5481483	350	5481483	290	1.0	5481483
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Inorganics

Total Ammonia-N	mg/L	0.94	0.31	5486762	0.29	5486762	1.3	0.050	5486762
Conductivity	umho/cm	540	660	5483813	720	5483813	570	1.0	5483813
Total Kjeldahl Nitrogen (TKN)	mg/L	1.0	1.2	5486728	0.47	5486728	4.1	0.10	5486728
pH	pH	7.98	8.04	5483819	7.76	5483819	7.95		5483819
Dissolved Sulphate (SO4)	mg/L	73	46	5483921	17	5483921	15	1.0	5483921
Alkalinity (Total as CaCO3)	mg/L	210	290	5483808	360	5483808	270	1.0	5483808
Dissolved Chloride (Cl)	mg/L	5.7	9.0	5483920	24	5483920	17	1.0	5483920
Nitrate (N)	mg/L	<0.10	1.34	5483527	<0.10	5483523	1.71	0.10	5483527

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam ID		GLC806			GLC806			GLC807		
Sampling Date		2018/04/10 02:35			2018/04/10 02:35			2018/04/10 03:10		
COC Number		657347-01-01			657347-01-01			657347-01-01		
	UNITS	TW-5A	RDL	QC Batch	TW-5A Lab-Dup	RDL	QC Batch	OW-2	RDL	QC Batch

Calculated Parameters

Hardness (CaCO3)	mg/L	430	1.0	5481483				310	1.0	5481483
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Inorganics

Total Ammonia-N	mg/L	1.6	0.050	5486762				<0.050	0.050	5486762
Conductivity	umho/cm	870	1.0	5483813	870	1.0	5483813	630	1.0	5483813
Total Kjeldahl Nitrogen (TKN)	mg/L	1.9	0.50	5486728				0.35	0.20	5486728
pH	pH	7.75		5483819	7.78		5483819	7.90		5483819
Dissolved Sulphate (SO4)	mg/L	38	1.0	5483921				23	1.0	5483921
Alkalinity (Total as CaCO3)	mg/L	370	1.0	5483808	370	1.0	5483808	260	1.0	5483808
Dissolved Chloride (Cl)	mg/L	30	1.0	5483920				27	1.0	5483920
Nitrate (N)	mg/L	8.86	0.10	5483523				4.95	0.10	5483527

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

RESULTS OF ANALYSES OF WATER

Maxxam ID		GLC807			GLC808			GLC809		
Sampling Date		2018/04/10 03:10			2018/04/10 03:20			2018/04/10 04:00		
COC Number		657347-01-01			657347-01-01			657347-01-01		
	UNITS	OW-2 Lab-Dup	RDL	QC Batch	OW-3	RDL	QC Batch	TW-6 (LEACHATE WELL)	RDL	QC Batch

Calculated Parameters										
Hardness (CaCO3)	mg/L				510	1.0	5481483	810	1.0	5481483
Inorganics										
Total Ammonia-N	mg/L	<0.050	0.050	5486762	2.3	0.050	5486762	0.25	0.050	5486762
Conductivity	umho/cm				1100	1.0	5483813	1500	1.0	5483813
Total Dissolved Solids	mg/L							790	10	5488248
Total Kjeldahl Nitrogen (TKN)	mg/L				2.9	0.50	5486728	0.93	0.10	5486728
pH	pH				7.86		5483819	7.65		5483819
Total Phosphorus	mg/L							0.22	0.020	5487483
Total Suspended Solids	mg/L							110	10	5484033
Dissolved Sulphate (SO4)	mg/L				36	1.0	5483921	83	1.0	5483921
Alkalinity (Total as CaCO3)	mg/L				510	1.0	5483808	790	1.0	5483808
Dissolved Chloride (Cl)	mg/L				30	1.0	5483920	4.5	1.0	5483920
Nitrate (N)	mg/L				11.9	0.10	5483523	1.14	0.10	5483523

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		GLC810			GLC811			GLC812		
Sampling Date		2018/04/10 03:55			2018/04/10 03:50			2018/04/10 03:45		
COC Number		657347-01-01			657347-01-01			657347-02-01		
	UNITS	SW-1	QC Batch		SW-2	QC Batch		SW-3	RDL	QC Batch

Inorganics										
Total Ammonia-N	mg/L	<0.050	5486756	0.056	5486762	<0.050	0.050	5486756		
Conductivity	umho/cm	680	5483813	650	5483813	660	1.0	5483813		
pH	pH	8.16	5483819	8.39	5483819	8.38		5483819		
Phenols-4AAP	mg/L	<0.0010	5483818	<0.0010	5483818	<0.0010	0.0010	5483818		
Total Phosphorus	mg/L	0.015	5487460	0.013	5487460	0.022	0.004	5487460		
Alkalinity (Total as CaCO3)	mg/L	300	5483808	320	5483808	320	1.0	5483808		
Dissolved Chloride (Cl)	mg/L	21	5483540	17	5483540	17	1.0	5483540		

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

RESULTS OF ANALYSES OF WATER

Maxxam ID		GLC812			GLC813		GLC814		
Sampling Date		2018/04/10 03:45			2018/04/10 03:40		2018/04/10 03:30		
COC Number		657347-02-01			657347-02-01		657347-02-01		
	UNITS	SW-3 Lab-Dup	RDL	QC Batch	SW-4	QC Batch	SW-5	RDL	QC Batch
Inorganics									
Total Ammonia-N	mg/L				<0.050	5486762	<0.050	0.050	5486756
Conductivity	umho/cm				650	5483813	660	1.0	5483813
pH	pH				8.39	5483819	8.38		5483819
Phenols-4AAP	mg/L				<0.0010	5483818	<0.0010	0.0010	5483818
Total Phosphorus	mg/L	0.023	0.004	5487460	0.017	5487460	0.027	0.004	5487460
Alkalinity (Total as CaCO3)	mg/L				320	5483808	320	1.0	5483808
Dissolved Chloride (Cl)	mg/L				17	5483540	18	1.0	5483540
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate									

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		GLC802	GLC803	GLC804	GLC805	GLC806	GLC807		
Sampling Date		2018/04/10 02:55	2018/04/10 03:00	2018/04/10 03:25	2018/04/10 02:30	2018/04/10 02:35	2018/04/10 03:10		
COC Number		657347-01-01	657347-01-01	657347-01-01	657347-01-01	657347-01-01	657347-01-01		
	UNITS	TW-1	TW-2	TW-3	TW-5	TW-5A	OW-2	RDL	QC Batch

Metals									
Dissolved Calcium (Ca)	mg/L	60	80	86	72	100	78	0.05	5485700
Dissolved Iron (Fe)	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	5485700
Dissolved Magnesium (Mg)	mg/L	32	35	33	26	42	27	0.05	5485700
Dissolved Sodium (Na)	mg/L	9.8	8.0	20	5.2	21	17	0.5	5485700

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam ID		GLC808			GLC809			GLC810		
Sampling Date		2018/04/10 03:20			2018/04/10 04:00			2018/04/10 03:55		
COC Number		657347-01-01			657347-01-01			657347-01-01		
	UNITS	OW-3	RDL	QC Batch	TW-6 (LEACHATE WELL)	RDL	QC Batch	SW-1	RDL	QC Batch

Metals										
Dissolved Arsenic (As)	mg/L				<0.2	0.2	5485700			
Dissolved Barium (Ba)	mg/L				0.13	0.005	5485700			
Dissolved Boron (B)	mg/L				0.32	0.02	5485700			
Dissolved Cadmium (Cd)	mg/L				<0.005	0.005	5485700			
Dissolved Calcium (Ca)	mg/L	110	0.05	5485700	180	0.05	5485700			
Dissolved Chromium (Cr)	mg/L				<0.01	0.01	5485700			
Dissolved Copper (Cu)	mg/L				<0.02	0.02	5485700			
Dissolved Iron (Fe)	mg/L	<0.02	0.02	5485700	<0.02	0.02	5485700			
Total Iron (Fe)	mg/L							0.08	0.02	5486045
Dissolved Lead (Pb)	mg/L				<0.05	0.05	5485700			
Dissolved Magnesium (Mg)	mg/L	56	0.05	5485700	86	0.05	5485700			
Dissolved Manganese (Mn)	mg/L				0.04	0.01	5485700			
Mercury (Hg)	ug/L				<0.1	0.1	5485695			
Dissolved Potassium (K)	mg/L				33	1	5485700			
Dissolved Sodium (Na)	mg/L	30	0.5	5485700	12	0.5	5485700			

