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REPORT ON

**2004
GROUNDWATER AND SURFACE WATER
MONITORING PROGRAM
CENTRAL LANDFILL
CORPORATION OF THE NATION MUNICIPALITY
ONTARIO**

Submitted to:

Corporation of the Nation Municipality
958 Road 500 West
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Casselman, Ontario
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March 2005

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March 18, 2005

05-1120-712

Corporation of the Nation Municipality
958 Road 500 West
R.R.3
Casselman, Ontario
K0A 1M0

Attention: Mrs. Mary McCuaig, A.M.C.T.

**RE: 2004 GROUNDWATER AND SURFACE WATER MONITORING PROGRAM
CENTRAL LANDFILL SITE
CORPORATION OF THE NATION MUNICIPALITY, ONTARIO**

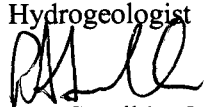
Dear Madam:

Golder Associates Ltd. is pleased to present our report on the 2004 Groundwater and Surface Water Monitoring Program for the Central Landfill Site.

Should you have any questions or comments on the report, or if we may be of further assistance, please do not hesitate to contact the undersigned.

Yours truly,

GOLDER ASSOCIATES LTD.
Environmental Division


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Hydrogeologist

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Principal

MG:PAS:cr

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EXECUTIVE SUMMARY

Golder Associates Ltd. (Golder) was retained by the Corporation of the Nation Municipality to conduct the 2004 Groundwater and Surface Water Monitoring Program at the Central Landfill (the site). The landfill site is located between Regional Road 3 (to the south) and the South Nation River (to the north), on Part of Lot 14, Concession V, in the former Township of Cambridge in the Nation Municipality, Ontario.

Field investigation activities included water level measurements, sampling of groundwater monitors and sampling of surface water locations.

The overburden at the site consists of clay or silty clay overlain by sandy silt, silty sand or sand (granular layer). The direction of groundwater flow in the overburden at the site is interpreted to be in a northerly direction towards the South Nation River. Along the edges of Ravine No. 1 near the northwest corner of the site, the flow of groundwater is interpreted to be following the top of clay surface and to be diverted towards the ravine. Groundwater flows in a northeasterly direction at the northeast corner of the site, east of the main area of filled wastes.

Based on the groundwater flow direction at the site, the presence of Ravine No. 1 along the northwest part of the site and the presence of the South Nation River along the northern part of the site, it is concluded that the only property boundary of concern with respect to groundwater compliance with Ministry of the Environment (MOE) Guideline B-7 would be the east boundary of the site.

Leachate impacts were measured at groundwater monitors installed at the northeast corner of the site, but the extent of the groundwater impacted zone could be defined using the existing monitoring well network. In order to bring the Central Landfill into compliance with Guideline B-7 (the Reasonable Use Concept) along its eastern boundary, the Nation Municipality has acquired a piece of property with approximate dimensions of 510 metres by 125 metres along the east property line of the site. This property was registered as a leachate-attenuation zone on the Certificate of Approval for the site. The site is in compliance with Guideline B-7.

The quality of surface water measured at the point of discharge from Ravine No. 1 to the South Nation River in 2004 generally improved compared to 2003 levels. This is likely attributable to reshaping of the wastes and installation of a clay cover at Village of Casselman Landfill, which reduced the contribution of leachate-impacted surface water (LISW) originating from Casselman flowing onto Central Landfill property. Parameters that exceeded their corresponding Provincial Water Quality Objective (PWQO) in Ravine No.1 at the outlet point to the river in 2004 include boron, cobalt, dissolved oxygen, iron, total phosphorous, unionized ammonia and zinc. A comparative review of surface water quality at stations located along Ravine No. 1 suggest that PWQO exceedances of iron and unionized ammonia at the outlet point to the river are predominantly associated with leachate impacts originating from Casselman Landfill.

A detailed review of critical leachate indicator parameters (chloride, iron, total phosphorous and ammonia) generally indicates that the discharge of LISW from Ravine No. 1 is not having a persistent, significant impact on water quality in the South Nation River. However, localized minor iron impacts beyond the PWQO within the zone immediately adjacent to and some distance downstream from the discharge point of Ravine No. 1 into the South Nation River appear to have occurred on a number of occasions, and with more frequent occurrences in 2004. The total phosphorous data suggest that an adverse impact on water quality in the river has not occurred since December 1999 with the possible exceptions of the June 2003, July 2003, August 2004 and October 2004 sessions. The only unionized ammonia impact to have occurred in the South Nation River since 2001 was measured in July 2004 within the zone adjacent to the discharge point of Ravine No. 1 at 0.041 mg/L.

The seasonal discharge of impacted surface water onto the adjoining property to the east and to the South Nation River (through Ravine No. 2) was previously found to have resulted in impact on off-site water quality at these locations. However, the constructed drainage was filled during the summer of 2004 which has virtually eliminated the discharge of impacted groundwater to the South Nation River via Ravine No. 2. The acquisition of a property to the east and its registration as a leachate-attenuation for the landfill site has addressed the issue of off-site LISW discharge to the east.

The results of aqueous toxicity testing on LISW in Ravine No. 1 conducted in 2004 has shown that discharge to the South Nation River via Ravine No. 1 was not toxic to rainbow trout or *Daphnia magna*. This is an improvement from toxicity results conducted in 2003 where the LISW collected at the point of discharge was found to be toxic to rainbow trout. Based on toxicity testing conducted during the spring 2004 with a sample collected near the common boundary between the Central Site and the Casselman Site, surface water discharging from Casselman Landfill onto Nation Central Landfill property was more toxic than the combined waters originating from both sites and discharging to the river for both species tested. This observation is consistent with results from 2003. Based on previous experience with municipal landfill leachate, the main toxic parameter for the rainbow trout specimen is likely un-ionized ammonia.

The MOE has recently made a request that a number of steps be undertaken by Nation Municipality to manage LISW in Ravine No. 1 discharging to the South Nation River, with specific associated deadlines. It is expected that a meeting to be attended by the MOE and the municipality will need to be organized to further discuss requirements by the MOE.

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1.0 INTRODUCTION

This report summarizes the 2004 groundwater and surface water monitoring program carried out at the Central Landfill (the site) in the Nation Municipality, Ontario. The scope of work was described in the letter dated January 14, 2004 by Golder Associates Ltd. (Golder).

The site is located between Regional Road 3 to the south and the South Nation River to the north, on Part of Lot 14, Concession V, in the former Township of Cambridge in the Nation Municipality, Ontario (see Key Plan, Figure 1). The site is accessible via Regional Road 3 and is located in a rural setting approximately 3 kilometres northwest of the Village of Casselman. The fill area is located in the northern section of the site with the access road to the west and the South Nation River to the north (see Site Plan, Figure 2).

The Central Landfill, which is owned by the Corporation of the Nation Municipality, ceased receiving wastes in August 1, 2001, and closure works were completed between 2001 and 2002. The site is licensed under Provisional Certificate of Approval (C of A) A471101, dated June 7, 1982 and the amendment, relating to site closure, to Provisional C of A A471101, dated August 1, 2001. The amending notice No. 2 dated December 14, 2004, recognizes that a 6.36 hectare leachate-attenuation zone was included in the licensed waste disposal property to comply with Condition 5 of the C of A. Provisional C of A A471101 and amending notices are included in Appendix A. Prior to the amendment, the landfill was licensed for the disposal of "domestic, commercial, and 'other' limited to agricultural waste, wire and wood waste". Other conditions as specified by the amendment to Provisional C of A A471101 are included in Appendix A.

The adjacent property to the west is a landfill owned and operated by the Village of Casselman. It is noted that the Village of Casselman is an independent entity which is not part of the amalgamated Nation Municipality. All waste disposal activities have been halted at this location since the beginning of 2003, and closure-related activities (including re-shaping of the wastes and installation of a clay soil cover) were conducted during the summer of 2004. The setting and operations at the Village of Casselman Landfill are briefly discussed in this report since previous studies (Golder, 2003b) have shown that surface water discharging from the Casselman Landfill property contributes to leachate impacts to surface water discharging to the South Nation via Ravine No. 1, which constitutes a state of non-compliance related to surface water impacts for the site (more details are included in Sections 10.0 and 11.0).

Filled material on the Central Landfill consist of domestic waste shaped as a north-south oriented ridge, and of construction debris and dry brush that were historically filled in the area just south of the crest of the South Nation River slopes and within and above the easternmost portion of Ravine No. 1 (see Figure 2). On Casselman Landfill Site, domestic waste material has been deposited to infill the former gulley that becomes Ravine No. 1 and extends further to the south of the ravine's original location.

2.0 PROGRAM OBJECTIVES

Based on historical measurements and analytical results from the previous groundwater and surface water monitoring program conducted in 2003, the primary concerns with respect to impacts on surface water and groundwater quality at the site identified for the year 2004 were as follows:

- Adverse impact on groundwater and surface water quality along the eastern property boundary (groundwater and surface water compliance); and
- Impact on surface water quality in the South Nation River as a result of the discharge of leachate-impacted surface (LISW) water from Ravine No. 1 (surface water compliance).

Physical closure-related works at the Central Landfill Site conducted during the summer of 2004 modified the site conditions and the monitoring program was adjusted accordingly. The constructed ditch located east of the waste fill area was filled in during the summer of 2004, which virtually eliminated the discharge of LISW via the eastern-most ravine (Ravine No. 2) to the South Nation River. As such, bi-annual monitoring of surface water quality in the constructed ditch was removed from the monitoring program starting in the fall of 2004. Also, a parcel of land located to the east of the area of filled wastes at the site, with approximate dimensions of 125 metres wide (along the South Nation River) by 510 metres long, was acquired by the Nation Municipality in September 2003. This area now serves as a leachate-attenuation zone for the site, as per amending notice No. 2 to the C of A A471101. The groundwater monitoring program was therefore reduced in scope during the fall 2004 monitoring session, as described later in this section.

The objectives of the proposed 2004 monitoring program were focused on monitoring water quality associated with the two primary migration pathways related to impact on off-site water resources. The related activities conducted in 2004 included:

- Measurement of groundwater levels during the spring and fall seasons of 2004 at all existing monitoring well locations at the site;
- Collection of groundwater samples from monitoring locations G00-4A, G00-4B, G99-7, P2, G02-1A, G02-1B, G02-2, G02-3, G02-4A and G02-4B during the spring 2004, and from monitoring locations G00-4A, G00-4B, P2, G02-1A and G02-1B during the fall 2004;
- Completion of monthly surface water monitoring sessions at surface water monitoring stations located along the Ravine No. 1 and South Nation River (CSW-1, SW6, SW7, SW8, SW9 and SW10);

- Collection of surface water samples along the east drainage ditch that discharges into the South Nation River via Ravine No. 2 near the northeast corner of the site (SW1, SW11, SW12, SW13 and SW3) during the spring 2004; collection of surface water sample at discharge of Ravine No. 2 (SW3) during the fall 2004 (as per Golder's recommendation, the eastern ditch was filled in by the Municipality during the summer of 2004);
- Preparation of a monitoring report based on field and laboratory results.

3.0 PREVIOUS STUDIES

The following is a summary of the various hydrogeological and operational activities that have been conducted at the Central Landfill since 1991.

McNeely Engineering, 1991. Site Development and Operation Plan For Waste Disposal Site, Township of Cambridge, Lot 14, Concession 5: McNeely Engineering, Report No. M-2905, February 1991.

McNeely Engineering completed a waste management improvement study on the Central Landfill including a site operation and development plan. All hydrogeological and geophysical investigations were completed by StanCon Groundwater Engineering Limited.

StanCon Groundwater Engineering Limited, 1991. Hydrogeological Investigation, Township of Cambridge, Municipal Landfill Site: StanCon Report No. 90-67, February 1991.

Four overburden boreholes including P1, P2, P3 and P4 were drilled and completed with one monitoring well and were sampled and analysed to determine groundwater quality. Surface water sampling was completed at four surface water stations both upstream and downstream of the fill area, two stations located at two ravines and three stations of ponded water. Soil sampling and water table measurements were also completed. The sampling and preservation methods were not consistent with those followed by Golder and therefore, were not compared to those of Golder.

StanCon identified that there was the potential for degradation of water quality in the South Nation River due to the Central Landfill. However, StanCon identified that it was not likely for potential degradation of neighbouring property uses.

Golder Associates Ltd, 2000. May 1999 to March 2000 Hydrogeological Investigation and Groundwater and Surface Water Monitoring Program, Central Landfill Site, Corporation of the Nation Municipality, Ontario: Golder Associates Ltd., Report No. 991-2837, May 2000.

Field investigation activities included the drilling of four boreholes, installation and hydraulic testing of four groundwater monitors (G99-5, G99-6, G99-7 and G99-8), water level measurements, sampling of groundwater monitors and sampling of surface water locations during sampling sessions in May, October, November and December 1999 and January, February and March 2000.

Due to the absence of background groundwater quality data in the silty clay layer, a groundwater site compliance assessment could not be performed under MOE Guideline B-7 (the "Reasonable Use Concept"). The South Nation River surface water quality upstream of the landfill was found to be similar to downstream water quality and did not appear to have been impacted by leachate from the landfill. However, it was concluded that the site was adversely impacting off-site surface water quality along the east property boundary.

It was recommended that the current level of groundwater monitoring should be maintained to monitor groundwater variations over time, to assess compliance with MOE Guideline B-7, and to define seasonal variations in water quality in the area of the site. It was further recommended that additional groundwater monitoring locations should be established to determine the background conditions in silty clay. The recommended surface water monitoring program included the monthly monitoring of stations CSW-1, SW2, SW3 and SW5 through SW10; bi-annual sampling at station SW1 was also recommended for the spring and fall of 2000. The proposed monitoring program received ascent by the Ministry of the Environment ("MOE") Eastern Region Water Resources Unit and was implemented in 2000. The MOE provided technical review comments on this report in their memoranda dated November 1, 2000 (surface water) and November 10, 2000 (groundwater).

Golder Associates Ltd, 2001. 2000 Hydrogeological Investigation and Groundwater and Surface Water Monitoring Program, Central Landfill Site, Corporation of the Nation Municipality, Ontario: Golder Associates Ltd., Report No. 001-2771, February 2001.

As part of a geotechnical investigation of the site, three boreholes were drilled southeast of the fill area (G00-1), adjacent and southwest of the fill area (G00-2) and south of the fill area (G00-3). Only one of these three boreholes (G00-3) was completed with a monitoring well and was included in the groundwater sampling program. Field investigation activities related to the hydrogeological investigation of the site included the drilling of one additional borehole and the installation of one groundwater monitor (G00-4). Water level measurements and sampling of groundwater monitors was conducted in July and October 2000 at G00-3, G00-4A, G00-4B, G00-4C, P4, G99-5, G99-6, G99-7 and G99-8. Sampling of surface water locations CSW-1, SW2, SW3, SW5, SW6, SW7, SW8, SW9 and SW10 was conducted in April, May, June, July, August and November 2000. Sampling of surface water location SW1 was conducted in July and October 2000.

Based on the groundwater flow direction at the site, the presence of Ravine No. 1 along the northwest part of the site and the presence of the South Nation River along the northern part of the site, it was concluded that the only property boundary of concern with respect to compliance with MOE Guideline B-7 was the east boundary of the site at monitor G99-7. Background conditions were established based on data from monitor G00-4B. The elevated concentrations of chloride, DOC, iron, manganese, sodium and TDS at G99-7 were found to exceed those permissible and therefore the site was considered to not be in compliance with MOE Guideline B-7 along the east property boundary.

Based on a review of the critical leachate indicator parameters, it was interpreted that the discharge of LISW from the Central Landfill was not having a persistent significant impact on water quality in the South Nation River. However, localized minor iron impacts beyond the Provincial Water Quality Objectives ("PWQO") within the zone adjacent to discharge of Ravine No. 1 were observed during the May and June 2000 monitoring sessions. Similarly, the unionized ammonia data suggested localized adverse impact on water quality in the area immediately adjacent to the discharge of Ravine No. 1 into the river during the July 2000 session only. A proposed groundwater and surface water monitoring program for 2001 was presented, which received the assent of MOE Eastern Region Water Resources Unit and was implemented in 2001.

The MOE provided technical review comments on this report in their memoranda dated May 16, 2001 (surface water) and June 8, 2001 (groundwater). MOE reviews indicated general agreement with Golder's assessment of site compliance.

Golder Associates Ltd, 2002. 2001 Groundwater and Surface Water Monitoring Program, Central Landfill Site, Corporation of the Nation Municipality, Ontario: Golder Associates Ltd., Report No. 011-2875, March 2002.

Field investigation activities included water level measurements at all groundwater monitors on site in June and October 2001. Sampling of groundwater monitors was conducted also in June and October 2001 at G99-7, G00-4A and G00-4B. Sampling of surface water locations SW1, SW6, SW7, SW8, SW9 and SW10 was conducted monthly from June 2001 to January 2002.

As previously, it was concluded that the only property boundary of concern with respect to compliance with MOE Guideline B-7 was the east boundary of the site at monitor G99-7. The elevated concentrations of chloride, DOC, iron, manganese, sodium and TDS at G99-7 were found to exceed those permissible and therefore the landfill site was considered to not be in compliance with MOE Guideline B-7 along the east property boundary. This was consistent with the conclusions from the previous (2000) Hydrogeological Investigation.

Based on a review of the 2000 and 2001 monitoring activities and critical leachate indicator parameters, it was concluded that the discharge of LISW from the Central Landfill was not having a persistent significant impact on water quality in the South Nation River. However, localized minor iron impacts beyond the PWQO within the zone associated to discharge of Ravine No. 1 were observed during the June 2001 and August 2001 monitoring sessions. Review of total phosphorous data suggested that an adverse impact on water quality in the zone associated to discharge of Ravine No. 1 was not occurring. Review of unionized ammonia data suggested localized adverse impact on water quality in the zone associated with discharge of Ravine No. 1 during the July 2001 session only.

Based on water quality at sampling station SW1, it was concluded that the discharge of LISW onto the adjoining property to the east had resulted in adverse impact on off-site surface water quality at this location.

A proposed groundwater and surface water monitoring program for 2002 was presented which received the assent of MOE Eastern Region Water Resources Unit, but with the addition of toxicity testing in Ravine No. 1. The proposed program was implemented at the site during 2002. Toxicity testing was incorporated into the monitoring program in 2003, as described later in this section.

The MOE provided technical review comments on the 2001 monitoring report in their memoranda dated August 20, 2002 (surface water) and December 24, 2002 (groundwater). The surface water review indicated general agreement with Golder's interpretation that discharge of LISW to the South Nation River was not having a persistent and significant impact on the receiving stream at the downstream station SW8. However, the surface water reviewer noted that there was persistent and significant impacted water quality monitored at the Ravine No. 1 discharge point (SW6) to the South Nation River, with consistent exceedances of PWQO for dissolved oxygen, cobalt, iron, total phosphorous and notably unionized ammonia. The surface water reviewer further noted that the effect of the Ravine No. 1 discharge was causing localized impacts within the area adjacent to discharge of Ravine No. 1 into the South Nation River (SW9 and S10) evidenced by PWQO exceedances for iron, total phosphorous and un-ionized ammonia. Finally, the MOE surface water reviewer expressed concern relating to elevated unionized ammonia concentrations in Ravine No. 1. The MOE groundwater review indicated general agreement with Golder's assessment of site compliance.

Golder Associates Ltd, 2003. 2002 Groundwater and Surface Water Monitoring Program, Central Landfill Site, Corporation of the Nation Municipality, Ontario: Golder Associates Ltd., Report No. 021-2768, May 2003.

Field investigation activities were similar to those conducted in 2002 and included bi-annual groundwater sampling at groundwater monitors at G99-7, G00-4A and G00-4B and at monitors constructed in 2002 on the property located east of the site (G02-1A, G02-1B, G02-2, G02-3, G02-4A and G02-4B). Monthly sampling of surface water locations along the South Nation River and bi-annual sampling at stations located along the east ditch were also conducted in 2002.

Compliance with MOE Guideline B-7 along the east property boundary at monitor G99-7 and at monitors constructed in 2002 was assessed based on background monitors G00-4A and G00-4B. The Reasonable Use assessment indicated that the permissible concentrations were exceeded at monitors G99-7 and G02-3. As in previous years, it was concluded that the landfill was not in compliance with MOE Guideline B-7. It was recommended that a 60 metre wide by 300 metre

long strip (minimum) of land located along a northern portion of the east property boundary be acquired, and that this land be registered as leachate-attenuation zone for the Central Landfill.

The interpretation relating to surface water data quality in Ravine No. 1 and to potential impacts on water quality in the South Nation River for the year 2002 was consistent with that provided in previous monitoring reports. The discharge from Ravine No. 1 was interpreted to not have a persistent, significant impact on water quality in the river. Also, based on water quality at sampling station SW1 located along the east boundary and at sampling stations SW11, SW12, SW13 and SW3 located along the east ditch and Ravine No. 2, it was concluded that the site was not in compliance along the east boundary with respect to impacts on off-site surface water quality. Acquisition of the leachate-attenuation zone was expected to address this issue.

The MOE provided groundwater technical review comments on the 2002 Annual Report in a memorandum dated October 10, 2003. The MOE technical reviewer concurred with Golder's recommended acquisition of a 1.8 hectare parcel along the northeast portion of the site to address non-compliance with Guideline B-7 along the east boundary. The MOE technical reviewer also agreed with Golder's interpretation that the leachate plume was contained within the 2002 groundwater monitor network located east of the site.

Golder Associates Ltd, 2004. 2003 Groundwater and Surface Water Monitoring Program, Central Landfill Site, Corporation of the Nation Municipality, Ontario: Golder Associates Ltd., Report No. 03-1120-718-3, July 2004.

Field investigation activities were similar to those conducted in 2003 and included bi-annual groundwater sampling at groundwater monitors located near the eastern boundary, monthly sampling of surface water locations along the South Nation River and bi-annual sampling at stations located along the east constructed ditch. Another aspect of the 2003 work program was the assessment of the relative contributions from Central Landfill and Casselman Landfill to LISW in the vicinity of Ravine No. 1. Related activities included collection of a groundwater sample at monitor G99-6 located near the edge of Ravine No. 1, and monthly monitoring of the discharge of surface water originating from Casselman Landfill onto Central Landfill property via Ravine No. 1 (CSW-1).

Assessment of site compliance with Guideline B-7, the Reasonable Use Concept, concluded that the site was not in compliance with Guideline B-7 along the east boundary. The non-compliance was determined to be limited in extent off-site, and could be defined using the monitoring wells installed off-site to the east. In order to bring the Central Landfill into compliance, the Nation Municipality acquired a piece of property to the east of the waste disposal area that was subsequently registered on the C of A for the site as a leachate-attenuation zone.

The interpretation relating to surface water data quality in Ravine No. 1 and to potential impacts on water quality in the South Nation River for the year 2003 was consistent with that provided in previous monitoring reports. The discharge from Ravine No. 1 was interpreted to not have a

persistent, significant impact on water quality in the river. However, the results of aqueous toxicity testing on LISW in Ravine No. 1 showed that discharge to the South Nation River via Ravine No. 1 was toxic to rainbow trout but not toxic to water fleas (*Daphnia magna*). Finally, the seasonal discharge of LISW onto the adjoining property to the east and to the South Nation River (through Ravine No. 2) was interpreted to have resulted in adverse impact on off-site water quality at these locations. However, the constructed drainage ditch was subsequently filled during the summer of 2004 such that surface water flow to the river via Ravine No. 2 was virtually eliminated. Acquisition of the leachate-attenuation zone addressed the issue of off-site LISW discharge to the east.

The MOE provided technical review comments on the 2003 Annual Report related to groundwater aspects and surface water aspects in memoranda dated January 28, 2005 and February 2, 2005, respectively. The technical review comments along with the cover letter by the MOE Cornwall environmental officer are included in Appendix A. The groundwater technical reviewer concluded that, with the inclusion of additional lands to the east of the filled area as a leachate-attenuation zone for the landfill site, the Central Landfill Site was in conformance with Guideline B-7 for off-site impacts to groundwater quality. The surface water technical reviewer identified issues of concern related to the discharge of leachate-impacted surface water to the South Nation River, and recommended that more frequent toxicity testing be conducted at sampling stations located along Ravine No. 1, as well as other remediation measures. The work plan for management of LISW in Ravine No. 1 is further discussed in Section 4.0 of this report, and specific comments by the Technical Review Section surface water reviewer are provided in the following section 3.1.

3.1 Response to Comments from Ministry of the Environment

In the memorandum dated February 2, 2005, the MOE Technical Support Section surface water reviewer requested that clarifications be provided on a certain number of issues. This section provides specific responses to questions raised in the memorandum, and also clarifications on certain issues, where required. The format of the responses is such that the original MOE comment is provided in italicized characters, followed by the response by Golder.

Page 3: Ravine No. 2 (SW13) is located at the northeast corner area of the Nation LFS, and sample location SW13 monitors the water quality of the ravine waters discharging to the South Nation River.

A clarification is required with respect to this reviewer's interpretation for the location of sampling station SW13. Station SW13 is located more than 100 metres from the shore of the South Nation River, along the channel into which drains the wetland area located east of the filled wastes (see Site Plan in Figure 2).

Page 4: *South Nation River (SW3) is located on the South Nation River and monitors the water quality of the immediate nearshore confluence waters of the No. 2 Ravine discharge and the receiving South Nation River.*

A clarification is again required for the location of surface water sampling station SW3. Station SW3 is located near the mouth of Ravine No. 2, about 5 metres from the outlet to the South Nations, and monitors the quality of surface water in Ravine No. 2 which discharges to the South Nation River.

Page 4: *Toxicity testing was conducted on the surface water samples collected at CSW-1 [...] and from SW5/SW6 located near the outlet of the main ravine (Ravine No. 1) to the South Nation River in March and July 2003. The reviewer is not clear on the specific sample location and requests confirmation from GAL whether it is the SW5 or the SW6 sampling stations.*

As outlined in Section 5.2.1 and in Table 2 of the 2003 Annual Report, the water sample was collected at SW6 during the July 2003 sampling event, but was necessarily collected at SW5, located slightly upstream in the retention pond, during the March 2003 sampling session because of frozen conditions prevailing at SW6 at that time.

Page 6: *The municipality has proposed to fill in the east drainage ditch during 2004 in order to limit or eliminate the discharge of leachate impacted groundwater to the ditch. The reviewer requests confirmation that east drainage ditch has in fact been filled in.*

The constructed ditch was filled in during the summer of 2004, which has virtually eliminated the discharge of LISW via Ravine No. 2 to the South Nation River. As part of the monitoring program for the site (further described in Section 15.0 of the present report), monthly site visits are planned during which flow conditions will be observed in Ravine No.2. If any defined flow channel is observed to be discharging to the South Nation River via Ravine No. 2 during the monthly site visits, a surface water sample would be collected at sampling station SW3 and submitted for analytical testing.

4.0 UPDATE ON STATUS OF WORK PLAN FOR THE MANAGEMENT OF LEACHATE IMPACTED SURFACE WATER

This section provides an update on the status of the work plan for the management of LISW originating from Central Landfill and Village of Casselman Landfill and discharging to the South Nation River via Ravine No. 1. Although this work program is carried out distinctly from the annual monitoring program for the site, the data compiled as part of the annual monitoring program is one of the factors that will influence the need to implement any corrective action to manage the discharge of LISW to South Nation River via Ravine No. 1.

In a letter dated November 10, 2003, Golder provided a revised work plan for the management of LISW at Central Landfill. Several tasks, S1 to S10, were identified with the purpose of achieving compliance with respect to impacts to surface water at the site. Completed were: Task S1 – Assessment of Toxicity of LISW in Ravine Entering South Nation River, Task S2 – Characterization of Receiving Waters, Task S3 – Data Assessment for Landfill Sites, Task S4a – Refinement and Completion of Site-Closure Activities, Central Landfill Site and Task S4b – Completion of Capping and Other “Mothballing” Activities, Village of Casselman Landfill Site. Also, as per Task S5 – Development and Implementation (if required) of Short-Term Contingency Plan for LISW, a short-term contingency plan was developed by Stantec Consulting in collaboration with Golder, and submitted to the MOE on April 29, 2004. Task S1 is still underway since bi-annual toxicity testing has been incorporated in the annual monitoring program for Central Landfill since 2003. As part of Task S4a, an application for a diversion system intended for improving the quality of LISW discharging to the South Nation River was submitted on February 27, 2004 (Golder, 2004a) to MOE Environmental Assessment and Approvals Branch for approval under Section 53 of Ontario Water Resources Act. However, in a letter dated May 21, 2004, MOE indicated that the application was found to not be acceptable for approval because the proposed system “[did] not address the requirements of Section 11(4) titled ‘Standard for Waste Disposal Sites’ of Regulation 347 under the Environmental Protection Act”. Finally, as per Task S6 – Identify and Evaluate Alternatives for LISW Long-Term Management to Meet Point of Discharge Criteria, a draft report on the conceptual design of alternatives was cooperatively prepared in draft format for Nation Municipality and Village of Casselman by Golder and Stantec Consulting Ltd. This document has not yet been finalized nor has it been submitted to MOE.

In a letter dated August 25, 2004, the Nation Municipality requested that the MOE ensure that “requirements for performance of landfill sites be applied separately to each of the two adjoining sites” (i.e., Nation Municipality’s Central Landfill and Village of Casselman Landfill). A request was also made in this letter to set up a meeting to be attended by MOE, the Nation Municipality and its consultant and legal counsel to discuss this matter. Nation Municipality continues to indicate its willingness to address the issue of discharge of LISW originating from Central Landfill to the South Nation River. Previous hydrogeological studies (Golder, 2003a) show that

the majority of landfill leachate impacts do not originate from the Central (Nation Municipality) site, but rather are associated with discharge from Village of Casselman Landfill (both as groundwater discharge and overland flow), and as such the discharge from Ravine No. 1 (located on Nation Municipality's Central Landfill property) cannot be brought into compliance until discharge from the Village of Casselman Landfill onto the Central Landfill property has been adequately managed by the Village of Casselman. A copy of Nation's Municipality letter is included in Appendix A.

Based on recommendations from the MOE Technical Review Section reviewer, the MOE Cornwall Office environmental officer made a request that a number of steps be undertaken by Nation Municipality for managing LISW in Ravine No. 1, with specific associated deadlines (see cover letter dated March 1, 2005 included in Appendix A). Despite the earlier petition made by Nation Municipality that requirements be applied separately to each site, MOE requested that regardless of the portion of contaminants being attributed to the Casselman Landfill versus the adjacent Central Landfill Site, Nation Municipality implement the contingency to capture and collect LISW for off-site treatment. It is expected that a meeting to be attended by the MOE and the municipality will need to be organized to further discuss requirements by the MOE included in this letter.

The results of surface water monitoring, including discharge of LISW via Ravine No. 1, are provided in Sections 10.0, 11.0 and 12.0 of this report.

5.0 APPLICABLE GUIDELINES

Because the Central Landfill falls under the jurisdiction of the Corporation of the Nation Municipality, provincial water quality guidelines are applicable.

In the Province of Ontario, the Ontario Drinking Water Standards (ODWQS) (Ministry of the Environment, 2003) are used to evaluate groundwater quality and landfill site compliance with respect to groundwater impacts, which are assessed in accordance with MOE Guideline B-7, the "Reasonable Use Concept" (Ministry of the Environment, 1994b). MOE Guideline B-7 is applied to determine the reasonable use of groundwater on property adjacent to a licensed contaminant source, i.e., a landfill site, and to establish limits on the discharge of contaminants from the waste disposal site.

The Provincial Water Quality Objectives (PWQO) (Ministry of the Environment and Energy, 1994a) are used to assess surface water quality.

The above guidelines are further addressed in Sections 9.0 and 11.0 of this report, for groundwater and surface water, respectively.

6.0 FIELD INVESTIGATION

6.1 Assessment of Groundwater Flow and Quality

The groundwater monitoring and sampling program was carried out at the Central Landfill twice in 2004, once during the spring (May 25) and once during the fall (October 25). Groundwater levels were measured at all operational groundwater monitors located on Central Landfill property. Groundwater level measurements were also taken at groundwater monitors located on Casselman Landfill (BH96-1, BH96-1 (I), BH96-2 (II), BH96-3, and BH96-4) to refine the assessment of groundwater flow direction in the vicinity of Ravine No. 1. Groundwater levels were taken prior to groundwater monitor sampling to ensure static conditions. The groundwater elevations measured at the site from 1999 to 2004 can be found in Table 1.