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		GLC811		GLC812	GLC813		GLC814		
Sampling Date		2018/04/10 03:50		2018/04/10 03:45	2018/04/10 03:40		2018/04/10 03:30		
COC Number		657347-01-01		657347-02-01	657347-02-01		657347-02-01		
	UNITS	SW-2	QC Batch	SW-3	SW-4	QC Batch	SW-5	RDL	QC Batch
Metals									
Total Iron (Fe)	mg/L	0.11	5486045	0.17	0.10	5485100	0.12	0.02	5486045
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									

TEST SUMMARY

Maxxam ID: GLC802
Sample ID: TW-1
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483920	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Hardness (calculated as CaCO ₃)		5481483	N/A	2018/04/18	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5485700	2018/04/16	2018/04/18	Suban Kanapathippilai
Total Ammonia-N	LACH/NH ₄	5486762	N/A	2018/04/19	Parminder Sangha
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	5483527	N/A	2018/04/13	Chandra Nandlal
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5483921	N/A	2018/04/16	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5486728	2018/04/16	2018/04/17	Rajni Tyagi

Maxxam ID: GLC803
Sample ID: TW-2
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483920	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Hardness (calculated as CaCO ₃)		5481483	N/A	2018/04/18	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5485700	2018/04/16	2018/04/16	Suban Kanapathippilai
Total Ammonia-N	LACH/NH ₄	5486762	N/A	2018/04/19	Parminder Sangha
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	5483527	N/A	2018/04/13	Chandra Nandlal
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5483921	N/A	2018/04/16	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5486728	2018/04/16	2018/04/17	Rajni Tyagi

Maxxam ID: GLC804
Sample ID: TW-3
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483920	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Hardness (calculated as CaCO ₃)		5481483	N/A	2018/04/18	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5485700	2018/04/16	2018/04/16	Suban Kanapathippilai
Total Ammonia-N	LACH/NH ₄	5486762	N/A	2018/04/19	Parminder Sangha
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	5483523	N/A	2018/04/13	Chandra Nandlal
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5483921	N/A	2018/04/16	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5486728	2018/04/16	2018/04/17	Rajni Tyagi

TEST SUMMARY

Maxxam ID: GLC805
Sample ID: TW-5
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483920	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Hardness (calculated as CaCO3)		5481483	N/A	2018/04/18	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5485700	2018/04/16	2018/04/16	Suban Kanapathippilai
Total Ammonia-N	LACH/NH4	5486762	N/A	2018/04/19	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5483527	N/A	2018/04/13	Chandra Nandlal
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5483921	N/A	2018/04/16	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5486728	2018/04/16	2018/04/17	Rajni Tyagi

Maxxam ID: GLC806
Sample ID: TW-5A
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483920	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Hardness (calculated as CaCO3)		5481483	N/A	2018/04/18	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5485700	2018/04/16	2018/04/16	Suban Kanapathippilai
Total Ammonia-N	LACH/NH4	5486762	N/A	2018/04/19	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5483523	N/A	2018/04/13	Chandra Nandlal
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5483921	N/A	2018/04/16	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5486728	2018/04/16	2018/04/17	Rajni Tyagi

Maxxam ID: GLC806 Dup
Sample ID: TW-5A
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
pH	AT	5483819	N/A	2018/04/16	Surinder Rai

Maxxam ID: GLC807
Sample ID: OW-2
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483920	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Hardness (calculated as CaCO3)		5481483	N/A	2018/04/18	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5485700	2018/04/16	2018/04/16	Suban Kanapathippilai

TEST SUMMARY

Maxxam ID: GLC807
Sample ID: OW-2
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Ammonia-N	LACH/NH4	5486762	N/A	2018/04/19	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5483527	N/A	2018/04/13	Chandra Nandlal
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5483921	N/A	2018/04/16	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5486728	2018/04/16	2018/04/17	Rajni Tyagi

Maxxam ID: GLC807 Dup
Sample ID: OW-2
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Ammonia-N	LACH/NH4	5486762	N/A	2018/04/19	Parminder Sangha

Maxxam ID: GLC808
Sample ID: OW-3
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483920	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Hardness (calculated as CaCO3)		5481483	N/A	2018/04/18	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5485700	2018/04/16	2018/04/16	Suban Kanapathipplai
Total Ammonia-N	LACH/NH4	5486762	N/A	2018/04/19	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5483523	N/A	2018/04/13	Chandra Nandlal
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5483921	N/A	2018/04/16	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5486728	2018/04/16	2018/04/17	Rajni Tyagi

Maxxam ID: GLC809
Sample ID: TW-6 (LEACHATE WELL)
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483920	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Hardness (calculated as CaCO3)		5481483	N/A	2018/04/18	Automated Statchk
Mercury	CV/AA	5485695	2018/04/16	2018/04/18	Ron Morrison
Lab Filtered Metals Analysis by ICP	ICP	5485700	2018/04/16	2018/04/16	Suban Kanapathipplai
Total Ammonia-N	LACH/NH4	5486762	N/A	2018/04/19	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5483523	N/A	2018/04/13	Chandra Nandlal
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5483921	N/A	2018/04/16	Deonarine Ramnarine
Total Dissolved Solids	BAL	5488248	2018/04/13	2018/04/17	Massarat Jan
Total Kjeldahl Nitrogen in Water	SKAL	5486728	2018/04/16	2018/04/17	Rajni Tyagi

TEST SUMMARY

Maxxam ID: GLC809
Sample ID: TW-6 (LEACHATE WELL)
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Phosphorus (Colourimetric)	LACH/P	5487483	2018/04/17	2018/04/17	Amanpreet Sappal
Total Suspended Solids	BAL	5484033	2018/04/13	2018/04/17	Nusrat Naz

Maxxam ID: GLC810
Sample ID: SW-1
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483540	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Total Metals Analysis by ICP	ICP	5486045	2018/04/16	2018/04/17	Suban Kanapathippillai
Total Ammonia-N	LACH/NH4	5486756	N/A	2018/04/19	Parminder Sangha
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5483818	N/A	2018/04/13	Zahid Soikot
Total Phosphorus (Colourimetric)	LACH/P	5487460	2018/04/17	2018/04/17	Amanpreet Sappal

Maxxam ID: GLC811
Sample ID: SW-2
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483540	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Total Metals Analysis by ICP	ICP	5486045	2018/04/16	2018/04/17	Suban Kanapathippillai
Total Ammonia-N	LACH/NH4	5486762	N/A	2018/04/19	Parminder Sangha
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5483818	N/A	2018/04/13	Zahid Soikot
Total Phosphorus (Colourimetric)	LACH/P	5487460	2018/04/17	2018/04/17	Amanpreet Sappal

Maxxam ID: GLC812
Sample ID: SW-3
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483540	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Total Metals Analysis by ICP	ICP	5485100	2018/04/14	2018/04/16	Suban Kanapathippillai
Total Ammonia-N	LACH/NH4	5486756	N/A	2018/04/19	Parminder Sangha
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5483818	N/A	2018/04/13	Zahid Soikot
Total Phosphorus (Colourimetric)	LACH/P	5487460	2018/04/17	2018/04/17	Amanpreet Sappal

TEST SUMMARY

Maxxam ID: GLC812 Dup
Sample ID: SW-3
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Phosphorus (Colourimetric)	LACH/P	5487460	2018/04/17	2018/04/17	Amanpreet Sappal

Maxxam ID: GLC813
Sample ID: SW-4
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483540	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Total Metals Analysis by ICP	ICP	5485100	2018/04/14	2018/04/16	Suban Kanapathippillai
Total Ammonia-N	LACH/NH4	5486762	N/A	2018/04/19	Parminder Sangha
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5483818	N/A	2018/04/13	Zahid Soikot
Total Phosphorus (Colourimetric)	LACH/P	5487460	2018/04/17	2018/04/17	Amanpreet Sappal

Maxxam ID: GLC814
Sample ID: SW-5
Matrix: Water

Collected: 2018/04/10
Shipped:
Received: 2018/04/12

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5483808	N/A	2018/04/16	Surinder Rai
Chloride by Automated Colourimetry	KONE	5483540	N/A	2018/04/16	Deonarine Ramnarine
Conductivity	AT	5483813	N/A	2018/04/16	Surinder Rai
Total Metals Analysis by ICP	ICP	5486045	2018/04/16	2018/04/17	Suban Kanapathippillai
Total Ammonia-N	LACH/NH4	5486756	N/A	2018/04/19	Parminder Sangha
pH	AT	5483819	N/A	2018/04/16	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5483818	N/A	2018/04/13	Zahid Soikot
Total Phosphorus (Colourimetric)	LACH/P	5487460	2018/04/17	2018/04/17	Amanpreet Sappal

GENERAL COMMENTS

The following sediment comments applies to all samples except for samples TW-6 (LEACHATE WELL), SW-1, SW-2, SW-3, SW-4, SW-5:

All of the 500mL plastic General and Solids bottles contained visible sediment.

All of the 250mL plastic Nutrients bottles contained visible sediment.

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Total Metals Analysis by ICP: Matrix Spike not calculated. Original sample and matrix spike sample were analyzed at a dilution, due to high target analytes, or sample matrix interference.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	
5483523	Nitrate (N)	2018/04/13	NC	80 - 120	102	80 - 120	<0.10	mg/L	0.21	20	
5483527	Nitrate (N)	2018/04/13	101	80 - 120	101	80 - 120	<0.10	mg/L	1.8	20	
5483540	Dissolved Chloride (Cl)	2018/04/16	NC	80 - 120	101	80 - 120	<1.0	mg/L	0.43	20	
5483808	Alkalinity (Total as CaCO3)	2018/04/16			98	85 - 115	<1.0	mg/L	0.48	20	
5483813	Conductivity	2018/04/16			101	85 - 115	<1.0	umho/cm	0	25	
5483818	Phenols-4AAP	2018/04/13	102	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20	
5483819	pH	2018/04/16			102	98 - 103			0.32	N/A	
5483920	Dissolved Chloride (Cl)	2018/04/16	105	80 - 120	103	80 - 120	<1.0	mg/L	0.24	20	
5483921	Dissolved Sulphate (SO4)	2018/04/16	98	75 - 125	105	80 - 120	<1.0	mg/L	0.70	20	
5484033	Total Suspended Solids	2018/04/17					<10	mg/L	5.4	25	85 - 115
5485100	Total Iron (Fe)	2018/04/16	NC	80 - 120	97	80 - 120	<0.02	mg/L	0.81	25	
5485695	Mercury (Hg)	2018/04/18	110	75 - 125	104	80 - 120	<0.1	ug/L	NC	20	
5485700	Dissolved Arsenic (As)	2018/04/16	99	80 - 120	98	80 - 120	<0.2	mg/L			
5485700	Dissolved Barium (Ba)	2018/04/16	103	80 - 120	101	80 - 120	<0.005	mg/L			
5485700	Dissolved Boron (B)	2018/04/16	104	80 - 120	102	80 - 120	<0.02	mg/L			
5485700	Dissolved Cadmium (Cd)	2018/04/16	103	80 - 120	101	80 - 120	<0.005	mg/L			
5485700	Dissolved Calcium (Ca)	2018/04/16	NC	80 - 120	102	80 - 120	<0.05	mg/L	0.059	25	
5485700	Dissolved Chromium (Cr)	2018/04/16	104	80 - 120	103	80 - 120	<0.01	mg/L			
5485700	Dissolved Copper (Cu)	2018/04/16	103	80 - 120	103	80 - 120	<0.02	mg/L			
5485700	Dissolved Iron (Fe)	2018/04/16	105	80 - 120	103	80 - 120	<0.02	mg/L			
5485700	Dissolved Lead (Pb)	2018/04/16	102	80 - 120	102	80 - 120	<0.05	mg/L			
5485700	Dissolved Magnesium (Mg)	2018/04/16	NC	80 - 120	101	80 - 120	<0.05	mg/L	0.90	25	
5485700	Dissolved Manganese (Mn)	2018/04/16	104	80 - 120	103	80 - 120	<0.01	mg/L			
5485700	Dissolved Potassium (K)	2018/04/16	105	80 - 120	103	80 - 120	<1	mg/L			
5485700	Dissolved Sodium (Na)	2018/04/16	103	80 - 120	103	80 - 120	<0.5	mg/L	0.11	25	
5486045	Total Iron (Fe)	2018/04/17	90	80 - 120	102	80 - 120	<0.02	mg/L			
5486728	Total Kjeldahl Nitrogen (TKN)	2018/04/17	109	80 - 120	101	80 - 120	<0.10	mg/L	0	20	80 - 120
5486756	Total Ammonia-N	2018/04/19	94	75 - 125	102	80 - 120	<0.050	mg/L	9.0	20	
5486762	Total Ammonia-N	2018/04/19	94	75 - 125	101	80 - 120	<0.050	mg/L	NC	20	
5487460	Total Phosphorus	2018/04/17	110	80 - 120	92	80 - 120	<0.004	mg/L	2.2	20	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5487483	Total Phosphorus	2018/04/17	105	80 - 120	101	80 - 120	<0.020	mg/L	4.5	20	103	80 - 120
5488248	Total Dissolved Solids	2018/04/17					<10	mg/L	3.6	25	97	90 - 110

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference \leq 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere

Cristina Carriere, Scientific Service Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Your Project #: Normanby Landfill (213087)
Your C.O.C. #: 683914-01-01, 683914-02-01

Attention: Andrea Nelson

GM BluePlan Engineering Limited
1260 - 2nd Ave E
Unit 1
Owen Sound, ON
CANADA N4K 2J3

Report Date: 2018/11/22
Report #: R5495289
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8U5365

Received: 2018/11/15, 09:44

Sample Matrix: Water
Samples Received: 13

Analyses	Quantity	Date		Laboratory Method	Reference
		Extracted	Analyzed		
Alkalinity	13	N/A	2018/11/19	CAM SOP-00448	SM 23 2320 B m
Chloride by Automated Colourimetry	8	N/A	2018/11/19	CAM SOP-00463	EPA 325.2 m
Chloride by Automated Colourimetry	5	N/A	2018/11/20	CAM SOP-00463	EPA 325.2 m
Conductivity	13	N/A	2018/11/19	CAM SOP-00414	SM 23 2510 m
Dissolved Oxygen	5	2018/11/16	2018/11/16	CAM SOP-00427	SM 23 4500 O G m
Hardness (calculated as CaCO ₃)	8	N/A	2018/11/20	CAM SOP 00102/00408/00447	SM 2340 B
Mercury	1	2018/11/21	2018/11/21	CAM SOP-00453	EPA 7470A m
Lab Filtered Metals Analysis by ICP	8	2018/11/19	2018/11/20	CAM SOP-00408	EPA 6010D m
Total Metals Analysis by ICP	5	2018/11/21	2018/11/22	CAM SOP-00408	EPA 6010D m
Total Ammonia-N	13	N/A	2018/11/20	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO ₃) and Nitrite (NO ₂) in Water (1)	1	N/A	2018/11/19	CAM SOP-00440	SM 23 4500-NO3/NO2B
Nitrate (NO ₃) and Nitrite (NO ₂) in Water (1)	7	N/A	2018/11/20	CAM SOP-00440	SM 23 4500-NO3/NO2B
pH	13	N/A	2018/11/19	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	5	N/A	2018/11/19	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	8	N/A	2018/11/19	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids	1	2018/11/17	2018/11/19	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water	6	2018/11/17	2018/11/19	CAM SOP-00938	OMOE E3516 m
Total Kjeldahl Nitrogen in Water	2	2018/11/17	2018/11/20	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	5	2018/11/19	2018/11/19	CAM SOP-00407	SM 23 4500 P B H m
Total Phosphorus (Colourimetric)	1	2018/11/19	2018/11/20	CAM SOP-00407	SM 23 4500 P B H m
Total Suspended Solids	1	2018/11/17	2018/11/19	CAM SOP-00428	SM 23 2540D m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been

Your Project #: Normanby Landfill (213087)
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CERTIFICATE OF ANALYSIS

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Received: 2018/11/15, 09:44

accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.