Groundwater was sampled for quality testing during the spring 2004 session at monitors G00-4A, G00-4B, G99-7, P2, G02-1A, G02-1B, G02-2, G02-3, G02-4A and G02-4B, and during the fall 2004 session at monitors G00-4A, G00-4B, P2, G02-1A and G02-1B. The groundwater monitoring program was reduced starting in the fall 2004 due to acquisition by the Nation Municipality of a parcel of land to the east of the area of filled wastes that was subsequently registered as a leachate-attenuation zone on the C of A for the landfill site.

Monitoring wells were developed by the removal of at least three standing volumes of water using dedicated samplers. Sampling of groundwater was performed immediately after well development. The groundwater samples were collected, prepared and preserved in the field as follows:

- one plastic bottle, field filtered to 0.45 microns and preserved to pH<2 with nitric acid for analysis of metals (calcium, magnesium, sodium, potassium, aluminum, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, total phosphorus, silicon, silver, strontium, thallium, tin, titanium, vanadium and zinc);
- one plastic bottle, unfiltered and unpreserved for analysis of biochemical oxygen demand (BOD) and total phosphorous;
- one plastic bottle, field filtered to 0.45 microns and unpreserved for analysis of dissolved reactive phosphorous;
- one plastic bottle, unfiltered and unpreserved for analysis of anions (chloride, nitrate, nitrite, orthophosphate and sulphate);
- one plastic bottle, unfiltered and unpreserved for analysis of total dissolved solids (TDS);

- one plastic bottle, unfiltered and preserved to pH<2 with sulphuric acid for analysis of ammonia, dissolved organic carbon (DOC) and chemical oxygen demand (COD) and alkalinity; and
- one amber glass bottle with foil lined cap, unfiltered and preserved with sulphuric acid (to pH<4) and copper sulphate for analysis of phenols.

The temperature, pH and conductivity of the groundwater samples were measured in the field at the time of sample collection. All sample identification numbers and information were entered on a Chain of Custody Form and the samples were placed in coolers with ice packs until they were shipped by courier service to PSC Analytical Services Ltd. (PSC) of Mississauga, Ontario. The laboratory Reports of Analysis are included in Appendix B and the results of the field and laboratory chemical and physical analyses are tabulated in Appendix C.

6.2 Assessment of Surface Water Flow and Quality

Surface water monitoring sessions were carried out at the Central Landfill Site in 2004 during twelve (12) visits which took place on January 29, February 20, March 26, April 29, May 26, June 29, July 20, August 20, September 20, October 25, November 24 and December 23.

Surface water samples were collected on a monthly basis by Golder from surface water monitoring locations CSW-1, SW6, SW7, SW8, SW9 and SW10. The location of these surface water monitoring locations is shown on Figure 2. Station CSW-1 is located along the alignment of the large ravine (Ravine No. 1) near the property boundary between Central and Casselman Landfills. Water quality at CSW-1 is representative of surface water discharging from Casselman Landfill onto the Central Landfill property. Station SW6 is located along Ravine No. 1 immediately upstream from the discharge point to the South Nation River. Water quality at SW6 is representative of combined surface water quality in Ravine No. 1 resulting from the discharge from the Casselman and Central Landfills. Stations SW7 and SW8 are located in the South Nation River upstream and downstream (respectively) of the Central Landfill. Stations SW9 and SW10 are located in the South Nation River immediately upstream and downstream (respectively) from the Ravine No. 1 discharge point to the river.

Surface water sampling was also performed along the east property boundary of Central Landfill at SW1, SW11, SW12, SW13 and SW3 on April 29, 2004 (locations are shown in Figure 2). Station SW1 is located on the Central Landfill, east of the landfill footprint and in close vicinity to the former property line, as shown in Figure 2. Station SW1 borders a marsh area that typically becomes flooded during the spring and the fall seasons (however, this sampling location was found to have insufficient water to sample during both the spring and fall monitoring sessions in 2004). Surface water sampling stations SW11, SW12, SW13 and SW3 were established along the drainage ditch that borders the landfill footprint on its southern and eastern edge and discharges into the South Nation River via Ravine No. 2. However, this constructed ditch

was filled in during the summer of 2004, which virtually eliminated the discharge of LISW via Ravine No. 2 to the South Nation River. As such, bi-annual monitoring of surface water quality in the constructed ditch was removed from the monitoring program since the fall of 2004.

Monthly stream flow estimates were conducted in Ravine No. 1 at SW6 on the basis of cross-sectional stream area and flow velocity; flow velocity was estimated by measuring the time taken for a floating object to travel a known distance. Daily flow measurements were also conducted in the main ravine from mid-June to mid-December 2004: a piece of corrugated aluminum was inserted in the clayey sediments of the ravine, which allowed interception of all surface flow discharging towards the river. By calculating the average of three time measurements for filling a container with a pre-determined volume, a reasonably accurate flow measurement could be obtained. The flow rate in the South Nation River (stations SW7 to SW10) could not be measured. However, an assessment of low flow conditions in the South Nation River is presented in Section 10.2 of this report. The assessment of presence or absence of flow in the east drainage ditch, in Ravine No. 2 and in Ravine No. 3 was also conducted on a monthly basis, and when possible, a flow estimate was conducted in Ravine No. 2 near sampling station SW3.

The surface water samples were collected, prepared and preserved by Golder in the field as follows:

- one plastic bottle, unfiltered and preserved to pH<2 with nitric acid for analysis of metals (calcium, magnesium, sodium, potassium, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, silicon, silver, strontium, thallium, tin, titanium, vanadium and zinc);
- one plastic bottle, field filtered to 0.2 microns and preserved to pH<2 with nitric acid for analysis of aluminum;
- one plastic bottle, unfiltered and unpreserved for analysis of turbidity, anions (chloride, nitrate, nitrite, phosphate and sulphate) and TDS;
- one plastic bottle, unfiltered and unpreserved for analysis of TSS;
- one plastic bottle, unfiltered and unpreserved for analysis of alkalinity;
- one plastic bottle, unfiltered and unpreserved for analysis of BOD;
- one plastic bottle, unfiltered and preserved to pH<2 with sulphuric acid for analysis of ammonia, total kjeldahl nitrogen (TKN), DOC, COD and phosphorous (low-level); and,
- one amber glass bottle with foil lined cap, unfiltered and preserved with sulphuric acid (to pH<4) and copper sulphate for analysis of phenols.

- surficial granular layer:

$$K = 8.3 \times 10^{-5} \text{ to } 4.2 \times 10^{-4} \text{ centimetres per second (cm/s)}$$

$$(G99-8: \quad 4.2 \times 10^{-4} \text{ cm/s})$$

$$G00-3: \quad 8.3 \times 10^{-5} \text{ cm/s})$$

- silty clay:

$$K = 2.3 \times 10^{-6} \text{ to } 7.0 \times 10^{-5} \text{ cm/s}$$

$$(G99-6: \quad 2.3 \times 10^{-6} \text{ cm/s})$$

$$G99-7: \quad 7.0 \times 10^{-5} \text{ cm/s}$$

$$G02-1A: \quad 2.4 \times 10^{-6} \text{ cm/s}$$

$$G02-4B: \quad 9.0 \times 10^{-6} \text{ cm/s})$$

These values are considered representative of what would be expected for the granular and silty clay (weathered) overburden stratigraphic units in the area of the site. The hydraulic conductivity of the underlying grey silty clay deposit is typically lower, with values of 1×10^{-7} to 1×10^{-8} cm/s. Using the limited number of monitoring wells in the surficial granular and weathered silty clay layers, a geometric mean of horizontal hydraulic conductivity values of 1.9×10^{-4} cm/s and 7.6×10^{-6} cm/s was calculated for the surficial granular layer and the weathered silty clay, respectively.

8.1.5 Groundwater Flux

Groundwater flux or specific discharge, q , is the discharge of groundwater per unit area per unit time and is calculated from Darcy's equation. Because the groundwater flux has the dimensions of velocity, it is sometimes known as the Darcy velocity or Darcy flux (Hubbert, 1940; Freeze and Cherry, 1979). The Darcy flux is calculated from the equation:

$$v_s = -Ki$$

where

$$i = \frac{\Delta h}{\Delta l}$$

v_s = groundwater flux (units of length per time)

K = horizontal hydraulic conductivity (units of length per time)

i = horizontal hydraulic gradient (dimensionless)

A horizontal hydraulic gradient of 0.01 between groundwater elevation contours of 60 and 62 metres measured in October 2004, in a direction roughly parallel to the direction of groundwater flow was used. The calculated geometric mean horizontal hydraulic conductivities of 1.9×10^{-4} cm/s and 7.6×10^{-6} cm/s was assumed for the surficial granular and weathered silty clay layers, respectively. The corresponding Darcy flux was calculated to be 1.9×10^{-6} cm/s and 7.6×10^{-8} cm/s for the October 2004 sampling session in the surficial granular and the weathered silty clay layers, respectively.

8.1.6 Average Linear Groundwater Velocity

The average linear groundwater velocity (seepage velocity), $\bar{v}$, is directly proportional to the groundwater flux and inversely proportional to formation porosity. The average linear groundwater velocity is calculated using the equation:

$$\bar{v} = - \frac{Ki}{n}$$

where

- $\bar{v}$ = average linear groundwater velocity (units of length per time)
- K = horizontal hydraulic conductivity (units of length per time)
- i = horizontal hydraulic gradient (dimensionless)
- n = formation porosity (dimensionless)

For unconsolidated deposits such as silts and sands, typical porosity values can range from 25 to 50 percent. For unconsolidated clay deposits, typical porosity values can range from 40 to 70 percent (Freeze and Cherry, 1979).

The average linear groundwater velocity across the Central Landfill between groundwater elevation contours of 60 and 62 metres measured in October 2004 in the vicinity of the active landfill is estimated to be about 1 to 2.5 metres per year in the surficial granular overburden using a range in porosity from 25 to 50 percent. The average linear groundwater velocity is estimated to be less than 0.1 metres per year in the upper silty clay using a range in porosity from 40 to 70 percent.

8.2 Groundwater Quality

This section describes the groundwater quality at the monitoring wells sampled during the 2004 monitoring program at Central Landfill. The Report of Analysis sheets from PSC are provided in Appendix B. These data, along with historical chemical data and the relevant ODWQS are provided in Appendix C. Measurements of temperature, electrical conductivity and pH in Appendix C are those measured in the field.

Discussion relating to compliance with the ODWQS relates specifically to non-health related objectives (i.e., aesthetic parameters) and health related parameters for which a Maximum Acceptable Concentration (MAC) or Interim Maximum Acceptable Concentration (IMAC) has been established.

A summary of background and leachate quality monitoring wells is presented in the table below.

Site Area Monitored	Monitoring Location
Background Groundwater Conditions: upgradient or distant	• <i>granular layer:</i> - G99-8 - G00-3 - G00-4C • <i>clay/silty clay layer:</i> - G00-4A and G00-4B
Leachate Quality: near landfill areas or immediately downgradient	• <i>granular layer:</i> - P1 (limited historical data available) • <i>clay/silty clay layer:</i> - no leachate quality wells exist

Chloride and boron are both conservative, soluble substances that typically occur in elevated concentrations in landfill leachate when compared to natural groundwater concentrations. They are therefore typically ideal tracers or indicators for a landfill leachate-impacted groundwater plume. If such a contaminant plume exists, the greatest concentrations of chloride and boron typically occur at the leachate source and immediately downgradient of this source. The lowest concentrations are typically equal to background concentrations, which occur upgradient and distant from the source. Chloride and boron are therefore considered to be the most useful leachate indicator parameters at the Central Landfill.

8.2.1 Background Conditions

For the purpose of this site assessment, background conditions in the granular silty sand unit are assumed to be represented by monitors G99-8, G00-3 and G00-4C whereas background conditions in the weathered silty clay are assumed to be represented by data collected from monitoring wells G00-4A and G00-4B. All of these groundwater monitors are located upgradient of the landfill footprint and are presumed to be unaffected by landfill leachate.

All three wells screened within the granular silty sand unit have not been monitored since October 2000. However, based on historical data at these locations, background groundwater quality in the granular silty sand unit is characterized by concentrations of aluminum, DOC, iron and manganese in excess of the ODWQS.

Notable changes in groundwater quality over time in the weathered silty clay unit at the locations of monitoring wells G00-4A and G00-4B are summarized in Table 3.

Based on the existing database, groundwater quality at monitoring well G00-4A (screened from 6.1 to 7.5 metres below ground level) is characterized by:

- ODWQS exceedances of aluminum, DOC and occasional exceedances of iron and manganese (becoming less frequent in recent years);
- low concentrations of chloride: 1 to 2 mg/L (with the exception of June 2001 measurement at 19 mg/L);
- low or non-detect concentrations of boron and nitrate; and
- highest to date TDS concentration measured to date during May 2004 at 444 mg/L .

Based on the existing database, groundwater quality at monitoring well G00-4B (screened from 2.9 to 4.4 metres below ground level) is characterized by:

- occasional ODWQS exceedances of aluminum, DOC, iron, manganese and TDS (July 2000 only), becoming less frequent in recent years;
- low concentration of chloride (1 to 2 mg/L);
- low or non-detect concentrations of boron and nitrate;
- TDS concentrations remaining below 200 mg/L since the fall of 2001; and
- generally lower BOD and iron levels in 2003 and 2004 than previously measured.

8.2.2 Leachate Conditions

Indicators of a leachate plume in closed municipal landfills typically include elevated concentrations of iron, DOC, TDS, manganese, and especially chloride and boron. Leachate conditions in the granular layer at the site are represented by limited historical data (November 1990) available from destroyed monitoring well P1, located within the waste footprint. Concentrations of metals from the 1990 sampling session are not comparable to more recent data at other locations due to different filtering and field preservation methods. No monitoring wells representing actual leachate conditions in the waste pile currently exist.

8.2.3 Groundwater Impact Monitors

Impact evaluation monitors are defined as those monitors which are not classified as background or leachate quality monitors. Impact evaluation monitors are typically located downgradient (in terms of groundwater flow) from the waste disposal area (or other potential sources of contamination) and thus are useful for assessing the presence/absence of impact on groundwater quality. Groundwater quality data from groundwater impact monitors G99-7, G02-1A, G02-1B, G02-2, G02-3, G02-4A and G02-4B was used to assess the impact of leachate on off-site groundwater quality across the boundary to the east of the Central Landfill in the weathered silty clay unit. Groundwater quality was also monitored in 2004 at monitoring well P2 to assess the impact of leachate on off-site groundwater quality in the granular silty sand unit.

The physical and chemical parameters with reported levels exceeding their respective ODWQS in 2004; notable changes in groundwater quality over time; a comparison of groundwater quality to background conditions; and an interpretation of the groundwater quality data are summarized in Table 3 for the above listed monitoring wells. With the exception of monitoring location P2, all wells are exclusively or predominantly screened in the weathered silty clay unit; the degree of leachate impact was therefore determined based on a comparison to background groundwater quality data in the weathered silty clay from monitoring wells G00-4A and G00-4B. Groundwater quality at P2 was compared to background conditions measured during previous monitoring sessions at monitoring wells G99-8, G00-3 and G00-4C.

Based on a review of the available groundwater quality data, the following summarizes the current groundwater quality conditions at the site.

Monitoring Well P2

Monitoring well P2 is located downgradient and 30 metres east of the landfill footprint along the eastern site boundary and is screened from 0.3 to 1.7 metres below ground level in the granular silty sand unit. The parameters with reported levels exceeding their respective ODWQS at P2 in 2004 are as follows: alkalinity, DOC, manganese and TDS.

Notable changes in groundwater quality over time at P2 include:

- the levels of alkalinity, ammonia, barium, chloride, COD, DOC, hardness, potassium and TDS measured were the highest measured to date in October 2004.

The following parameters were found to be consistently greater at P2 than the background conditions¹: alkalinity, barium, boron, chloride, cobalt, DOC, hardness, manganese, nitrate, potassium, sodium, strontium and TDS. This is consistent with the interpretation based on 2003 data.

Based on the concentrations of several parameters exceeding background conditions, including chloride and boron, monitoring well P2 is interpreted to be impacted by landfill leachate.

Monitoring Well G99-7

Monitoring well G99-7 is located downgradient and 65 metres east of the landfill footprint along the eastern site boundary and is screened from 1.7 to 3.2 metres below ground level in the

¹ A parameter was evaluated to be exceeding background conditions when 50% or more of all the historical and recent measurements available at the monitoring well being considered exceed the background conditions by a value greater than the uncertainty associated with the corresponding analytical method. The background groundwater quality in the granular silty sand unit is based on historical information available from monitoring wells G99-8, G00-3 and G00-4C.

weathered silty clay unit. The parameters with reported levels exceeding their respective ODWQS at G99-7 during the spring 2004 session are as follows: DOC, manganese and TDS.