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Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key



Ashton Gibson
Project Manager
22 Nov 2018 17:22:40

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ashton Gibson, Project Manager

Email: AGibson@maxxam.ca

Phone# (905) 817-5700

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

RESULTS OF ANALYSES OF WATER

Maxxam ID		IHO192	IHO193		IHO194			IHO195		
Sampling Date		2018/11/14	2018/11/14		2018/11/14			2018/11/14		
COC Number		683914-01-01	683914-01-01		683914-01-01			683914-01-01		
	UNITS	TW-1	TW-3	QC Batch	TW-5	RDL	QC Batch	TW-5A	RDL	QC Batch

Calculated Parameters										
Hardness (CaCO ₃)	mg/L	260	400	5841954	300	1.0	5842487	420	1.0	5842487
Inorganics										
Total Ammonia-N	mg/L	0.11	0.28	5843535	0.41	0.050	5843535	2.0 (1)	0.050	5843535
Conductivity	umho/cm	540	830	5843227	510	1.0	5843227	730	1.0	5843227
Total Kjeldahl Nitrogen (TKN)	mg/L	0.82	0.58	5843531	0.64	0.10	5843531	1.7 (1)	0.50	5843531
pH	pH	7.74	7.58	5843228	7.81		5843228	7.69		5843228
Dissolved Sulphate (SO ₄)	mg/L	70	87	5843217	8.8	1.0	5843217	37	1.0	5843217
Alkalinity (Total as CaCO ₃)	mg/L	200	340	5843224	290	1.0	5843224	370	1.0	5843224
Dissolved Chloride (Cl ⁻)	mg/L	5.9	33	5843214	13	1.0	5843214	33	1.0	5843214
Nitrate (N)	mg/L	0.29	0.15	5843249	2.21	0.10	5843249	8.55	0.10	5843212

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

(1) TKN < NH₄: Both values fall within acceptable RPD limits for duplicates and are likely equivalent.

Maxxam ID		IHO196	IHO197			IHO199		
Sampling Date		2018/11/14	2018/11/14			2018/11/14		
COC Number		683914-01-01	683914-01-01			683914-01-01		
	UNITS	OW-2	OW-3	RDL	QC Batch	TW-6 (LEACHATE WELL)	RDL	QC Batch

Calculated Parameters								
Hardness (CaCO ₃)	mg/L	350	400	1.0	5842487	870	1.0	5842487
Inorganics								
Total Ammonia-N	mg/L	0.18	<0.050	0.050	5843535	1.8	0.050	5843535
Conductivity	umho/cm	600	780	1.0	5843227	1500	1.0	5843227
Total Dissolved Solids	mg/L					915	10	5843125
Total Kjeldahl Nitrogen (TKN)	mg/L	0.22	<0.10	0.10	5843531	2.6	0.10	5843531
pH	pH	7.87	7.79		5843228	7.70		5843228
Total Phosphorus	mg/L					0.68	0.10	5845182
Total Suspended Solids	mg/L					240	17	5841992
Dissolved Sulphate (SO ₄)	mg/L	72	34	1.0	5843217	110	1.0	5843217
Alkalinity (Total as CaCO ₃)	mg/L	270	390	1.0	5843224	870	1.0	5843224
Dissolved Chloride (Cl ⁻)	mg/L	22	28	1.0	5843214	15	1.0	5843214
Nitrate (N)	mg/L	<0.10	5.04	0.10	5843249	0.32	0.10	5843249

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

RESULTS OF ANALYSES OF WATER

Maxxam ID		IHO200			IHO200		IHO202		
Sampling Date		2018/11/14			2018/11/14		2018/11/14		
COC Number		683914-01-01			683914-01-01		683914-02-01		
	UNITS	SW-1	RDL	QC Batch	SW-1 Lab-Dup	QC Batch	SW-2	RDL	QC Batch

Inorganics									
Total Ammonia-N	mg/L	<0.050	0.050	5843535			0.052	0.050	5843535
Conductivity	umho/cm	660	1.0	5843227			660	1.0	5843227
Dissolved Oxygen	mg/L	9.46		5842583	9.48	5842583	10.8		5842583
pH	pH	8.08		5843228			8.25		5843228
Phenols-4AAP	mg/L	<0.0010	0.0010	5843990			<0.0010	0.0010	5843990
Total Phosphorus	mg/L	<0.004	0.004	5843988			0.006	0.004	5843988
Alkalinity (Total as CaCO3)	mg/L	300	1.0	5843224			310	1.0	5843224
Dissolved Chloride (Cl-)	mg/L	22	1.0	5845272			19	1.0	5843243

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		IHO203			IHO204		IHO204		
Sampling Date		2018/11/14			2018/11/14		2018/11/14		
COC Number		683914-02-01			683914-02-01		683914-02-01		
	UNITS	SW-3	QC Batch	SW-4	RDL	QC Batch	SW-4 Lab-Dup	RDL	QC Batch

Inorganics									
Total Ammonia-N	mg/L	<0.050	5843535	<0.050	0.050	5843540			
Conductivity	umho/cm	660	5843227	650	1.0	5843227			
Dissolved Oxygen	mg/L	10.8	5842583	10.7		5842583			
pH	pH	8.25	5843228	8.28		5843228			
Phenols-4AAP	mg/L	<0.0010	5843997	<0.0010	0.0010	5843990			
Total Phosphorus	mg/L	0.006	5843988	0.005	0.004	5843988	0.005	0.004	5843988
Alkalinity (Total as CaCO3)	mg/L	310	5843224	310	1.0	5843224			
Dissolved Chloride (Cl-)	mg/L	19	5843243	19	1.0	5843243			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

RESULTS OF ANALYSES OF WATER

Maxxam ID		IHO205			IHO206			IHO206		
Sampling Date		2018/11/14			2018/11/14			2018/11/14		
COC Number		683914-02-01			683914-02-01			683914-02-01		
	UNITS	SW-5	RDL	QC Batch	OW-2 (DUP)	RDL	QC Batch	OW-2 (DUP) Lab-Dup	RDL	QC Batch
Calculated Parameters										
Hardness (CaCO3)	mg/L				380	1.0	5842487			
Inorganics										
Total Ammonia-N	mg/L	<0.050	0.050	5843535	<0.050	0.050	5843535			
Conductivity	umho/cm	670	1.0	5843227	730	1.0	5843227	780	1.0	5843227
Total Kjeldahl Nitrogen (TKN)	mg/L				<0.10	0.10	5843531			
Dissolved Oxygen	mg/L	10.9		5842583						
pH	pH	8.19		5843228	7.85		5843228	7.86		5843228
Phenols-4AAP	mg/L	<0.0010	0.0010	5843992						
Total Phosphorus	mg/L	0.005	0.004	5843988						
Dissolved Sulphate (SO4)	mg/L				45	1.0	5843217			
Alkalinity (Total as CaCO3)	mg/L	300	1.0	5843224	330	1.0	5843224	330	1.0	5843224
Dissolved Chloride (Cl-)	mg/L	19	1.0	5843243	35	1.0	5843214			
Nitrate (N)	mg/L				1.11	0.10	5843249			
RDL = Reportable Detection Limit										
QC Batch = Quality Control Batch										
Lab-Dup = Laboratory Initiated Duplicate										

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		IHO192	IHO193	IHO194	IHO195	IHO196	IHO197		
Sampling Date		2018/11/14	2018/11/14	2018/11/14	2018/11/14	2018/11/14	2018/11/14		
COC Number		683914-01-01	683914-01-01	683914-01-01	683914-01-01	683914-01-01	683914-01-01		
	UNITS	TW-1	TW-3	TW-5	TW-5A	OW-2	OW-3	RDL	QC Batch

Metals									
Dissolved Iron (Fe)	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	5845459
Dissolved Sodium (Na)	mg/L	9.5	25	6.0	21	8.7	28	0.5	5845459

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam ID		IHO199			IHO200	IHO202	IHO203		
Sampling Date		2018/11/14			2018/11/14	2018/11/14	2018/11/14		
COC Number		683914-01-01			683914-01-01	683914-02-01	683914-02-01		
	UNITS	TW-6 (LEACHATE WELL)		RDL	QC Batch	SW-1	SW-2	SW-3	RDL QC Batch