Notable changes in groundwater quality over time at G99-7 include:

- the concentrations of chloride, COD, DOC, hardness, sodium, strontium, and TDS were the lowest measured to date in May 2004;
- the iron concentration was observed to increase in 2001 but has been decreasing since 2002;
- lower COD levels than previously reported were measured since October 2002.

The following parameters were found to be consistently greater at G99-7 than background conditions²: alkalinity, barium, boron, chloride, cobalt, COD, DOC, hardness, manganese, sodium, strontium and TDS.

Based on the concentrations of several parameters exceeding background conditions, including chloride and boron, monitoring well G99-7 is interpreted to be impacted by landfill leachate.

Monitoring Well G02-1A

Monitoring well G02-1A is located downgradient and 120 metres east of the landfill footprint on the leachate-attenuation zone for Central Landfill and is screened from 2.7 to 4.3 metres below ground level in the weathered silty clay unit. The only parameter measured at G02-1A during the spring 2004 found to be exceeding its corresponding ODWQS was DOC. Groundwater quality at G02-1A was generally found to be consistent with time. However, the concentrations of DOC and COD were the highest measured to date during October 2004. Only sulphate was found to be consistently greater than background conditions at this monitoring location.

Based on the groundwater quality at monitoring well G02-1A, which appears to be generally comparable to background conditions, this well is interpreted to not be impacted by landfill leachate.

Monitoring Well G02-1B

Monitoring well G02-1B is located downgradient and 120 metres east of the landfill footprint on the leachate-attenuation zone for Central Landfill and is screened from 0.5 to 2.1 metres below ground level primarily in the weathered silty clay unit. There were no parameters with reported levels

² A parameter was evaluated to be exceeding background conditions when 50% or more of all the historical and recent measurements available at the monitoring well being considered exceed the background conditions by a value greater than the uncertainty associated with the corresponding analytical method. The background groundwater quality in the silty clay unit is based on historical and recent information available from monitoring wells G00-4A and G00-4B.

exceeding their respective ODWQS at G02-1B in 2004. Groundwater quality at G02-1B was generally found to be consistent with time, with low chloride and non-detect to low boron and nitrate. The following parameters were found to be consistently greater at G02-1B than background conditions: alkalinity, barium, hardness, strontium and sulphate. This is consistent with the interpretation based on 2003 data.

Several parameters measured at G02-1B were found to exceed background conditions established for the weathered silty clay layer. However, boron and chloride levels are low to non-detect and do not exceed background conditions. Based on the available data, it is interpreted that monitor G02-1B is not impacted by landfill leachate.

Monitoring Well G02-2

Monitoring well G02-2 is located 150 metres east of the landfill footprint on the leachate-attenuation zone for Central Landfill and is screened from 0.6 to 2.1 metres below ground level in the weathered silty clay unit. Based on interpreted groundwater flow direction in this area of the site, monitor G02-2 is indicated to be located downgradient from the fill area. The parameters with reported levels exceeding their respective ODWQS at G02-2 for the spring 2004 are as follows: iron, manganese and TDS. The groundwater quality at G02-2 over the three year monitoring period was generally found to be consistent with time with low chloride and non-detect to low boron and nitrate. The levels of alkalinity, iron and strontium measured in May 2004 were the highest measured to date at this location.

The following parameters were found to be consistently greater at G02-2 than background conditions: alkalinity, barium, hardness, strontium, sulphate and TDS. This is consistent with the interpretation based on 2003 data.

Several parameters exceed background conditions established for the weathered silty clay layer. However, boron and chloride levels are low to non-detect and do not exceed background conditions. Based on the available data, it is interpreted that monitor G02-2 is not impacted by landfill leachate.

Monitoring Well G02-3

Monitoring well G02-3 is located 90 metres east of the landfill footprint on the leachate-attenuation zone for Central Landfill and is screened from 0.3 to 1.8 metres below ground level primarily in the weathered silty clay unit. Based on interpreted groundwater flow direction in this area of the site, monitor G02-3 is indicated to be located downgradient from the fill area. The parameters with reported levels exceeding their respective ODWQS at G02-3 during the spring 2004 included: DOC, manganese, sulphate and TDS.

The groundwater quality at G02-3 over the three years of monitoring was generally found to be consistent with time. However, the levels of alkalinity, COD, hardness, potassium, sulphate and strontium levels were the highest measured to date at this location in May 2004.

The following parameters were found to be consistently greater at G02-3 than background conditions: alkalinity, barium, chloride, hardness, manganese, sodium, strontium, sulphate and TDS.

Several parameters exceed background conditions established for the weathered silty clay layer, including chloride measured at elevated concentrations (from 43 to 75 mg/L). Based on the available data, monitor G02-3 is interpreted to be impacted by landfill leachate.

Monitoring Well G02-4A

Monitoring well G02-4A is located 125 metres east of the landfill footprint on the leachate-attenuation zone for Central Landfill Site and is screened from 2.4 to 4.0 metres below ground level in the weathered silty clay unit. Based on interpreted groundwater flow direction in this area of the site monitor G02-4A is possibly located downgradient from the fill area. Manganese was the only parameter that was detected at G02-4A during the spring 2004 at a concentration exceeding its corresponding ODWQS. Groundwater quality at G02-4A was generally found to be consistent with time. However, levels of alkalinity, manganese, strontium and TDS measured during the spring 2004 were the highest reported to date. Only sulphate was found to be consistently greater than background conditions at this monitoring location.

Based on the groundwater quality at monitoring well G02-4A which appears to be generally comparable to background conditions, this groundwater monitor is interpreted to not be impacted by landfill leachate.

Monitoring Well G02-4B

Monitoring well G02-4B is located 125 metres east of the landfill footprint on the leachate-attenuation zone for Central Landfill and is screened from 0.2 to 1.8 metres below ground level primarily in the weathered silty clay unit. Based on interpreted groundwater flow direction in this area of the site, monitor G02-4B is possibly located downgradient from the fill area. The parameters with reported levels exceeding their respective ODWQS at G02-4B during the spring 2004 are DOC, iron, manganese and TDS. Groundwater quality at G02-4B was generally found to be consistent with time. However, the concentration of manganese measured at this location in May 2004 was the highest reported to date. Also, sodium concentrations were generally found to be decreasing with time. Finally, sulphate concentrations were lower in 2003 and 2004 than previously measured. The following parameters were found to be consistently greater at G02-4B than background conditions: alkalinity, barium, hardness, strontium, sulphate and TDS.

Several parameters measured at G02-4B exceed background conditions established for the weathered silty clay layer. However, boron and chloride levels are low to non-detect and do not exceed background conditions. Based on the available data, it is interpreted that monitor G02-4B is not impacted by landfill leachate.

9.0 GROUNDWATER COMPLIANCE ASSESSMENT

MOE Guideline B-7, the "Reasonable Use Concept", addresses the level of off-site leachate impact on groundwater considered acceptable by the MOE and defines the level of impact on groundwater beyond which some form of mitigation measures would be warranted.

Under MOE Guideline B-7, a change in the quality of groundwater on adjacent properties will only be acceptable if the quality is not degraded in excess of fifty percent (50%) of the difference between background concentrations and established water quality criteria for aesthetic related parameters, and twenty-five percent (25%) of the difference between background conditions and established water quality criteria for health related parameters. The standards described in the ODWQS are used to represent established water quality criteria.

Based on the groundwater flow direction at the site, the presence of Ravine No. 1 along the northwest part of the site and the presence of the South Nation River along the northern part of the site, it is concluded that the only property boundary of concern with respect to compliance with MOE Guideline B-7 would be the east boundary of the site.

Compliance with MOE Guideline B-7 along the east property boundary was assessed based on background monitors G99-8, G00-3 and G00-4C for the granular silty sand unit and based on background monitors G00-4A and G00-4B for the weathered silty clay unit. The results of the assessment for the 2004 monitoring program are summarized in Table 4. Results for monitors G99-7, G02-1A, G02-1B, G02-2, G02-3, G02-4A and G02-4B (weathered silty clay) and for monitor P2 (granular silty sand) are presented.

As shown in Table 4, the concentrations of DOC, manganese and TDS generally exceed those permissible under MOE Guideline B-7 for monitoring well G99-7. At monitors G02-2 and G02-3, manganese, sulphate and TDS levels measured during the spring 2004 were above their respective RUPO. Manganese and TDS concentrations measured at G02-4B during the same time period exceeded the permissible limit, which is consistent with 2003 data. The concentration of all parameters measured at wells G02-1A, and G02-4A consistently remained below the corresponding RUPO. Within the granular silty sand layer (as established based on groundwater quality from monitoring well P2), the concentrations of nitrate and TDS exceeded the applicable RUPO in May 2004, whereas in October 2004, chloride, DOC, manganese, sodium and TDS concentrations were above their applicable criteria.

As discussed in Section 8.2.3, monitor P2 constructed in the granular silty sand and monitors G99-7 and G02-3 constructed entirely or primarily in the weathered silty clay are interpreted to be impacted by landfill leachate. The Reasonable Use assessment indicates that the RUPO are exceeded at these three locations in 2004. Based on data from monitors G02-1A, G02-1B, G02-2, G02-4A and G02-4B, which are interpreted to not be impacted by landfill leachate at this

time, the current extent of MOE Guideline B-7 exceedance is indicated to be contained within the existing monitoring well network constructed east of the landfill footprint. In September 2003, the Nation Municipality acquired a piece of property located to the east of the area of filled wastes (as shown in Figure 2), with approximate dimensions of 510 metres by 125 metres, in directions perpendicular and parallel, respectively, to the South Nation River. This property, which encompasses the 2002 monitoring well network, has since been registered as a leachate-attenuation zone on the C of A for the landfill site. Central Landfill is therefore in compliance with MOE Guideline B-7 along its eastern boundary. As will be discussed further in Section 15.0 of the report, future recommended yearly monitoring at groundwater monitors P2, G02-1A and G02-1B, located at the most downgradient end of the area of filled wastes, will be used for ongoing assessment that the landfill remains in compliance with MOE Guideline B-7 along its eastern boundary.

10.0 SURFACE WATER CONDITIONS

10.1 Description of Drainage Courses

The Central Landfill is adjacent to the South Nation River along its northern limit. The South Nation River is the major surface water drainage course in the area and flows from east to west within the section adjacent to the site. Due to geology and topography, groundwater underneath the Central Landfill drains to the South Nation River.

It is typical for the lands bordering the South Nation River that surface water drainage from the flat table land towards the river causes erosion that cuts down into the clayey soils to form natural gullies. Based on historical air photos and topographic maps, the alignment of such a natural gully (referred to as 'Ravine No. 1') originating from beneath the current location of the Casselman Landfill located to the west of Central Landfill, crosses the common boundary between the two landfill sites. Based on interpreted groundwater flow direction, both landfill site properties currently contribute drainage to the main ravine. Surface water within this ravine discharges into the South Nation River on the Central Landfill, which is on Nation Municipality's property. As part of approved works under the Central Landfill's C of A, an impoundment berm was constructed within the main ravine in January 2000 to create a settling and holding pond, before the surface water is discharged into the South Nation River. The outlet of the impoundment is located approximately 15 metres before the discharge point to the river. The locations of Ravine No. 1 and the impoundment are shown in Figure 2.

Two other smaller ravines (Ravines No. 2 and No. 3) are located north of the filled area on Central Landfill and originate at the crest of the slope to the South Nation River. Ravine No. 3 has no definite surface water flow channel. Ravine No. 2 discharges in a northerly direction to the South Nation River but exhibits intermittent flow and lower overall discharge volumes throughout the year than within Ravine No. 1. A periodically flooded low-lying marsh area vegetated with various aquatic species (bulrush and cattail) is found immediately east of the former eastern boundary of the site (see Figure 2), and is now encompassed within the leachate-attenuation zone for the site. Prior to summer of 2004, the surface water flowing in Ravine No. 2 originated from this wetland area and from a drainage ditch dug along the southern and eastern edges of the filled area, and which connected with the natural channel draining the wetland area (see Figure 2). Due to the geometry of the waste mound and the direction of groundwater flow near the east drainage ditch, it was determined that there was a likely contribution of impacted groundwater to the flow within the east ditch, which was evidenced by leachate impacts to surface water in the ditch. Further to Golder's recommendation, the constructed ditch was filled in during the summer of 2004, which, based on observations from the fall 2004, has virtually eliminated the discharge of LISW via Ravine No. 2 to the South Nation River.

Surface water sampling stations established at the site are shown on Figure 2. Surface water collected at station SW6 is representative of the quality of LISW in Ravine No. 1 at the point of discharge to the South Nation River. The water flowing in Ravine No. 1 originates from groundwater entering the ravine on both Central Landfill and on Casselman Landfill. Surface water in Ravine No. 1 also originates, to a lesser degree, from overland flow at both landfill sites.

Therefore, water quality measured at SW6 corresponds to the contribution of flow from both landfill sites. Background surface water quality in the South Nation River is assessed using samples from station SW7, located approximately 130 metres upstream of the eastern edge of the landfill footprint and 330 metres upstream of the discharge point of Ravine No. 1 into the South Nation River. Stations SW9 and SW10 are representative of the surface water quality within the River immediately upstream and downstream, respectively, of the discharge point of Ravine No. 1 into the South Nation River. Sampling station SW8 indicates surface water downstream of the Central Landfill Site as it is located 130 metres downstream of the discharge point of Ravine No. 1 into the South Nation River.

The remaining surface water stations sampled in 2004 are indicators of the surface water quality near the eastern boundary of the Central Landfill. Station SW1 is located immediately adjacent to the former eastern property boundary for the landfill site (now within the leachate-attenuation zone) along the periodically flooded low-lying marsh area discussed previously. There was insufficient water to sample at this location during both the spring and fall seasons of 2004. Other stations SW11, SW12, SW13 and SW3 were established in successive order in the direction of flow along the drainage ditch and natural channel discharging to the river via Ravine No. 2. Station SW3 is representative of the quality of LISW in Ravine No. 2 at the point of discharge to the South Nation River. These stations located in the eastern portion of the site were sampled during the spring of 2004, prior to filling of the ditch. The outlet of Ravine No. 2 (sampling location SW3) had insufficient water flowing to collect a sample during the fall 2004 monitoring season.

Photographs of selected surface water sampling stations and of the impoundment constructed within Ravine No. 1 are included in Appendix F.

10.2 Surface Water Flow

Based on data from 1981 to 2001, the 7Q20 (lowest median flow for seven consecutive days having a recurrence in 20 years) in the South Nation River near the site ranges from 7,800 litres per minute (Lpm) to about 25,000 Lpm during the summer months (July to September).

Daily flow rate measurements for surface water discharging to the South Nation River via Ravine No. 1 are plotted in Figure 3. Throughout the 2004 monitoring period, the flow rate was measured to be generally between 5 and 20 Lpm. However, following large precipitation events,

including the very heavy rainfall event on September 9, 2004, flow rate peaked to values ranging between 40 and 60 Lpm. The discharge rate in Ravine No. 1 varies on a seasonal basis. It is typically lowest during the summer and winter, highest during the spring freshet, and intermediate during the fall. The surface water in Ravine No. 1 typically freezes during colder days of the winter season. High water levels in the South Nation River prevented flow measurements during the early spring, but it is expected that, during the spring freshet, flow rates could have been higher than the values plotted on Figure 3.

"Mothballing" activities were conducted in June 2004 at Casselman Landfill. Following reshaping of the wastes and application of a clay cover at Casselman Landfill, the flow rate in Ravine No. 1 decreased compared to levels measured in previous years. Since daily flow measurements were not available for the years 2001-2003, an exact quantitative evaluation of the decrease in flow rates prevailing in Ravine No. 1 cannot be provided. Sampling station CSW-1, established at the point where surface water flowing from Casselman Landfill property discharges onto Central Landfill, was found to be dry during the June, July, August and September 2004 site visits. It is likely that, even through these four months, shallow groundwater (a portion of which would be leachate-impacted) originating from Casselman Landfill was continuously seeping through the edges of the ravine, thereby contributing to the overall flow in Ravine No. 1. Observable overland flow at CSW-1 was noted during the October 2004 site visit and thereafter (see Picture 17 in Appendix F). The physical setting at sampling station CSW-1 did not allow for accurate surface water flow rate measurements of LISW contribution in Ravine No. 1 originating from Casselman Landfill.