Metals									
Dissolved Arsenic (As)	mg/L	<0.2	0.2	5845459					
Dissolved Barium (Ba)	mg/L	0.13	0.005	5845459					
Dissolved Boron (B)	mg/L	0.50	0.02	5845459					
Dissolved Cadmium (Cd)	mg/L	<0.005	0.005	5845459					
Dissolved Chromium (Cr)	mg/L	<0.01	0.01	5845459					
Dissolved Copper (Cu)	mg/L	<0.02	0.02	5845459					
Dissolved Iron (Fe)	mg/L	0.11	0.02	5845459					
Total Iron (Fe)	mg/L				<0.02	0.06	0.04	0.02	5849689
Dissolved Lead (Pb)	mg/L	<0.05	0.05	5845459					
Dissolved Manganese (Mn)	mg/L	0.25	0.01	5845459					
Mercury (Hg)	ug/L	<0.1	0.1	5848749					
Dissolved Potassium (K)	mg/L	41	1	5845459					
Dissolved Sodium (Na)	mg/L	46	0.5	5845459					

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Maxxam ID		IHO204	IHO205			IHO206		
Sampling Date		2018/11/14	2018/11/14			2018/11/14		
COC Number		683914-02-01	683914-02-01			683914-02-01		
	UNITS	SW-4	SW-5	RDL	QC Batch	OW-2 (DUP)	RDL	QC Batch

Metals								
Dissolved Iron (Fe)	mg/L					<0.02	0.02	5845459
Total Iron (Fe)	mg/L	0.04	0.04	0.02	5849689			
Dissolved Sodium (Na)	mg/L					24	0.5	5845459

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

TEST SUMMARY

Maxxam ID: IHO192
Sample ID: TW-1
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843214	N/A	2018/11/19	Alina Dobreanu
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Hardness (calculated as CaCO ₃)		5841954	N/A	2018/11/20	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5845459	2018/11/19	2018/11/20	Azita Fazaeli
Total Ammonia-N	LACH/NH ₄	5843535	N/A	2018/11/20	Charles Opoku-Ware
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	5843249	N/A	2018/11/20	Chandra Nandlal
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5843217	N/A	2018/11/19	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5843531	2018/11/17	2018/11/19	Rajni Tyagi

Maxxam ID: IHO193
Sample ID: TW-3
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843214	N/A	2018/11/19	Alina Dobreanu
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Hardness (calculated as CaCO ₃)		5841954	N/A	2018/11/20	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5845459	2018/11/19	2018/11/20	Azita Fazaeli
Total Ammonia-N	LACH/NH ₄	5843535	N/A	2018/11/20	Charles Opoku-Ware
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	5843249	N/A	2018/11/20	Chandra Nandlal
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5843217	N/A	2018/11/19	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5843531	2018/11/17	2018/11/19	Rajni Tyagi

Maxxam ID: IHO194
Sample ID: TW-5
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843214	N/A	2018/11/19	Alina Dobreanu
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Hardness (calculated as CaCO ₃)		5842487	N/A	2018/11/20	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5845459	2018/11/19	2018/11/20	Azita Fazaeli
Total Ammonia-N	LACH/NH ₄	5843535	N/A	2018/11/20	Charles Opoku-Ware
Nitrate (NO ₃) and Nitrite (NO ₂) in Water	LACH	5843249	N/A	2018/11/20	Chandra Nandlal
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5843217	N/A	2018/11/19	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5843531	2018/11/17	2018/11/19	Rajni Tyagi

TEST SUMMARY

Maxxam ID: IHO195
Sample ID: TW-5A
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843214	N/A	2018/11/19	Alina Dobreanu
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Hardness (calculated as CaCO3)		5842487	N/A	2018/11/20	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5845459	2018/11/19	2018/11/20	Azita Fazaeli
Total Ammonia-N	LACH/NH4	5843535	N/A	2018/11/20	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5843212	N/A	2018/11/19	Chandra Nandlal
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5843217	N/A	2018/11/19	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5843531	2018/11/17	2018/11/20	Rajni Tyagi

Maxxam ID: IHO196
Sample ID: OW-2
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843214	N/A	2018/11/19	Alina Dobreanu
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Hardness (calculated as CaCO3)		5842487	N/A	2018/11/20	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5845459	2018/11/19	2018/11/20	Azita Fazaeli
Total Ammonia-N	LACH/NH4	5843535	N/A	2018/11/20	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5843249	N/A	2018/11/20	Chandra Nandlal
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5843217	N/A	2018/11/19	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5843531	2018/11/17	2018/11/19	Rajni Tyagi

Maxxam ID: IHO197
Sample ID: OW-3
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843214	N/A	2018/11/19	Alina Dobreanu
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Hardness (calculated as CaCO3)		5842487	N/A	2018/11/20	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5845459	2018/11/19	2018/11/20	Azita Fazaeli
Total Ammonia-N	LACH/NH4	5843535	N/A	2018/11/20	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5843249	N/A	2018/11/20	Chandra Nandlal
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5843217	N/A	2018/11/19	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5843531	2018/11/17	2018/11/19	Rajni Tyagi

TEST SUMMARY

Maxxam ID: IHO199
Sample ID: TW-6 (LEACHATE WELL)
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843214	N/A	2018/11/19	Alina Dobreanu
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Hardness (calculated as CaCO3)		5842487	N/A	2018/11/20	Automated Statchk
Mercury	CV/AA	5848749	2018/11/21	2018/11/21	Ron Morrison
Lab Filtered Metals Analysis by ICP	ICP	5845459	2018/11/19	2018/11/20	Azita Fazaeli
Total Ammonia-N	LACH/NH4	5843535	N/A	2018/11/20	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5843249	N/A	2018/11/20	Chandra Nandlal
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5843217	N/A	2018/11/19	Deonarine Ramnarine
Total Dissolved Solids	BAL	5843125	2018/11/17	2018/11/19	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5843531	2018/11/17	2018/11/20	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5845182	2018/11/19	2018/11/20	Amanpreet Sappal
Total Suspended Solids	BAL	5841992	2018/11/17	2018/11/19	Nilam Borole

Maxxam ID: IHO200
Sample ID: SW-1
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5845272	N/A	2018/11/20	Deonarine Ramnarine
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Dissolved Oxygen	DO	5842583	2018/11/16	2018/11/16	Prakash Piya
Total Metals Analysis by ICP	ICP	5849689	2018/11/21	2018/11/22	Azita Fazaeli
Total Ammonia-N	LACH/NH4	5843535	N/A	2018/11/20	Charles Opoku-Ware
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5843990	N/A	2018/11/19	Bramdeo Motiram
Total Phosphorus (Colourimetric)	LACH/P	5843988	2018/11/19	2018/11/19	Amanpreet Sappal

Maxxam ID: IHO200 Dup
Sample ID: SW-1
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Oxygen	DO	5842583	2018/11/16	2018/11/16	Prakash Piya

Maxxam ID: IHO202
Sample ID: SW-2
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843243	N/A	2018/11/20	Deonarine Ramnarine
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Dissolved Oxygen	DO	5842583	2018/11/16	2018/11/16	Prakash Piya

TEST SUMMARY

Maxxam ID: IHO202
Sample ID: SW-2
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Metals Analysis by ICP	ICP	5849689	2018/11/21	2018/11/22	Azita Fazaeli
Total Ammonia-N	LACH/NH4	5843535	N/A	2018/11/20	Charles Opoku-Ware
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5843990	N/A	2018/11/19	Bramdeo Motiram
Total Phosphorus (Colourimetric)	LACH/P	5843988	2018/11/19	2018/11/19	Amanpreet Sappal

Maxxam ID: IHO203
Sample ID: SW-3
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843243	N/A	2018/11/20	Deonarine Ramnarine
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Dissolved Oxygen	DO	5842583	2018/11/16	2018/11/16	Prakash Piya
Total Metals Analysis by ICP	ICP	5849689	2018/11/21	2018/11/22	Azita Fazaeli
Total Ammonia-N	LACH/NH4	5843535	N/A	2018/11/20	Charles Opoku-Ware
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5843997	N/A	2018/11/19	Bramdeo Motiram
Total Phosphorus (Colourimetric)	LACH/P	5843988	2018/11/19	2018/11/19	Amanpreet Sappal

Maxxam ID: IHO204
Sample ID: SW-4
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843243	N/A	2018/11/20	Deonarine Ramnarine
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Dissolved Oxygen	DO	5842583	2018/11/16	2018/11/16	Prakash Piya
Total Metals Analysis by ICP	ICP	5849689	2018/11/21	2018/11/22	Azita Fazaeli
Total Ammonia-N	LACH/NH4	5843540	N/A	2018/11/20	Charles Opoku-Ware
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5843990	N/A	2018/11/19	Bramdeo Motiram
Total Phosphorus (Colourimetric)	LACH/P	5843988	2018/11/19	2018/11/19	Amanpreet Sappal

Maxxam ID: IHO204 Dup
Sample ID: SW-4
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Phosphorus (Colourimetric)	LACH/P	5843988	2018/11/19	2018/11/19	Amanpreet Sappal

TEST SUMMARY

Maxxam ID: IHO205
Sample ID: SW-5
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843243	N/A	2018/11/20	Deonarine Ramnarine
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Dissolved Oxygen	DO	5842583	2018/11/16	2018/11/16	Prakash Piya
Total Metals Analysis by ICP	ICP	5849689	2018/11/21	2018/11/22	Azita Fazaeli
Total Ammonia-N	LACH/NH4	5843535	N/A	2018/11/20	Charles Opoku-Ware
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5843992	N/A	2018/11/19	Bramdeo Motiram
Total Phosphorus (Colourimetric)	LACH/P	5843988	2018/11/19	2018/11/19	Amanpreet Sappal

Maxxam ID: IHO206
Sample ID: OW-2 (DUP)
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/19	Surinder Rai
Chloride by Automated Colourimetry	KONE	5843214	N/A	2018/11/19	Alina Dobreanu
Conductivity	AT	5843227	N/A	2018/11/19	Surinder Rai
Hardness (calculated as CaCO3)		5842487	N/A	2018/11/20	Automated Statchk
Lab Filtered Metals Analysis by ICP	ICP	5845459	2018/11/19	2018/11/20	Azita Fazaeli
Total Ammonia-N	LACH/NH4	5843535	N/A	2018/11/20	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5843249	N/A	2018/11/20	Chandra Nandlal
pH	AT	5843228	N/A	2018/11/19	Surinder Rai
Sulphate by Automated Colourimetry	KONE	5843217	N/A	2018/11/19	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5843531	2018/11/17	2018/11/19	Rajni Tyagi

Maxxam ID: IHO206 Dup
Sample ID: OW-2 (DUP)
Matrix: Water

Collected: 2018/11/14
Shipped:
Received: 2018/11/15

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5843224	N/A	2018/11/18	Surinder Rai
Conductivity	AT	5843227	N/A	2018/11/18	Surinder Rai
pH	AT	5843228	N/A	2018/11/18	Surinder Rai

GENERAL COMMENTS

Sample IHO195 [TW-5A] : TKN < Ammonia: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5841992	Total Suspended Solids	2018/11/19					<10	mg/L	9.5	25	95	85 - 115
5843125	Total Dissolved Solids	2018/11/19					<10	mg/L	4.7	25	98	90 - 110
5843212	Nitrate (N)	2018/11/19	93	80 - 120	94	80 - 120	<0.10	mg/L	0.75	20		
5843214	Dissolved Chloride (Cl-)	2018/11/19	96	80 - 120	102	80 - 120	<1.0	mg/L	0.93	20		
5843217	Dissolved Sulphate (SO4)	2018/11/19	NC	75 - 125	104	80 - 120	<1.0	mg/L	0.68	20		
5843224	Alkalinity (Total as CaCO3)	2018/11/18			97	85 - 115	<1.0	mg/L	0.98	20		
5843227	Conductivity	2018/11/18			100	85 - 115	<1.0	umho/cm	6.9	25		
5843228	pH	2018/11/18			101	98 - 103			0.12	N/A		
5843243	Dissolved Chloride (Cl-)	2018/11/20	NC	80 - 120	101	80 - 120	<1.0	mg/L	0.96	20		
5843249	Nitrate (N)	2018/11/20	98	80 - 120	98	80 - 120	<0.10	mg/L	0.39	20		
5843531	Total Kjeldahl Nitrogen (TKN)	2018/11/19	98	80 - 120	95	80 - 120	<0.10	mg/L	5.0	20	103	80 - 120
5843535	Total Ammonia-N	2018/11/20	87	75 - 125	99	80 - 120	<0.050	mg/L	0.27	20		
5843540	Total Ammonia-N	2018/11/20	99	75 - 125	100	80 - 120	<0.050	mg/L	1.8	20		
5843988	Total Phosphorus	2018/11/19	96	80 - 120	88	80 - 120	<0.004	mg/L	3.9	20	87	80 - 120
5843990	Phenols-4AAP	2018/11/19	97	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20		
5843992	Phenols-4AAP	2018/11/19	98	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20		
5843997	Phenols-4AAP	2018/11/19	98	80 - 120	100	80 - 120	<0.0010	mg/L	NC	20		
5845182	Total Phosphorus	2018/11/20	96	80 - 120	98	80 - 120	<0.020	mg/L	6.1	20	96	80 - 120
5845272	Dissolved Chloride (Cl-)	2018/11/20	103	80 - 120	101	80 - 120	<1.0	mg/L	2.1	20		
5845459	Dissolved Arsenic (As)	2018/11/20	100	80 - 120	98	80 - 120	<0.2	mg/L				
5845459	Dissolved Barium (Ba)	2018/11/20	104	80 - 120	101	80 - 120	<0.005	mg/L				
5845459	Dissolved Boron (B)	2018/11/20	103	80 - 120	99	80 - 120	<0.02	mg/L				
5845459	Dissolved Cadmium (Cd)	2018/11/20	103	80 - 120	100	80 - 120	<0.005	mg/L				
5845459	Dissolved Chromium (Cr)	2018/11/20	106	80 - 120	102	80 - 120	<0.01	mg/L				
5845459	Dissolved Copper (Cu)	2018/11/20	104	80 - 120	101	80 - 120	<0.02	mg/L				
5845459	Dissolved Iron (Fe)	2018/11/20	101	80 - 120	98	80 - 120	<0.02	mg/L				
5845459	Dissolved Lead (Pb)	2018/11/20	105	80 - 120	101	80 - 120	<0.05	mg/L				
5845459	Dissolved Manganese (Mn)	2018/11/20	104	80 - 120	101	80 - 120	<0.01	mg/L				
5845459	Dissolved Potassium (K)	2018/11/20	106	80 - 120	102	80 - 120	<1	mg/L	3.0	25		
5845459	Dissolved Sodium (Na)	2018/11/20	NC	80 - 120	102	80 - 120	<0.5	mg/L	1.9	25		
5848749	Mercury (Hg)	2018/11/21	91	75 - 125	95	80 - 120	<0.1	ug/L	NC	20		

QUALITY ASSURANCE REPORT(CONT'D)

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5849689	Total Iron (Fe)	2018/11/22	93	80 - 120	111	80 - 120	<0.02	mg/L				

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2x$ RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Ewa 

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

**APPENDIX G:
HISTORIC GROUNDWATER ELEVATIONS**

**APPENDIX G
NORMANBY LANDFILL SITE
GROUNDWATER LEVELS AND ELEVATIONS**

Test Well	Ground Elevation (m)	Measuring Point Elevation (m)	April 14, 2011		October 25, 2011		April 3, 2012		September 25, 2012		May 9, 2013		November 26, 2013		May 1, 2014		November 4, 2014	
			WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)
TW-1	90.38	91.42	1.69	89.73	1.71	89.71	1.83	89.59	2.38	89.04	2.01	89.41	1.83	89.59	1.71	89.71	1.99	89.43
TW-2	90.33	91.36	1.88	89.48	2.00	89.36	2.05	89.31	2.5	88.89	2.38	88.98	2.07	89.29	1.95	89.41	2.29	89.07
TW-3	88.77	89.49	1.53	87.96	1.53	87.96	1.58	87.91	2.66	86.83	1.68	87.81	1.55	87.94	1.55	87.94	1.93	87.56
TW-5	96.27	97.60	3.25	94.35	3.24	94.36	3.26	94.34	3.89	93.71	3.29	94.31	2.70	94.90	3.49	94.11	3.58	94.02
TW5-A	96.34	97.17	3.7	93.47	3.46	93.71	3.55	93.62	4.04	93.13	3.74	93.43	3.25	93.92	3.24	93.93	3.45	93.72
TW-6	95.98	96.92	3.78	93.14	3.70	93.22	3.78	93.14	4.32	92.60	3.77	93.15	3.70	93.22	3.73	93.19	3.88	93.04
OW-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.50	NA	1.61	NA
OW-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.24	NA	1.40	NA