Monthly observations from previous years indicate that flow in the east-most ravine (Ravine No. 2) typically occurs during the spring freshet (April to June) and fall (late August to November). Based on observations from recent years, Ravine No. 2 typically remains dry during the summer months and during the winter when any water present in the ditch freezes. Filling of the east ditch was conducted in July 2004 and resulted in a reduction of surface water flow discharging via Ravine No. 2. Although the ground surface was found to be saturated during the October 2004 monitoring session, there was never enough water to sample (see Picture 18 in Appendix F).

There was no definite flow channel observed at Ravine No. 3 during the 2004 monitoring sessions from where water samples could be collected for water quality testing. However, during the wetter periods of the year (spring and fall), saturated ground conditions with shallow groundwater seeps near the ground surface were observed occasionally at the outlet of Ravine No. 3.

10.3 Surface Water Quality

This section describes the surface water quality at the monitoring locations sampled during the 2004 monitoring program.

The Reports of Analysis from PSC are provided in Appendix B. These data, along with the relevant PWQO are also provided in Appendix C. Measurements of temperature, electrical conductivity, pH and DO in Appendix C are those measured in the field.

10.3.1 Ravine No. 1 and South Nation River

The physical and chemical parameters with reported levels exceeding their respective PWQO in 2004; notable changes in surface water quality over time; a comparison of surface water quality to background conditions at SW7; and an interpretation of the surface water quality data are summarized in Table 5 for the sampling stations located within the South Nation River (SW7 to SW10) as well as for sampling station SW6 established along Ravine No. 1. It is noted that a parameter was interpreted to be exceeded at a given surface water sampling station compared to background condition when the concentration exceeded the background concentration measured at SW7 during the same sampling event for 5 out of the total 10 or 11 sampling sessions or more, by a value greater than the uncertainty associated with the corresponding analytical method.

Elevated concentrations of several parameters relative to background conditions were noted at surface water monitoring location SW6 in Ravine No. 1 in 2004, namely: alkalinity, total ammonia and unionized ammonia, barium, BOD, boron, chloride, chromium, cobalt, COD, DOC, hardness, iron, manganese, nickel, nitrate, total phosphorous, potassium, silicon, sodium, strontium, TDS, titanium, TKN, TSS, turbidity, and zinc, indicating leachate impacts from the landfill entering the ravine. Also, dissolved oxygen levels at SW6 were generally lower than those measured at background station SW7.

The quality of surface water measured at SW6 in 2004 generally improved compared to 2003 levels. This is likely attributable to "mothballing" works conducted at Village of Casselman Landfill which appeared to reduce the contribution of LISW originating from Casselman Landfill flowing onto Central Landfill property. Namely, total ammonia concentrations measured at SW6 in 2004 were generally decreased compared to 2003 levels (27 mg/L, 36 mg/L and 37 mg/L in June, July and August 2003, compared to 13.4 mg/L, 11.7 mg/L and 12.7 mg/L in June, July and August 2004).

However, total ammonia concentrations rose from 8.2 mg/L in September 2004 to 18.7 mg/L in October 2004, which was coincident with re-initiation of overland flow from Casselman Landfill. Highest unionized ammonia levels for the year 2004 were measured in July and August at about 0.30 mg/L and 0.21 mg/L, respectively; these concentrations are comparable to 2003 levels, and are linked to higher field-measured pH occurring at SW6 during the summer of 2004. Concentrations of chloride, total ammonia, TDS, sodium, BOD, potassium and TKN concentrations measured in 2004 at SW6 – all parameters that can be linked to landfill leachate impacts for this site – generally decreased compared to 2002-2003 levels. However, concentrations of iron, boron and cobalt (which are commonly measured at levels exceeding PWQO at SW6) and strontium (another leachate-indicator parameter) did not decrease significantly in 2004 compared to 2003 levels. Other notable trends in water quality at SW6 are described in Table 5.

Minor leachate effects are measurable in surface water samples collected from the immediate point of entry of Ravine No. 1 to the South Nation River, and the parameters consistently exceeding background conditions measured at SW7³ include iron, silicon and turbidity at SW9 and SW10. Surface water quality at station SW8 measured in 2004 was generally similar to background concentrations at SW7, with the possible exception of iron which exceeded background conditions on 5 out of 11 sampling events. Other trends and noteworthy variations at stations SW8, SW9 and SW10 are described in Table 5.

Monthly water quality monitoring was also conducted at sampling station CSW-1, which is representative of surface water discharging from Casselman Landfill onto the Central Landfill property. Surface water quality data for station CSW-1 can be found in Appendix C (but is not discussed in Table 5). The reason for monitoring surface water quality at CSW-1 was to assess the relative contribution of impacts to surface water quality in Ravine No. 1 from Casselman Landfill and Central Landfill. A review of surface quality data at CSW-1 and SW6 demonstrates significant alteration of surface water quality by landfill leachate in the upper reaches of existing Ravine No. 1 where it leaves the Casselman Landfill property. During the six sampling sessions during which both SW6 and CSW-1 were sampled in 2004 (i.e., March, April, May, October, November and December), higher levels of total ammonia, unionized ammonia, cobalt, total phosphorous, iron, alkalinity, COD, DOC, hardness, manganese, potassium, sodium, strontium, TDS, TKN and turbidity were *consistently* measured at CSW-1 compared to the levels measured at SW6 during the same sampling event. Also, in 2004, higher levels of (particularly) boron, but also barium, BOD, silicon, TSS and zinc were *generally* measured at CSW-1 compared to levels measured at SW6 during the same day. It is noted that concentrations of nitrate, nitrite and sulphate were generally higher at SW6 compared to CSW-1, but these parameters do not constitute exceedances of the regulatory limits for surface water quality. More details on the results of the assessment on the relative contribution of each landfill to LISW in Ravine No. 1 can be found in Golder (2003b).

10.3.2 East Boundary

Surface water quality in the east ditch and Ravine No. 2 was evaluated based on the results from the April 2004 monitoring session. The background conditions of surface water quality near the east boundary could not be established since leachate impacts are likely to have occurred along the whole length of the east drainage ditch due to the proximity of the waste. As discussed in Section 9.1, a contribution of leachate-impacted groundwater from underneath the fill area was interpreted to contribute to the flow within the east ditch. During the spring 2004, surface water

³ A parameter was evaluated to be exceeding background conditions when at least 5 measurements out of the 10 or 11 sampling events were found to exceed the background condition by a value greater than the uncertainty associated with the corresponding analytical method. The background condition is established for any given sampling event as the concentrations measured at SW7 during that same sampling event.

quality was observed to vary in quality along the length of the ditch and natural channel discharging to Ravine No. 2, with the concentration of several parameters, including total ammonia, chloride, boron, sodium, alkalinity, COD, TKN, manganese, hardness, potassium and barium, generally increasing from SW11 to SW12, declining or remaining constant from SW12 to SW13, and remaining generally constant from SW13 to SW3. Iron concentration was observed to be increasing during the spring 2004 from SW13 to SW3, which was not observed in previous years.

Higher concentrations of alkalinity, total ammonia, boron, chloride, COD, hardness, potassium, sodium, strontium, TDS and TKN were measured in October 2003 at stations SW11 and SW12, but concentrations measured in April 2004 returned to levels at or below those measured in 2002 and spring 2003. Surface water quality measured at SW13 was generally consistent with time over the sampling period considered (i.e., from June 2002 to April 2004). Water quality at station SW3 was monitored from May 1999 to November 2000 and from June 2002 to October 2004. As discussed previously, the east ditch was filled in during the summer 2004, and sampling station SW3 had insufficient water to sample during the fall of 2004. It is anticipated that any significant discharge of surface water to the river via Ravine No. 2 will likely not be re-initiated in the future. If any flow is found to be present, it would be drained from the wetland area and would therefore likely not be impacted by landfill leachate. Water quality at SW3 was generally found to be consistent with time between June 2002 and April 2004. However, a higher unionized ammonia concentration was calculated at SW3 in April than previously, which is attributable to higher pH prevailing at the outlet to the river at that time.

Surface water quality at station SW1 located along the periodically flooded marsh area shows a generally decreasing trend for the concentration of most parameters, with highest concentrations measured in October 2001 and lower measured levels in 2002 and 2003. This station had insufficient water to sample during both the spring and fall of 2004.

11.0 SURFACE WATER COMPLIANCE ASSESSMENT

This section provides an assessment of the impact of the landfill site on surface water quality in the area of the site based on the results of the 2004 monitoring program.

11.1 Ravine No. 1 and South Nation River

Based on the available data on the surface water quality at station SW7, it is interpreted that the surface water at this location represents background surface water quality in the South Nation River. During 2004, out of the 11 sampling events, 10 samples collected at SW7 exhibited PWQO exceedances for total phosphorous, 7 for iron, 3 for zinc and 1 each for pH, silver and aluminum. Therefore, it is assumed for the purpose of this assessment that the background surface water quality of the South Nation River in the vicinity of the landfill site does not naturally meet the PWQO for all parameters. For this surface water quality compliance assessment, it is considered that Policy 2 (MOE, 1994a) would apply to surface water quality in the vicinity of the landfill site. Policy 2 indicates that "water quality which presently does not meet the Provincial Water Quality Objectives shall not be degraded further and all practical measures shall be taken to upgrade the water quality to the Objectives".

For the purpose of this surface water quality compliance assessment related to the discharge from Ravine No. 1, the PWQO are being applied to surface water sampling stations SW6 (along Ravine No. 1 immediately prior to discharge to South Nation River) SW8 (along South Nation River downstream of site), and SW9 and SW10 (along South Nation River within the zone adjacent to the point of discharge associated with Ravine No. 1). Surface water quality trends that were noted for these four sampling stations are summarized in Table 5.

Parameters that exceeded the PWQO at station SW6 (which represents the quality of LISW in Ravine No. 1 at the point of discharge to the South Nation River) include boron, cobalt, dissolved oxygen, iron, total phosphorous, unionized ammonia and zinc. Parameters that exceeded the PWQO at sampling stations located within along the South Nation River close to or downstream from the point of discharge from Ravine No. 1 (with number of exceedances in 2004) are as follows: aluminum (1), iron (7), pH (1), silver (1), total phosphorous (10) and zinc (2) at SW8; cobalt (1), iron (9), total phosphorous (11) and zinc (1) at SW9 and; iron (7), silver (1), total phosphorous (10), unionized ammonia (1) and zinc (2) at SW10. Based on PWQO exceedances measured at background station SW7 and levels measured at SW6, the only PWQO exceedances measured in the South Nation River (stations SW9, SW10 and/or SW8) that are potentially associated with landfill leachate impact are unionized ammonia measured at a concentration of 0.041 mg/L at SW10 during the July 2004 sampling event, and possibly 'elevated' iron concentrations measured at stations SW8, SW9 and/or SW10. Although iron concentrations at background station SW7 exceeded PWQO on 7 out of 11 sampling events, the concentrations of iron measured at stations SW8, SW9 and SW10 were slightly higher than background conditions during more than half of the sampling events conducted in 2004, which could indicate marginal effects on surface water quality in the South Nation River.

A comprehensive list of the concentrations of four selected leachate indicator parameters (chloride, iron, total phosphorous and unionized ammonia) in the South Nation River at surface water sampling stations SW7 through SW10 is provided in Table 6. The surface water sampling stations have been included in Table 6 such that the background station (SW7) is compared to successive downstream surface water sampling stations, with SW8 being the most downstream station. Also presented in Table 6 are the data from station SW6 that represents the quality of LISW in Ravine No. 1 at the point of discharge to the South Nation River, and the data from station SW3 that represents the quality of surface water flowing in Ravine No. 2 at the point of discharge to the South Nation River. It is noted that flow in Ravine No. 2 at SW3, located northeast of the fill area, has been significantly reduced since the summer of 2004, and due to the filling of the east ditch, it is not anticipated that leachate impacts will be possible within Ravine No. 2 in the future.

As shown in Table 6, the four selected leachate indicator parameters are typically elevated at station SW6 and SW3 which discharge into the South Nation River. Based on Policy 2 of the PWQO, since the background concentrations of iron, total phosphorous and unionized ammonia at SW7 are commonly (for iron and total phosphorous) or sporadically (for unionized ammonia) greater than the PWQO, the concentrations of these parameters are important in terms of assessing landfill site compliance. Chloride has been included in Table 6 because it is a conservative typical leachate indicator parameter.

Concentrations that exceed the corresponding PWQO have been shaded in Table 6. Also, concentrations measured at the river stations in the immediate vicinity or some distance downstream from the discharge point of Ravine No. 1 (i.e., SW8, SW9 and SW10) that exceed background conditions measured at SW7 have been identified with an asterisk ("*"). Differences in concentrations that have been established as noteworthy (i.e., above the standard deviation associated with the corresponding analytical method) are ≥ 2 mg/L for chloride, ≥ 0.05 mg/L for iron, ≥ 0.01 mg/L for total phosphorous and any difference above the PWQO of 0.02 mg/L for unionized ammonia.

Based on Table 6, the trends in selected leachate indicator parameter concentrations at the various sampling stations over the 50 sampling sessions conducted since December 1999 can be summarized as follows:

- Several elevated chloride concentrations were reported at sampling station SW6. The concentration of chloride measured at SW3 in June 2002 and April 2003 was also elevated. Ten sampling sessions (20% of all sampling sessions) at station SW9 reported marginally elevated concentrations of chloride, by at least 2 mg/L or more, compared to background water quality, while the concentration of chloride was significantly higher at SW9 compared to background conditions during only one sampling event (55 mg/L in January 2002 compared to 34 mg/L at SW7). The number of marginally elevated chloride concentrations

over the whole sampling period was 8 (16% of all sampling sessions) at station SW10 and eleven (22% of all sampling sessions) at SW8. Also, sampling station SW8 reported one sampling session (January 2002) when the concentration of chloride was significantly higher compared to background (53 mg/L compared to 34 mg/L at SW7). For the year 2004, there were only two occurrences (March and July) when chloride concentrations measured at SW8 exceeded background conditions by 2 mg/L or more, whereas there were no such occurrences at stations SW9 and SW10. In conclusion, even though elevated chloride concentrations are reported at station SW6, the monthly chloride concentrations at the SW8, SW9 and SW10 (and in particular data from the year 2004) indicate negligible landfill leachate impact on water quality in the South Nation River when compared to SW7.

- There were 14 occurrences (28% of all sampling sessions) when elevated concentrations of iron (by 0.05 mg/L or more) compared to background quality were reported at station SW9, while there were 15 elevated iron concentration occurrences (30% of all sampling sessions) at station SW10, and 16 elevated iron concentration occurrences (32% of all sampling sessions) at station SW8. Data from previous years suggested that, although 'elevated' concentrations of iron were occasionally measured in the South Nation River near the point of discharge of Ravine No. 1 at SW10, these were localized since concentrations measured at downstream station SW8 were generally comparable to background conditions at SW7. However, in 2004, iron concentrations measured at SW9 or SW10 were consistently above background conditions throughout the months of March to November 2004. These elevated concentrations (although generally marginal in nature) were associated with high iron concentrations at SW6 from May to November 2004. Elevated iron concentrations were measured at downstream station SW8 during 5 of the 11 sampling events in 2004. There were more PWQO exceedances for iron measured in 2004 than in previous years, including at background station SW7.
- There were 15 sampling sessions (30% of all sampling sessions) where elevated total phosphorous levels were reported at stations SW9 and SW10, compared to background station SW7. At downstream station SW8, total phosphorous concentrations were measured on 11 occasions (22% of all sampling sessions). The majority of these occurrences of 'elevated' total phosphorous concentrations at SW10, SW9 and/or SW8 were marginal in nature (difference equal to 0.02 mg/L or less), and on only rare occasions were they coupled with occurrences of high total phosphorous concentrations at SW6. Total phosphorous concentrations that significantly exceeding background conditions at SW7 were measured at stations SW9 and/or SW10 during only four sampling events (June 2003, July 2003, August 2004, and October 2004) when they were coupled with 'elevated' concentrations at SW6. During these four occasions, it is possible that that total phosphorous impacts may have occurred that were related to the discharge from Ravine No. 1. In conclusion, the discharge of LISW from Ravine No. 1 at SW6 is shown to have had a negligible effect on total phosphorous concentrations in the South Nation River, but possibly with infrequent evidence of localized impacts to surface water quality in the river near the discharge point.

- The concentrations of unionized ammonia at stations SW7, SW9, SW10 and SW8 have typically been measured to be below the PWQO of 0.02 mg/L throughout the period of sampling (1999-2004). However, PWQO was exceeded at station SW10 during the August 2004 sampling even where the calculated unionized ammonia concentration reached 0.041 mg/L. Past exceedances were measured in the South Nation River in July 2000, August 2000 and July 2001. No exceedances of unionized ammonia were reported at stations SW7, SW9, SW10, and SW8 during the 2002 and 2003 monitoring seasons. The unionized ammonia levels at station SW6 consistently exceeded the PWQO of 0.02 mg/L from December 1999 to January 2002, ranging from 0.04 mg/L to 0.90 mg/L. From April 2002 to December 2002, the unionized ammonia concentrations measured at SW6 declined and ranged from <0.02 mg/L to 0.21 mg/L. In 2003, the unionized ammonia concentration measured at SW6 from February to September ranged from 0.03 mg/L to 0.31 mg/L, but returned to below the criteria from October to December. In 2004, unionized ammonia concentrations rose to above criteria in April, and ranged from 0.09 mg/L to 0.30 mg/L from April to September. Similarly to 2003, unionized ammonia levels measured from October 2004 to December 2004 returned to below PWQO. In conclusion, although surface water discharging to the South Nation River at SW6 regularly exceeded PWQO, measurable impacts from landfill leachate were measured in the South Nation River during only 3 sampling sessions (6% of all sampling sessions) since December 1999.

The results of the monitoring activities conducted between 1999 and 2004 and a detailed review of critical leachate indicator parameters (Table 6) indicate that the discharge of LISW from the Ravine No. 1 is generally not having a persistent, significant impact on water quality in the South Nation River. Chloride concentrations measured in the South Nation River downstream of the point of discharge from Ravine No. 1 were generally similar to background conditions measured at SW7 (and more so during the year 2004 than previously). Localized minor iron impacts beyond the PWQO adjacent to and some distance downstream from the discharge point of Ravine No. 1 into the South Nation River appear to have occurred from time to time, but with more frequent occurrences during the year 2004 than previously. The total phosphorous data suggest that an adverse impact on water quality is not occurring with the possible exceptions of the June 2003, July 2003, August 2004 and October 2004 sampling events. The unionized ammonia data suggest that localized adverse impact on water quality in South Nation River near the discharge point (stations SW10 and/or SW9) occurred during 3 out of the 50 monitoring sessions conducted at the site since December 1999 (on July 2000, July 2001 and August 2004).

A comparative review of surface water quality at SW6 and CSW-1 suggest that PWQO exceedances of iron and unionized ammonia at SW6 are predominantly associated with leachate impacts originating from Casselman Landfill (more details in Section 10.3.1 and Golder [2003a]). Iron concentrations measured at SW6 did not decrease through the summer months when CSW-1 was found to be dry, but this could be attributable to the previous and ongoing seepage of groundwater and its migration towards/onto the impoundment, as well as suspended

solids and/or precipitate present in the retention pond and that has accumulated over time. Following "mothballing" activities conducted at Casselman Landfill during the summer of 2004, the concentrations of several leachate-indicator parameters (including chloride and total ammonia) have decreased significantly. It is possible that improvements to water quality in Ravine No 1 related to reshaping works and installation of a clay cover over the waste pile at Casselman Landfill will further increase in the future as infiltration of precipitation through wastes is reduced and shallow groundwater conditions stabilize.

11.2 East Boundary

Based on 2003 data, Central Landfill was determined to be not in compliance with respect to off-site surface impacts on the property located east of the landfill and to the South Nation River through surface water discharge via Ravine No. 2. However in September 2003, the Nation Municipality acquired a piece of land (shown in Figure 2) located east of the original extent of the licensed landfill. This property was subsequently registered as a leachate-attenuation zone for the landfill site (see Amending Notice 2 included in Appendix A). Reshaping of the ground surface was conducted by the municipality during the summer 2004, where the constructed drainage ditch located east of the area of filled wastes was filled in. This measure has decreased surface water discharge to the South Nation River via Ravine No. 2.

PWQO exceedances for cobalt, iron, total phosphorous and unionized ammonia were measured during the April 2004 sampling event at station SW3 located near the outlet of Ravine No. 2. However, there was no distinct water flow via Ravine No. 2 observed throughout the fall of 2004. Since the contribution from the east drainage ditch was eliminated, it is not anticipated that PWQO exceedances associated with landfill leachate impacts will be observed again in the future for surface water discharging to the river via Ravine No. 2. Surface water drainage to the east of the area of filled wastes (namely at station SW1) is now contained within the newly acquired leachate-attenuation zone for the site.

Registration of the leachate-attenuation zone east and filling-in of the east ditch have brought Central Landfill into compliance with respect to impacts on off-site surface water quality along the east boundary and to discharge via Ravine No. 2 to the South Nation River. Continued observation of surface water drainage at the northeast corner east of the landfill site and in Ravine No. 2 and water quality sampling at the outlet to the river (if any flow is found to be present) have been incorporated in the proposed monitoring program for the site to ensure that this state of compliance remains.

12.0 AQUEOUS TOXICITY TESTING

This section discusses the results of aqueous toxicity testing conducted on surface water samples collected at CSW-1 (located at the common boundary between Casselman Landfill and Central Landfill) and at SW6 (located near the outlet of the main ravine to South Nation River) in March 2004 and/or August 2004. The analyses consisted of Acute Lethal Toxicity Testing (LC₅₀) for water fleas (*Daphnia magna*) and for rainbow trout (*Oncorhynchus mykiss*), which are representative sensitive species of the invertebrates and vertebrates, respectively. Station CSW-1 was found to be dry during the August 2004 sampling event and surface water from this location could therefore not be sampled at that time.

The toxicity test reports from Hydroqual Laboratories are included in Appendix D and the results are summarized in Table 2.

12.1 Background and Methodology

Toxicity is defined as "an adverse response, ranging from injury to death, in a living organism". Acute toxicity is defined as "an adverse response, ranging from injury to death, following exposure of short duration relative to the normal lifespan of the organism". LC₅₀ is the test concentration of a sample that will cause lethal effects to (kill) 50 % of the test specimens within a designated period. This parameter is calculated by interpolation through a series of toxicity tests conducted at varying concentrations (for example, based on data from March 26, 2004, 50 % of rainbow trout would die in water from CSW-1 if the sample has been diluted to 18.9 % of its original strength). A low LC₅₀ value indicates higher toxic effects. When there is between 0% and 30% mortality observed at full test sample concentration, for example for rainbow trout using water samples at SW6 from the year 2004, no LC₅₀ value is calculated, and the test sample is considered to be non-toxic to the test species.

In 2004, tests were conducted concurrently with the standard toxicity assays on rainbow trout where pH was adjusted using bone-dry carbon dioxide (CO₂) to mimic field conditions. Adjusted toxicity tests for pH performed concurrently with standard unadjusted tests are used more and more commonly for assessing lethal effect on fresh water fish species. Based on information provided by Hydroqual Laboratories, who is conducting leading edge research in toxicity testing and is consulted on a regular basis by Environment Canada for establishing standards, pH-adjusted tests will likely be introduced in the government approved standard test method in the near future. The reason for adjusting toxicity tests is that the concentration of unionized ammonia is highly sensitive to the pH. As the pH value increases (i.e., as the water becomes more alkaline), a greater proportion of the total ammonia is found in the aquatic system in the unionized form. This form of ammonia is the most toxic to fish and aquatic invertebrates. However, with no form of control, the pH of water in the laboratory typically increases as the test progresses due to the metabolism of the fish. The results from adjusted tests are therefore more

representative of field conditions. For example, the range of laboratory measured pH for SW6 in March 2004 was 8.3 to 8.5 for the unadjusted tests, but 7.5 to 7.7 for the adjusted tests (field measured pH was 7.7). The results of the pH-adjusted tests are discussed in Section 12.2.1.

In August 2004, additional experimental work was done involving toxicity testing using solutions prepared at variable concentrations of ferric iron (Fe^{3+}). Given the relatively high iron concentrations found at the sampling stations located along Ravine No. 1, and in particular at CSW-1, the objective of the test was to assess whether the occurrence of ferric iron at high concentrations was involved in the mechanisms that caused toxic effects to rainbow trout. The results of these additional experiments are discussed in Section 12.2.2.

12.2 Results

Toxicity results for the years 2003 and 2004 are included in Table 2. The total ammonia, iron and boron concentrations measured in each of the water samples are included for reference purposes. The field conditions (temperature, pH) measured at the time of sampling and the range of laboratory conditions (temperature, pH) prevailing during the testing period are indicated in Table 2. Also included is the unionized ammonia concentration (calculated from the total ammonia, temperature and pH), based both on field and laboratory conditions.

Based on the results presented in Table 2, surface water sampled at SW6 during both sampling events in 2004 was found to not be acutely toxic to either rainbow trout or *Daphnia magna*. This is an improvement to water quality measured in 2003, since surface water from SW6 had been found to show toxic effects on rainbow trout (LC_{50} at SW6 was calculated to be at about 35% during both winter and summer 2003 sessions). Water quality at SW6 did not show acute toxic effects to *Daphnia magna* in 2004, which was consistent with observations from 2003. In comparison, water quality measured at CSW-1 (representative of water quality originating from Casselman Landfill flowing onto Central Landfill property) continued to show toxic effects to both rainbow trout and *Daphnia magna* during the March 2004 sampling event, as shown in Table 2. During the summer 2004 sampling session, station CSW-1 was dry.

Based on previous experience with municipal landfill leachate, the main toxic parameter for the rainbow trout specimen is likely un-ionized ammonia. Seasonal variations affect toxic properties of the LISW. Based on previous data collected at CSW-1 and SW6, the total ammonia concentrations are, as a general rule, higher during the summer time due to drier conditions and resulting more highly impacted surface water. However, for the year 2004, the seasonal trends in total ammonia concentrations were not observed at SW6 due to interruption of highly impacted surface water flow discharging from the Village of Casselman Landfill through the period of June to September 2004. The higher temperatures, coupled with increased total ammonia concentrations, are generally observed to result in more toxic LISW during the summer season.

The spring time is usually characterized by less toxic conditions due to dilution of LISW by melt water. The fall and winter seasons are generally characterized by intermediate toxic conditions of the LISW. Due to standardization of conditions in the laboratory, these seasonal trends cannot always be observed in laboratory results.

Based on the 2004 toxicity testing results, no toxic effects from sample SW6 were observed on the rainbow trout species for unionized ammonia concentrations (calculated based on laboratory conditions) of up to 0.71 mg/L.

12.2.1 pH-Adjusted Tests on Rainbow Trout

The LC₅₀ results presented in Table 2 do not show seasonal variations as they are observed on site because the temperature and pH conditions are standardized in the laboratory. To obtain more representative results of conditions as they prevailed at the site, toxicity tests for rainbow trout were conducted in 2004 where the pH was controlled to better mimic field conditions. These 'pH-adjusted' tests were conducted concurrently with the standard 96-hour toxicity tests with no pH control. As noted in Table 2, the laboratory-measured pH values for the pH-adjusted tests conducted in March 2004 were higher than values measured in the field (7.5 to 7.7 for the pH-controlled test compared to 6.8 in the field at SW6, and 7.8 to 7.9 for the pH-controlled test compared to 6.3 in the field at CSW-1). However, the unionized ammonia concentrations calculated for laboratory conditions show that pH-adjusted tests create laboratory conditions that more closely resembled field conditions. The LC₅₀ for the water sample collected at CSW-1 in March 2004 correspondingly showed less severe toxic effects for the pH-adjusted test with LC₅₀=32.9%, compared to LC₅₀=18.9% for the unadjusted test. The sample collected at SW6 in March was shown to be non-toxic to rainbow trout for both adjusted and non-adjusted conditions. Results of the pH-adjusted test for the sample collected at SW6 in August 2004 were not valid since the control sample showed greater than 10% mortality.

12.2.3 Toxic Effects Associated with Iron

In August 2004, additional experimental work was done to assess potential toxic effects associated with high iron concentrations. Given the relatively high iron concentrations measured at the sampling stations located along Ravine No. 1, and in particular at CSW-1, the objective of the test was to assess whether the occurrence of ferric iron at high concentrations was involved in the mechanisms that caused toxic effects to rainbow trout. There is very little data available in the literature for the toxicity of iron on rainbow trout.

Solutions were prepared by adding various concentrations of ferric chloride to the sample collected at SW6 to generate the treatments with a range of ferric iron (Fe³⁺) concentrations (100, 30, 10, 3 and 1 mg/L iron). Two reference toxicant tests for ferric iron (Fe³⁺) were conducted using laboratory dilution water.

For the water sampled at SW6 during the August 2004 monitoring session, a LC_{50} for iron of 46 mg/L iron was calculated. The two reference toxicant tests conducted using laboratory dilution water resulted in LC_{50} values of 17 and 23 mg/L iron, respectively. Iron was therefore less toxic to rainbow trout in the sample collected from SW-6 than in the laboratory dilution water.

Given the range of iron concentrations measured during the year 2004 at CSW-1 (12.3 mg/L – 52.8 mg/L) and at SW6 (0.22 mg/L – 4.69 mg/L), some toxic effects to rainbow trout were likely attributable to high iron concentrations at CSW-1, but less likely the case at SW6.

13.0 SUMMARY OF MAINTENANCE PROGRAM INSPECTION

The Closure Plan for Central Landfill which was approved as part of the August 1, 2001 Notice to Amend C of A No. A471101 included a biannual maintenance program for the site. Also, a summary of the maintenance program inspections was to be included in the annual monitoring report. This section includes observations from the maintenance inspections conducted at Central Landfill in 2004 and provides recommendations for corrective work that should be conducted at the site in 2005. A series of pictures showing the site conditions observed throughout the 2004 monitoring program is included in Appendix F.

Physical closure-related works were conducted by Nation Municipality at the site during the summer of 2004. The constructed ditch located east of the waste fill area was filled in, which virtually eliminated the discharge of LISW via the eastern-most ravine (Ravine No. 2) to the South Nation River. Also, exposed wastes located along areas of the ravines were covered with soil, and reshaping of the ground surface was conducted where required.

A maintenance inspection was conducted at the site on October 25, 2004 to examine the corrective works conducted by Nation Municipality Works Department through the summer. The following is a list of observations from the maintenance inspection where additional work would be required:

- casing of wells G99-5 and G99-6 were damaged during re-grading works and need repairs;
- seeding did not catch near the former location of the constructed drainage ditch east of the area of filled wastes since there was apparently no topsoil installed at this location; however, since the ground surface is very flat, no erosion problems are expected (see Picture 11 in Appendix F);
- problems of severe erosion of the soil cover on the western edge of Ravine 3, northeast of former tire pile, resulted in well developed channels (see Picture 13 in Appendix F);
- some windblown garbage remains in the northern portion of the site between Ravine No. 1 and Ravine No. 3;
- some construction debris and brush remain uncovered on Central Landfill property east of CSW-1 (see Picture 14 in Appendix F).

Necessary repairs to the soil cover and to the casing of monitoring wells and re-vegetation should be conducted by the Nation Municipality during the year 2005 to address the issues identified above.

14.0 SUMMARY

The 2004 monitoring program carried out at the Central Landfill and its findings are summarized below:

- The 2004 field program included measurement of groundwater levels and collection of groundwater samples from monitoring wells in May and October 2004; monthly collection of samples from surface water monitoring stations located along Ravine No. 1 and the South Nation River; collection of surface water samples from the east drainage ditch which discharges into the South Nation River via Ravine No. 2 in April 2004 (the drainage ditch was filled in during the summer 2004 such that no surface water flow could be sampled in Ravine No. 2 in October 2004).
- The horizontal groundwater flow direction in the overburden aquifer from the 2004 measurements was consistent with flow direction interpreted for the 2000-2003 data which was in a northerly direction towards the South Nation River. Based on groundwater elevations obtained at monitoring wells installed in 2002 within the area now designated as a leachate-attenuation zone, the groundwater flow direction exhibits a northeasterly component in the area located to the east of the landfill footprint. Groundwater elevations measured at monitoring wells installed on Casselman Landfill allowed a better refinement of the assessment of groundwater flow direction in the vicinity of Ravine No. 1. The flow of groundwater along the edges of Ravine No. 1 is interpreted to follow the top of clay surface and to be diverted towards the ravine.
- Given the presence of the South Nation River along the northern part of the site it is concluded that the MOE Guideline B-7 would not apply to the north boundary of the site. The north boundary of the site is a surface water compliance issue.
- Assessment of site compliance with Guideline B-7, the Reasonable Use Concept, was carried out using the data from monitoring wells P2, G99-7 and the six monitoring wells installed off-site for this purpose in 2002. Based on data from monitors G02-1A, G02-1B, G02-2, G02-4A and G02-4B, which are interpreted to not be impacted by landfill leachate at this time, the current extent of MOE Guideline B-7 exceedances is indicated to be contained within the existing monitoring well network. A piece of land was purchased by Nation Municipality in 2003 which encompasses the 2002 monitoring well network. This property was registered as a leachate-attenuation zone for the landfill site, as per Amending Notice No.2 to the C of A for the site. The site is therefore now in compliance with Guideline B-7 along its eastern boundary. Yearly groundwater quality monitoring at a reduced selected number of background and downgradient groundwater monitors is proposed for 2005 to verify that this state of compliance remains.