Test Well	Ground Elevation (m)	Measuring Point Elevation (m)	April 20, 2015		November 3, 2015		April 19, 2016		October 26, 2016		May 16, 2017		November 27, 2017		April 10, 2018		November 14, 2018	
			WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)	WL (m)	WL Elev. (m)
TW-1	90.38	91.42	1.78	89.64	2.27	89.15	1.71	89.71	2.23	89.19	1.91	89.51	1.97	89.45	1.91	89.51	2.06	89.36
TW-2	90.33	91.36	1.98	89.38	2.27	89.09	2.04	89.32	2.51	88.85	2.40	88.96	2.32	89.04	2.21	89.15	2.42	88.94
TW-3	88.77	89.49	1.60	87.89	2.21	87.28	1.66	87.83	2.62	86.87	1.65	87.84	1.65	87.84	1.40	88.09	1.44	88.05
TW-5	96.27	97.60	3.53	94.07	3.70	93.90	3.49	94.11	4.15	93.45	3.52	94.08	3.52	94.08	3.55	94.05	3.61	93.99
TW5-A	96.34	97.17	2.64	94.53	3.68	93.49	3.26	93.91	3.94	93.23	3.32	93.85	3.28	93.89	3.37	93.8	3.51	93.66
TW-6	95.98	96.92	3.75	93.17	4.06	92.86	3.77	93.15	4.40	92.52	3.76	93.16	3.73	93.19	3.80	93.12	3.92	93.00
OW-2	NA	NA	1.53	NA	1.66	NA	1.51	NA	2.00	NA	1.56	NA	1.54	NA	1.51	NA	1.56	NA
OW-3	NA	NA	1.25	NA	1.40	NA	1.26	NA	1.76	NA	1.33	NA	1.22	NA	1.32	NA	1.36	NA

Notes:

1. The data presented up to 2013 has been summarized from information presented in previous Annual Reports completed by Genivar
2. Wells TW4, TW7 and TW7A were previously destroyed.
3. WL = Water Levels below top of pipe
4. TW5A damaged - repaired July 12, 2002. New top of casing (measuring point) elevation required.
5. NA: No Data is Available
6. No historic groundwater elevation data is available beyond the 2011 Annual Report

**APPENDIX H:
BOREHOLE LOGS/MONITORING WELL CONSTRUCTION
DETAILS**

RECORD OF WELL No. 1

PROJECT : NORMANBY TOWNSHIP LANDFILL

PROJECT NO. : M-1170

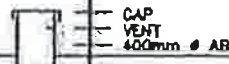
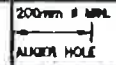
CLIENT : TOWNSHIP OF NORMANBY

SUPERVISOR : R. SLAUGHTER

WELL TYPE : 400 mm Ø ABS PIEZOMETER

DATE : JANUARY 13, 1984

LOCATION : LOT 7, CONCESSION 14, TOWNSHIP OF NORMANBY

DEPTH (METRES)	ELEVATION (METRES)	DESCRIPTION	MARK	SAMPLE			WELL DETAIL	REMARKS
				No.	TYPE	"N"		
SURF.	00.35	TOPSOIL	~				 CAP VENT 400mm Ø ABS	
1m		SANDY BROWN GRAVEL	●	1	SS	24		WL TAKEN FEB. 20/84
2m		SANDY, GREY SILT WITH SOME GRAVEL	●	2	SS	28		
3m			●	3	SS	29		
4m			●	4	SS	27		
5m			●	5	SS	29		
6m		SANDY, GREY SILT WITH SOME LAYERING	●	6	SS	33		PELTONITE SEAL SILICA SAND SEAL 0.9m SCREEN SAWCUT SLOTS AT EVERY 75mm
7m			●	7	SS	28	 200mm Ø MIN. AUGER HOLE	$K = 1.7 \times 10^{-4} \text{ cm/sec}$
8m								END OF BOREHOLE
9m								

CS - GRAB SAMPLE, SS - SPLIT SPOON, ST - SHIELDY TUBE, "N" - BLOWS/FOOT

RECORD OF WELL No. 2

PROJECT : NORMANBY TOWNSHIP LANDFILL

PROJECT NO. : M-1170

CLIENT : TOWNSHIP OF NORMANBY

SUPERVISOR : R. SLAUGHTER

WELL TYPE : 400 mm # ABS PIEZOMETER

DATE : JANUARY 13, 1984

LOCATION : LOT 7, CONCESSION 14, TOWNSHIP OF NORMANBY

DEPTH (METRES)	ELEVATION (METRES)	DESCRIPTION	MARK	SAMPLE No. TYPE "N"			WELL DETAIL	REMARKS
SURF.	90.35	TOPSOIL	~				<p>CAP VENT 400mm # ABS</p> <p>WL. TAKEN FEB. 20/84</p> <p>PELTONITE SEAL</p> <p>NATIVE SILTY SAND GRAVEL AND SANDY SILT PACKING</p> <p>$K = 1.7 \times 10^{-3} \text{ cm/sec}$</p> <p>1.5m SCREEN SAWCUT SLOTS AT EVERY 75mm</p>	
1m		SANDY BROWN GRAVEL	A	1	SS	24		
2m		SANDY, GREY SILT WITH SOME GRAVEL	B	2	SS	25		
3m			C	3	SS	26		
4m			D	4	SS	27		
5m		SANDY, GREY SILT WITH SOME LAYERING	E	5	SS	28		
6m			F	6	SS	33		
7m			G	7	SS	28		
8m							END OF BOREHOLE	
9m								

GS - GRAB SAMPLE, SS - SPLIT SPOON, ST - SHREIBY TUBE, "N" - BLOWS/FOOT

RECORD OF WELL No. 3

PROJECT : NORMANBY TOWNSHIP LANDFILL

PROJECT NO. : M-1170

CLIENT : TOWNSHIP OF NORMANBY

SUPERVISOR : R. SLAUGHTER

WELL TYPE : 400 mm Ø ABS PIEZOMETER

DATE : JANUARY 13, 1984

LOCATION : LOT 7, CONCESSION 14, TOWNSHIP OF NORMANBY

DEPTH (METRES)	ELEVATION (METRES)	DESCRIPTION	MARK	SAMPLES No. TYPE "N"		WELL DETAIL	REMARKS	
SURF.	88.77	TOPSOIL	A				WL TAKEN FEB. 20/84	
1m		FINE SILTY, GRAVELLY, BROWN SAND	B	1	SS		8	NATIVE SILTY SAND PACKING
2m		MEDIUM SILTY, GRAVELLY SAND	C	2	SS		30	
3m		SANDY, GREY SILT	D	3	SS		25	1.7m SCREEN SAWCUT SLOTS AT EVERY 75mm
4m				4	SS	32	END OF BOREHOLE	
5m								
6m								
7m								
8m								
9m								

GS - GRAB SAMPLE, SS - SPLIT SPOON, ST - SHELBY TUBE, "N" - BLOWS/FOOT

RECORD OF WELL No. 4

PROJECT : NORMANBY TOWNSHIP LANDFILL
 CLIENT : TOWNSHIP OF NORMANBY
 WELL TYPE : 400 mm Ø ABS PIEZOMETER
 LOCATION : LOT 7, CONCESSION 14, TOWNSHIP OF NORMANBY