- The quality of surface water measured in 2004 at the point of discharge from Ravine No. 1 to the South Nation River (SW6) generally improved compared to 2003 levels. This improvement is likely attributable to "mothballing" works conducted at Village of Casselman Landfill which reduced the contribution of LISW originating from Casselman flowing onto Central Landfill property. Concentrations for the following leachate-indicator parameters, amongst others, generally decreased in 2004 compared to 2002-2003 levels: chloride, total ammonia, TDS, sodium, BOD, potassium and TKN. However, concentrations of iron, boron, cobalt and strontium did not decrease significantly in 2004 compared to previously measured levels.
- A comparative analysis of surface quality data at CSW-1 (representative of surface water discharging from Casselman Landfill onto the Central Landfill property) and SW6 demonstrates significant alteration of surface water quality by landfill leachate in the upper reaches of existing Ravine No. 1 where it leaves the Casselman Landfill property. In 2004, higher levels of total ammonia, unionized ammonia, cobalt, total phosphorous, iron, alkalinity, COD, DOC, hardness, manganese, potassium, sodium, strontium, TDS, TKN and turbidity were *consistently* measured at CSW-1 compared to the levels measured at SW6, and higher levels of boron, barium, BOD, silicon, TSS and zinc were *generally* observed at CSW-1 compared to the levels measured at SW6.
- Parameters that exceeded their corresponding PWQO at SW6 in 2004 include boron, cobalt, dissolved oxygen, iron, total phosphorous, unionized ammonia and zinc. A comparative review of surface water quality at SW6 and CSW-1 suggest that PWQO exceedances of iron and unionized ammonia at SW6 are predominantly associated with leachate impacts originating from Casselman Landfill.
- The following PWQO exceedances were measured in 2004 in the South Nation River at or downstream from the point of discharge (stations SW9, SW10 and SW8): iron, total phosphorous (commonly exceeded), and aluminum, cobalt, pH, silver and unionized ammonia (rarely exceeded). However, the only PWQO exceedances measured in the South Nation River in 2004 that are interpreted to be associated with the discharge from Ravine No. 1 are unionized ammonia measured at a concentration of 0.041 mg/L at SW10 during the July 2004 sampling event, and possibly iron at stations SW9, SW10 and/or SW8 measured at concentrations marginally higher than background conditions during more than half of the sampling events conducted in 2004.
- The results of the monitoring activities conducted between 2000 and 2004 and a detailed review of critical leachate indicator parameters (chloride, iron, total phosphorous and unionized ammonia) generally indicate that the discharge of LISW from the Ravine No. 1 is not having a persistent, significant impact on water quality in the South Nation River.

However, localized minor iron impacts beyond the PWQO near and/or downstream from the discharge point of Ravine No. 1 into the South Nation River occurred from time to time, but with more frequent occurrences in 2004 than previously. The total phosphorous data suggest that an adverse impact on water quality has not occurred since December 1999 with the possible exceptions of the June 2003, July 2003, August 2004 and October 2004 sampling events. The unionized ammonia data suggest localized adverse impact on water quality in the South Nation River near the point of discharge of Ravine No. 1 occurred during the July 2000, July 2001 and August 2004 sessions only.

- Registration of the leachate-attenuation zone east of the area of filled wastes has brought the site into compliance with respect to impacts on off-site surface water quality along the east boundary. Also, reshaping of the ground surface was conducted by the municipality during the summer 2004, where the constructed drainage ditch located east of the area of filled wastes was filled in. Based on observations from the fall 2004 session, this measure has eliminated the leachate impacts to surface water discharging to the South Nation River via Ravine No. 2. It is proposed that regular inspection of surface water drainage at the northeast corner east of the landfill site and in Ravine No. 2 and water quality sampling at the outlet of Ravine No. 2 to the river (if any flow is found to be present) be maintained as part of the monitoring program for the site to verify that this state of compliance with respect to off-site surface water impacts to the east and via Ravine No. 2 remains.
- The results of aqueous toxicity testing on LISW in Ravine No. 1 conducted in March and August 2004 has shown that discharge to the South Nation River at SW6 was not toxic to rainbow trout or *Daphnia magna*. Sampling station CSW-1, which represents the quality of surface water discharging from Casselman Landfill onto Nation Central Landfill property, was sampled during March 2004 (no water flowing in August 2004), and was toxic to both test species. Based on previous experience with municipal landfill leachate, the main toxic parameter for the rainbow trout specimen is likely un-ionized ammonia. To obtain more representative results of conditions as they prevailed at the site, toxicity tests for rainbow trout were conducted in 2004 where the pH was controlled to better mimic field conditions. These tests generally concluded that there were less toxic effects to rainbow trout when the pH was maintained closer to field conditions, presumably due to lower unionized ammonia concentrations in the water.
- Based on recommendations from the MOE Technical Review Section reviewer, the MOE Cornwall Office environmental officer requested that a number of steps be undertaken by Nation Municipality for managing LISW in Ravine No. 1, with specific associated deadlines. It is expected that a meeting to be attended by the MOE and the municipality will need to be organized to further discuss requirements by the MOE.

15.0 PROPOSED 2005 ACTIVITIES

15.1 Background

Based on historical measurements and analytical results from the 2004 groundwater and surface water monitoring program, the primary concerns with respect to impacts on surface water and groundwater quality at the Central Landfill are as follows:

- Impact on surface water quality in the South Nation River as a result of the discharge of LISW from Ravine No. 1 (surface water compliance boundary); and
- Impact on groundwater and surface water quality along the eastern property boundary (groundwater compliance boundary).

15.2 Proposed Changes to Previously Approved Monitoring Program

Following physical closure-related works at the Central Landfill Site that were conducted in 2004, site conditions were modified and the monitoring program being proposed for 2005 was adjusted accordingly. As described previously, the constructed ditch located east of the waste fill area was filled in, which has virtually eliminated the discharge of LISW via the eastern-most ravine (Ravine No. 2) to the South Nation River. As such, monitoring of surface water quality in the constructed ditch has been removed from the monitoring program, and monitoring of surface water quality in Ravine No. 2 is to be conducted twice during the year (spring and fall), if any flow is found to be present.

Also, a parcel of land located to the east of area of filled wastes at the site, with approximate dimensions of 125 metres wide (along the South Nation River) by 510 metres long, was acquired by the Nation Municipality in 2003. This area now serves as a leachate-attenuation zone for the site, as per amending notice No. 2 to the C of A A471101 issued by MOE on December 14, 2004. Golder's proposed groundwater monitoring program is therefore reduced in scope and now includes one annual groundwater monitoring session to be conducted in the fall (October) at 3 background monitors (G00-4A, G00-4B and G00-4C) and at 3 downgradient monitors (P2, G02-1A and G02-1B).

During recent consultation with the MOE, it was indicated that MOE would not consider the concept of mixing zone for assessing potential impacts to surface water quality in the South Nation River near the inlet of Ravine No. 1 to be acceptable if no engineered treatment system is in place. Since surface water quality measured at the two surface water quality monitoring stations SW9 and SW10, located slightly upgradient and downgradient, respectively, from the discharge point is very similar, it is proposed to remove sampling at station SW9 from the monthly monitoring program in the South Nation River, but to maintain monthly all other sampling stations (SW6, SW7, S8, SW10 and CSW-1).

Finally, certain analytical parameters (aluminum in surface water, phenols in groundwater and surface water) were determined to not be associated with leachate impacts to natural water quality at the site. As such, it is recommended that these parameters be removed from the suite of analytical parameters for 2005.

15.3 Proposed Monitoring Program for 2005

The objectives of the proposed 2005 monitoring program are focused on monitoring water quality associated with the two primary migration pathways related to impact on off-site water resources discussed in Section 15.1. Sampling at the existing monitoring wells and surface water sampling locations would be conducted during 2005 as outlined below:

- monitor groundwater levels in all operational monitoring wells on site (including 5 groundwater monitors located on Casselman Landfill property);
- monitor groundwater quality at existing monitoring wells G00-4A, G00-4B and G00-4C (for establishing background conditions) and P2, G02-1A and G02-1B (for establishing groundwater quality downgradient of the area of filled wastes) to confirm that the extent of leachate-impacted groundwater remains limited in extent within the leachate-attenuation zone located along the eastern boundary of the site;
- monitor surface water at SW13 and SW3 in order to assess quality of LISW discharging via Ravine No. 2 to the South Nation River near the northeast corner of the site (if any flow present);
- monitor surface water at CSW-1, SW6, SW7, SW8 and SW10 in order to continue to assess the impact on water quality in Ravine No. 1 and in the South Nation River;
- conduct aqueous toxicity testing for *Daphnia magna* and rainbow trout at CSW-1 (outlet from Casselman Landfill) and SW6.

It is suggested that the groundwater level monitoring and groundwater quality monitoring sampling frequency be once per year during the fall (October). The proposed surface water quality monitoring at sampling locations positioned near the eastern boundary is twice a year, once during the spring, and once during the fall. It is recommended that surface water sampling frequency in the South Nation River and in Ravine No. 1 be conducted monthly from January 2005 to December 2005.

Golder's proposed monitoring frequency for toxicity testing is bi-annually in February/March and July/August. Based on monitoring data, these time periods correspond to fairly typical and the highest parameter concentrations, respectively, in the LISW. In the review of the 2003 Annual Monitoring Report for the site, MOE Technical Review Section surface reviewer

suggested that toxicity testing should be conducted on a weekly basis until such time that the LISW discharging to the South Nation River via Ravine No. 1 is demonstrated to be non toxic to both test species (see memorandum dated 2 February 2005 in Appendix A). It is suggested that an adequate monitoring frequency for toxicity testing in Ravine No. 1 be discussed during an upcoming consultation meeting to be attended by MOE staff, Nation Municipality and its consultant.

A summary of the proposed groundwater and surface water monitoring program at the Central Landfill Site for the year 2005 is presented in Tables 7 and 8, respectively.

16.0 LIMITATIONS AND USE OF REPORT

This report was prepared for the exclusive use of the Corporation of the Nation Municipality. The report, which specifically includes all tables, figures and appendices, is based on data and information collected by Golder and is based solely on the conditions of the properties at the time of the work, supplemented by historical information and data obtained by Golder as described in this report, and in the previous reports prepared by Golder (see the References section for list of previous reports). Each of these reports must be read and understood collectively, and can only be relied upon in their totality.

Golder has relied in good faith on all information provided and does not accept responsibility for any deficiency, misstatements, or inaccuracies contained in the reports as a result of omissions, misinterpretation, or fraudulent acts of the persons contacted or errors or omissions in the reviewed documentation.

The assessment of environmental conditions and possible hazards at this site has been made using the results of physical measurements and chemical analyses of liquids from a number of locations. The site conditions between sampling locations have been inferred based on conditions observed at borehole and monitoring well locations. Subsurface conditions may vary from these sampled locations.

The services performed, as described in this report, were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

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TABLE 2
SUMMARY OF TOXICITY TESTING RESULTS

Sample Location	SW5	SW6	SW6	SW6	CSW-1	CSW-1	CSW-1	CSW-1
Sampling Date	20/03/2003	17/07/2003	26/03/2004	20/08/2004	20/03/2003	17/07/2003	26/03/2004	20/08/2004
Total Ammonia (mg/L)	42	36	8.7	12.7	82	95	58.6	dry
Iron (mg/L)	3.79	2.13	1.90	2.12	52.1	37.4	46.6	
Boron (mg/L)	0.93	1.3	0.544	0.866	1.02	1.31	1.41	
Field pH	6.9	7.5	6.8	7.7	6.7	6.6	6.3	
Field Temp. (°C)	3	15	5.9	17.7	4	18	11.8	
Unionized Ammonia - Field ¹	0.035	0.308	0.007	0.210	0.047	0.129	0.025	
96-Hour Acute Toxicity to Rainbow Trout (without pH adjustment)								
Range of Lab pH	8.1 - 8.3	8.0 - 8.4	8.3 - 8.5	8.0 - 8.4	8.0 - 8.2	8.1 - 8.3	8.1 - 8.4	
Range of Lab Temp. (°C)	15.5 - 16.0	14.0 - 16.0	15.0 - 16.0	15.0 - 16.0	15.5 - 16.0	15.0 - 16.0	15.0 - 16.0	
LC 50 Trout (%)	35.4	35.0	>100	>100	16.0	18.0	18.9	
Calc. Unionized Ammonia - Lab (mg/L) ²	1.45	1.61	0.645	0.705	2.26	4.24	2.61	
% Mortality Trout @ 100%	100	100	20	10	100	100	100	
% Mortality Trout @ 50%	100	100	0	0	100	100	100	
% Mortality Trout @ 25%	0	0	10	0	100	100	80	
% Mortality Trout @ 12.5%	0	0	0	0	20	0	10	
% Mortality Trout @ 6.25%	0	0	0	10	0	0	0	
96-Hour Acute Toxicity to Rainbow Trout (with pH adjustment)								
Range of Lab pH - CO2 adjusted	-	-	7.5 - 7.7	test not valid due to greater than 10% mortality in the control	-	-	7.8 - 7.9	
Range of Lab Temp. (°C) - CO2 adjusted	-	-	15.0 - 16.0		-	-	16.0	
Calc. Unionized Ammonia - Lab (mg/L) ²	-	-	0.094		-	-	1.34	
LC 50 Trout - CO2 adjusted (%)	-	-	>100		-	-	32.9	
% Mortality Trout @ 100% - CO2 adjusted	-	-	20		-	-	100	
% Mortality Trout @ 50% - CO2 adjusted	-	-	0		-	-	100	
% Mortality Trout @ 25% - CO2 adjusted	-	-	10		-	-	10	
% Mortality Trout @ 12.5% - CO2 adjusted	-	-	20		-	-	0	
% Mortality Trout @ 6.25% - CO2 adjusted	-	-	0		-	-	0	
48-Hour Acute Toxicity to <i>Daphnia magna</i>								
LC 50 Water Flea (%)	>100	>100	>100	>100	82.8	37.0	100	
% Mortality Water Flea @ 100%	0	0	0	0	75	100	50	
% Mortality Water Flea @ 50%	0	not tested	not tested	not tested	0	70	20	
% Mortality Water Flea @ 25%	0	not tested	not tested	not tested	0	0	0	
% Mortality Water Flea @ 12.5%	0	not tested	not tested	not tested	0	0	0	
% Mortality Water Flea @ 6.25%	0	not tested	not tested	not tested	0	0	0	

Notes:

¹ Calculated unionized ammonia concentration based on full test sample concentration and field-measured temperature and pH.

² Calculated unionized ammonia concentration based on full test sample concentration and laboratory-measured temperature and pH at termination of toxicity assay.