PROJECT NO. : M-1170
 SUPERVISOR : R. SLAUGHTER
 DATE : JANUARY 13, 1984

DEPTH (METRES)	ELEVATION (METRES)	DESCRIPTION	MARK	SAMPLE No. TYPE "N"		WELL DETAIL	REMARKS
SURF.	02.00						
1m		TOPSOIL AND FILL	[Cross-hatched pattern]				
2m		FINE TO MEDIUM BROWN SAND	[Dotted pattern]	1	SS 13		W.L. TAKEN FEB. 20/84 1.8m SCREEN SAWCUT SLOTS AT EVERY 75mm
3m		SANDY, MOTTLED, BROWN CLAY	[Diagonal lines]	2	SS 22		
4m		SANDY GREY SILT	[Vertical lines]	3	SS 04		
5m				4	SS 08		
6m							END OF BOREHOLE
7m							
8m							
9m							

GS - GRAB SAMPLE, SS - SPLIT SPOON, ST - SHELBY TUBE, "N" - BLDGS/FOOT

RECORD OF WELL No. 5

PROJECT : NORMANBY TOWNSHIP LANDFILL
 CLIENT : TOWNSHIP OF NORMANBY
 WELL TYPE : 400 mm Ø ABS PIEZOMETER
 LOCATION : LOT 7, CONCESSION 14, TOWNSHIP OF NORMANBY

PROJECT NO. : M-1170
 SUPERVISOR : R. SLAUGHTER
 DATE : JANUARY 13, 1984

DEPTH (METRES)	ELEVATION (METRES)	DESCRIPTION	MARK	SAMPLE		WELL DETAIL	REMARKS	
				No.	TYPE "N"			
SURF.	95.89					<p>CAP VENT 400mm Ø ABS</p> <p>WL. TAKEN FEB. 20/84</p> <p>PELTONITE SEAL</p> <p>NATIVE SAND PACKING</p> <p>2.6m SCREEN SAWCUT SLOTS AT EVERY 75mm</p>		
		TOPSOIL AND GRAVEL FILL						
1m		BROWN SAND AND GRAVEL, MINOR SILT AND STONES		1	SS		22	
2m				2	SS		77	
3m				3	SS		120	
4m		SILTY, BROWN SAND		4	SS		27	
5m				5	SS		24	
6m				6	SS		7	
7m		FINE TO MEDIUM, UNIFORM, BROWN SAND		7	SS		18	
8m				8	SS		7	
9m		SANDY, GREY SILT WITH SOME MINOR SAND LAYERS		9	SS	28		
10m								
11m		SANDY, GREY SILT		10	SS	43		
12m							END OF BOREHOLE	

GS - GRAB SAMPLE, SS - SPLIT SPOON, ST - SHELBY TUBE, "N" - BLOWS/FOOT

RECORD OF WELL No. 5A

PROJECT : NORMANBY TOWNSHIP LANDFILL

PROJECT NO. : M-1170

CLIENT : TOWNSHIP OF NORMANBY

SUPERVISOR : R. SLAUGHTER

WELL TYPE : 400 mm Ø ABS PIEZOMETER

DATE : JANUARY 13, 1984

LOCATION : LOT 7, CONCESSION 14, TOWNSHIP OF NORMANBY

DEPTH (METRES)	ELEVATION (METRES)	DESCRIPTION	MARK	SAMPLE		WELL DETAIL	REMARKS	
				No.	TYPE "N"			
SURF.	95.89					<p> CAP VENT 400mm Ø ABS PELTONITE SEAL NATIVE SAND/GRAVEL PACKING 2.4m SCREEN SAWCUT SLOTS AT EVERY 75mm WL TAKEN FEB. 21/84 </p>		
		TOPSOIL AND GRAVEL FILL						
1m		BROWN SAND AND GRAVEL MINOR SILT AND STONES		1	SS 22			
				2	SS 77			
2m				3	SS 120			
3m		SILTY, BROWN SAND		4	SS 27			
4m				5	SS 24			
5m				6	SS 7			
6m		FINE TO MEDIUM, UNIFORM, BROWN SAND		7	SS 16			
7m				8	SS 7			
8m		SANDY, GREY SILT WITH SOME MINOR SAND LAYERS		9	SS 26			
9m				10	SS 43			
10m		SANDY, GREY SILT						
11m							END OF BOREHOLE	
12m								

RECORD OF WELL No. 6

PROJECT : NORMANBY TOWNSHIP LANDFILL
 CLIENT : TOWNSHIP OF NORMANBY
 WELL TYPE : 400 mm # ABS PIEZOMETER
 LOCATION : LOT 7, CONCESSION 14, TOWNSHIP OF NORMANBY

PROJECT NO. : M-1170
 SUPERVISOR : R. SLAUGHTER
 DATE : JANUARY 13, 1984

DEPTH (METRES)	ELEVATION (METRES)	DESCRIPTION	MARK	SAMPLE No. TYPE "N"			WELL DETAIL	REMARKS
SURF.	85.90							
1m		FILL - SAND AND GRAVEL	[Cross-hatch pattern]					
2m		REFUSE AND FILL	[Cross-hatch pattern]					
3m		SILTY SAND AND GRAVEL	[Dotted pattern]					WL TAKEN FEB. 20/84 PELTONITE SEAL
4m		SANDY, GREY TO GREY-BROWN SILT	[Vertical line pattern]	1	SS	24		NATIVE SILTY SAND GRAVEL AND SANDY SILT PACKING
5m				2	SS	14		1.2m SCREEN SAWCUT SLOTS AT EVERY 75mm
6m				3	SS	17		
7m								END OF BOREHOLE
8m								
9m								

CS - GRAB SAMPLE, SS - SPLIT SPOON, ST - SQUEEZY TUBE, "N" - BLOWS/FOOT

RECORD OF WELL No. 7

PROJECT : NORMANBY TOWNSHIP LANDFILL
 CLIENT : TOWNSHIP OF NORMANBY
 WELL TYPE : 400 mm Ø ABS PIEZOMETER
 LOCATION : LOT 7, CONCESSION 14, TOWNSHIP OF NORMANBY

PROJECT NO. : M-1170
 SUPERVISOR : R. SLAUGHTER
 DATE : JANUARY 13, 1984

DEPTH (METRES)	ELEVATION (METRES)	DESCRIPTION	MARK	SAMPLE			WELL DETAIL	REMARKS
				No.	TYPE	"N"		
SURF.	98.51	TOPSOIL					CAP VENT 400mm Ø ABS	
1m		SANDY GRAVEL		1	SS	-		 WL TAKEN FEB. 20/84 PELTONITE SEAL 0.9m SCREEN SAWCUT SLOTS AT EVERY 75mm NATIVE SAND PACKING
2m				2	SS	48		
3m				3	SS	70		
4m				4	SS	48		
5m		BROWN SAND, WITH SANDY SILT LENSES		5	SS	17		
6m				6	SS	18		
7m		SANDY SILT		7	SS	57		
8m								
9m								

CS - GRAB SAMPLE, SS - SPLIT SPOON, ST - SHELBY TUBE, "N" - BLOWS/FOOT

CAMBY AND MANIROW Limited

RECORD OF WELL No. 7A

PROJECT : NORMANBY TOWNSHIP LANDFILL

PROJECT NO. : M-1170

CLIENT : TOWNSHIP OF NORMANBY

SUPERVISOR : R. SLAUGHTER

WELL TYPE : 400 mm Ø ABS PIEZOMETER

DATE : JANUARY 13, 1984

LOCATION : LOT 7, CONCESSION 14, TOWNSHIP OF NORMANBY

DEPTH (METRES)	ELEVATION (METRES)	DESCRIPTION	MARK	SAMPLE No. TYPE "N"		WELL DETAIL	REMARKS	
SURF.	66.58	TOPSOIL	~					
1m		SANDY GRAVEL	●	1	SS			
2m			●	2	SS		48	
3m			●	3	SS		70	WL TAKEN FEB. 20/84
4m		BROWN SAND, WITH SANDY SILT LENSES	●	4	SS		48	PELTONITE SEAL 0.9m SCREEN SAWCUT SLOTS AT EVERY 75mm NATIVE SAND/GRAVEL PACKING
5m			●	5	SS		17	
6m			●	6	SS		18	
7m		SANDY SILT	●	7	SS	57		
8m							END OF BOREHOLE	
9m								

CS - CRAB SAMPLE, SS - SPLUT SPOON, ST - SHELBY TUBC, "N" - BLOWS/FOOT

CAMBY AND MANORRE Limited