TABLE 3
INTERPRETATION OF 2004 GROUNDWATER QUALITY DATA

Borehole Location	Monitoring Well	Depth of Screened Interval BGL (m)	Geological Unit(s) Encountered	Parameters Exceeding ODWQS in 2004 (# of exceedances / # of sampling sessions in 2004)	Trend(s)	Parameters Consistently Elevated Compared to Background Conditions ^a	Hydrogeological Interpretation
P2	P2	0.3 - 1.7	silty fine sand	- alkalinity (1/2) - DOC (2/2) - manganese (1/2) - TDS (2/2)	- highest alkalinity, ammonia, barium, chloride, COD, DOC, hardness, potassium, TDS levels measured to date in October 2004	alkalinity, barium, boron, chloride, cobalt, DOC, hardness, manganese, nitrate, potassium, sodium, strontium, TDS	• monitoring well is located approximately 30 m east of fill area • monitoring well is hydrogeologically downgradient from fill area (see Figure 2) • groundwater quality is interpreted to be impacted by <i>landfill leachate</i>
G99-7	G99-7	1.7 - 3.2	silty clay	- DOC (1/1) - manganese (1/1) - TDS (1/1)	- groundwater quality generally consistent over time, with lower concentrations measured during the spring season, and higher concentrations measured during the fall season - lowest chloride, COD, DOC, hardness, sodium, strontium, and TDS levels measured to date in May 2004 - iron concentrations increasing until 2001, then decreasing since 2002 - lower COD levels since October 2002	alkalinity, barium, boron, chloride, cobalt, COD, DOC, hardness, manganese, sodium, strontium, TDS	• monitoring well is located approximately 65 m east of fill area • monitoring well is hydrogeologically downgradient from fill area (see Figure 2) • groundwater quality is interpreted to be impacted by <i>landfill leachate</i>

TABLE 3 (Continued)

Borehole Location	Monitoring Well	Depth of Screened Interval BGL (m)	Geological Unit(s) Encountered	Parameters Exceeding ODWQS in 2004 (# of exceedances / # of sampling sessions in 2004)	Trend(s)	Parameters Consistently Elevated Compared to Background Conditions ^a	Hydrogeological Interpretation
G00-4	G00-4A	6.1 – 7.6	silty clay	- aluminium (1/2)	- groundwater quality generally consistent over time - low chloride (with the exception of June 2001 measurement) and non-detect to low boron and nitrate - aluminum, COD, iron, nitrate and total phosphorous levels variable over time - highest TDS measured to date at this location in May 2004 at 444 mg/L	N/A	• monitoring well is located approximately 170 m southeast of fill area • monitoring well is hydrogeologically upgradient from fill area (see Figure 2) • groundwater quality represents background conditions in silty clay unit
G00-4	G00-4B	2.9 – 4.4	silty clay	- aluminium (1/2)	- groundwater quality generally consistent over time - low chloride and non-detect to low boron and nitrate - highest COD measured to date at this location in May 2004 - aluminium, COD and total phosphorous levels variable over time - TDS high in July 2000, and consistently below 200 mg/L since fall 2001	N/A	• monitoring well is located approximately 170 m southeast of fill area • monitoring well is hydrogeologically upgradient from fill area (see Figure 2) • groundwater quality represents background conditions in silty clay unit
G02-1	G02-1A	2.7 – 4.3	silty clay	- DOC (1/2)	- groundwater quality generally consistent over time - low chloride and non-detect to low boron - highest COD and DOC concentrations measured to date at this location in October 2004	sulphate	• monitoring well is located approximately 120 m east of fill area • monitoring well is hydrogeologically downgradient from fill area (see Figure 2) • groundwater quality is interpreted to <u>not</u> be impacted by landfill leachate

TABLE 3 (Continued)

Borehole Location	Monitoring Well	Depth of Screened Interval BGL (m)	Geological Unit(s) Encountered	Parameters Exceeding ODWQS in 2004 (# of exceedances / # of sampling sessions in 2004)	Trend(s)	Parameters Consistently Elevated Compared to Background Conditions ^a	Hydrogeological Interpretation
G02-1	G02-1B	0.5 - 2.1	silty sand underlain by silty clay ^b	- none	- groundwater quality generally consistent over time - low chloride and non-detect to low boron and nitrate	alkalinity, barium, hardness, strontium, sulphate	- monitoring well is located approximately 120 m east of fill area - monitoring well is hydrogeologically downgradient from fill area (see Figure 2) - groundwater quality is interpreted to <u>not</u> be impacted by <i>landfill leachate</i>
G02-2	G02-2	0.6 - 2.1	silty clay	- iron (1/1) - manganese (1/1) - TDS (1/1)	- groundwater quality generally consistent over time - low chloride and non-detect to low boron and nitrate - highest alkalinity, iron and strontium measured to date at this location in May 2004 - total phosphorus, and sulphate concentrations variable over time	alkalinity, barium, hardness, strontium, sulphate, TDS	- monitoring well is located approximately 150 m east of fill area - monitoring well is hydrogeologically downgradient from fill area (see Figure 2) - groundwater quality is interpreted to <u>not</u> be impacted by <i>landfill leachate</i>
G02-3	G02-3	0.3 - 1.8	silty sand underlain by silty clay ^b	- DOC (1/1) - manganese (1/1) - sulphate (1/1) - TDS (1/1)	- groundwater quality generally consistent over time - highest alkalinity, COD, hardness, potassium, sulphate and strontium levels measured to date at this location in May 2004 - decreasing ammonia concentrations since June 2002 - total phosphorus concentrations variable over time	alkalinity, chloride, hardness, manganese, sodium, strontium, sulphate, TDS	- monitoring well is located approximately 90 m east of the fill area - monitoring well is hydrogeologically downgradient from fill area (see Figure 2) - groundwater quality is interpreted to be impacted by <i>landfill leachate</i>

TABLE 3 (Continued)

Borehole Location	Monitoring Well	Depth of Screened Interval BGL (m)	Geological Unit(s) Encountered	Parameters Exceeding ODWQS in 2004 (# of exceedances / # of sampling sessions in 2004)	Trend(s)	Parameters Consistently Elevated Compared to Background Conditions ^a	Hydrogeological Interpretation
G02-4	G02-4A	2.4 - 4.0	silty clay	- manganese (1/1)	- groundwater quality generally consistent over time - low chloride, boron and nitrate - highest alkalinity, manganese, strontium and TDS levels measured to date in May 2004 - lowest total phosphorus concentration measured to date at this location in May 2004	sulphate	- monitoring well is located approximately 125 m east of the fill area - monitoring well is possibly hydrogeologically downgradient from fill area (see Figure 2) - groundwater quality is interpreted to <u>not</u> be impacted by <i>landfill leachate</i>
G02-4	G02-4B	0.2 - 1.8	silty fine sand underlain by silty clay ^b	- DOC (1/1) - iron (1/1) - manganese (1/1) - TDS (1/1)	- groundwater quality generally consistent over time - low chloride and non-detect to low boron and nitrate - highest manganese concentration measured to date at this location in May 2004 - generally decreasing sodium concentrations over time - sulphate concentrations lower in 2003 and 2004 than previously - COD, manganese and total phosphorus levels variable over time	alkalinity, barium, hardness, strontium, sulphate, TDS	- monitoring well is located approximately 125 m east of the fill area - monitoring well is possibly hydrogeologically downgradient from fill area (see Figure 2) - groundwater quality is interpreted to <u>not</u> be impacted by <i>landfill leachate</i>

Notes:

BGL - Below Ground Level

ODWQS - Ontario Drinking Water Quality Standards (Ministry of the Environment, 2003)

N/A - Not Applicable

^a A parameter was evaluated to be exceeding background conditions when 50% or more of all the historical and recent measurements available at the monitoring well being considered exceed the background conditions by a value greater than the uncertainty associated with the corresponding analytical method. The background groundwater quality in the granular silty sand layer is based on historical information available from monitoring wells G99-8, G00-3 and G00-4C. The background groundwater quality in the silty clay unit is based on historical and recent information available from monitoring wells G00-4A and G00-4B.

^b These groundwater samples are predominantly representative of silty clay unit since the major portion of the screened interval is located in the silty clay unit.

TABLE 4

SUMMARY OF PARAMETERS EXCEEDING REASONABLE
USE PERFORMANCE OBJECTIVES IN 2004

Parameter	ODWQS	Maximum Background Concentration at Monitoring Wells G00-4A and G00-4B	RUPO	Monitoring Well G99-7	Monitoring Well G02-1A		Monitoring Well G02-1B	
				May 2004	May 2004	October 2004	May 2004	October 2004
Barium	1 (MAC)	0.04	0.28	0.112	0.008	0.007	0.067	0.076
Boron	5 (IMAC)	0.15	1.4	0.22	0.036	0.047	<0.005	0.011
Cadmium	0.005 (MAC)	<0.0001	0.0013	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chloride	250 (AO)	19	135	50.1	0.6	0.8	0.6	<0.5
Chromium	0.05 (MAC)	0.014	0.023	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	1 (AO)	0.018	0.51	0.0014	0.0010	0.0013	0.0025	0.0029
DOC	5 (AO)	8.9	8.9	9.9	1.3	18.4	2.2	3.4
Iron	0.3 (AO)	5.49	5.5	<0.03	<0.03	0.03	<0.03	0.04
Lead	0.01 (MAC)	0.003	0.0053	0.0008	0.0006	<0.0005	0.0007	0.0006
Manganese	0.05 (AO)	0.286	0.29	0.507	0.027	0.031	0.008	<0.005
Nitrate	10 (MAC)	1.16	3.4	0.2	0.20	0.20	<0.20	<0.20
Nitrite	1 (MAC)	0.16	0.37	<0.20	<0.20	<0.20	<0.20	<0.20
Sodium	200 (AO)	80	140	53.3	23.3	24.1	6.1	13.3
Sulphate	500 (AO)	27	264	2.6	13.9	12.6	30.4	35.9
TDS	500 (AO)	444	472	550	204	168	378	436
Zinc	5 (AO)	0.02	2.5	0.005	<0.005	0.008	0.010	0.007

TABLE 4 (Continued)

Parameter	ODWQS	Maximum Background Concentration at Monitoring Wells G00-4A and G00-4B	RUPO	Monitoring Well G02-2	Monitoring Well G02-3	Monitoring Well G02-4A	Monitoring Well G02-4B
				May 2004	May 2004	May 2004	May 2004
Barium	1 (MAC)	0.04	0.28	0.054	0.033	0.030	0.087
Boron	5 (IMAC)	0.15	1.4	0.029	0.063	0.046	0.020
Cadmium	0.005 (MAC)	<0.0001	0.0013	<0.0001	<0.0001	<0.0001	<0.0001
Chloride	250 (AO)	19	135	0.5	70.4	0.7	0.5
Chromium	0.05 (MAC)	0.014	0.023	<0.005	<0.005	<0.005	<0.005
Copper	1 (AO)	0.018	0.51	<0.0005	0.0022	<0.0005	<0.0005
DOC	5 (AO)	8.9	8.9	2.2	7.4	1.6	7.4
Iron	0.3 (AO)	5.49	5.5	0.75	<0.03	<0.03	0.35
Lead	0.01 (MAC)	0.003	0.0053	0.0007	0.0009	0.0007	0.0009
Manganese	0.05 (AO)	0.286	0.29	0.486	0.537	0.070	0.544
Nitrate	10 (MAC)	1.16	3.4	<0.20	<0.20	0.20	<0.20
Nitrite	1 (MAC)	0.16	0.37	<0.20	<0.20	<0.20	<0.20
Sodium	200 (AO)	80	140	26.9	87.8	32.8	18.1
Sulphate	500 (AO)	27	264	315	715	16.9	12.2
TDS	500 (AO)	444	472	846	1702	228	508
Zinc	5 (AO)	0.02	2.5	<0.005	0.009	0.007	0.016

TABLE 4 (Continued)

Parameter	ODWQS	Maximum Background Concentration at Monitoring Wells G99-8, G00-3 and G00-4C	RUPO	Monitoring Well P2	
				May 2004	October 2004
Barium	1 (MAC)	0.07	0.30	0.079	0.300
Boron	5 (IMAC)	0.03	1.3	0.245	0.462
Cadmium	0.005 (MAC)	<0.0001	0.0013	<0.0001	<0.0001
Chloride	250 (AO)	27	139	89.9	152
Chromium	0.05 (MAC)	<0.01	0.02	<0.005	<0.005
Copper	1 (AO)	0.005	0.50	0.0182	0.0148
DOC	5 (AO)	22.7	22.7	17.1	36.1
Iron	0.3 (AO)	20.4	20.4	<0.03	0.04
Lead	0.01 (MAC)	0.003	0.0053	<0.0005	0.0014
Manganese	0.05 (AO)	0.34	0.34	<0.005	1.54
Nitrate	10 (MAC)	0.10	2.6	4.60	<0.20
Nitrite	1 (MAC)	<0.10	0.33	<0.20	<0.20
Sodium	200 (AO)	28	114	85.1	126
Sulphate	500 (AO)	41	271	10.0	10.7
TDS	500 (AO)	276	388	732	1298
Zinc	5 (AO)	0.2	2.6	<0.005	0.009

Notes: ODWQS - Ontario Drinking Water Quality Standards (Ministry of the Environment, 2003)
 Shaded parameter concentration exceeds Reasonable Use Performance Objective (RUPO)

TABLE 5

INTERPRETATION OF 2004 SURFACE WATER QUALITY DATA
RAVINE NO.1 AND SOUTH NATION RIVER

Surface Water Sampling Station	Parameters Exceeding PWQO in 2004 (# of exceedances in parentheses)	Trends	Parameters Consistently Exceeding Background Conditions in 2004 *	Interpretation
SW6 (10 sampling events in 2004)	- boron (10) - cobalt (8) - dissolved oxygen (3) - iron (9) - total phosphorous (10) - unionized ammonia (6) - zinc (7)	- chloride concentrations ranged from about 45 mg/L in the spring 2004 to 150 mg/L during the late summer and winter 2004; chloride concentrations measured in 2004 were generally lower than in previous years - total ammonia concentrations measured in 2004 were also generally lower than in previous years; however, total ammonia concentrations rose from 8.2 mg/L in September to 18.7 mg/L in October, which was coincident with re-initiation of overland flow from Casselman Landfill; highest unionized ammonia levels for the year 2004 measured in July and August at about 0.3 mg/L and 0.21 mg/L, respectively, are linked to higher field-measured pH and temperature - TDS, sodium, BOD, potassium and TKN concentrations (which can be associated with landfill leachate impacts) decreased in 2004 compared to 2002-2003 levels; total chromium levels also decreased in 2004; however iron, boron, cobalt and strontium concentrations did not decrease significantly in 2004 compared to 2003 levels - highest titanium concentration measured in 2004, but still remain at levels below 0.15 mg/L; this increase is likely attributable to different analytical laboratory than previously - TSS peak levels generally decreased in 2004 (maximum in 2004 is 134 mg/L compared to 705 mg/L in 2003 and 2,710 mg/L in 2002) - the highest sulphate concentration was reported in September 2004 at 282 mg/L	alkalinity, ammonia, barium, BOD, boron, chloride, chromium, cobalt, COD, dissolved oxygen, DOC, hardness, iron, manganese, nickel, nitrate, total phosphorous, potassium, silicon, sodium, strontium, sulphate, TDS, titanium, TKN, TSS, turbidity, unionized ammonia, zinc	• surface water station SW6 is located in the large ravine (Ravine No. 1) near the entry point to the South Nation River (see Figure 2). • surface water quality at this location is interpreted to be impacted by landfill leachate.
SW7 (11 sampling events in 2004)	- aluminium (1) - iron (7) - pH (1) - silver (1) - total phosphorous (10) - zinc (3)	- chloride and total ammonia concentrations generally higher in the winter season - highest DOC, iron, ammonia, manganese, and titanium concentrations measured to date in March and/or April 2004 - highest zinc measured to date (0.077 mg/L) in June 2004 - unionized ammonia consistently below 0.02 mg/L since August 2001 - BOD consistently below or at 2 mg/L in 2003-2004	N/A	• surface water station SW7 is located in the South Nation River upstream (northeast) of the Central Landfill (see Figure 2) approximately 150 metres upstream of the landfill footprint • surface water conditions at this location are used to represent background surface water quality in the South Nation River, with naturally occurring PWQO exceedances for selected parameters, namely iron and total phosphorous.

TABLE 5 (Continued)

Surface Water Sampling Station	Parameters Exceeding PWQO in 2004 (# of exceedances in parentheses)	Trends	Parameters Consistently Exceeding Background Conditions in 2004 ^a	Interpretation
SW8 (11 sampling events in 2004)	- aluminum (1) - iron (7) - pH (1) - silver (1) - total phosphorus (10) - zinc (2)	- chloride concentrations are generally higher in the winter season - highest silicon, iron, and total ammonia concentrations measured to date in March 2004 - highest zinc concentration measured to date (0.1 mg/L) in February 2004 and highest aluminum concentration measured to date (0.3 mg/L) in August 2004 - unionized ammonia consistently below 0.02 mg/L since July 2001 - BOD consistently below or at 2 mg/L in 2003-2004	iron	• surface water station SW8 is located in the South Nation River downstream (northwest) of the Central Landfill (see Figure 2). • surface water conditions at this location are interpreted to be periodically affected by landfill leachate
SW9 (11 sampling events in 2004)	- cobalt (1) - iron (9) - total phosphorous (11) - zinc (1)	- chloride concentrations are generally higher in the winter season - highest total ammonia concentration measured to date in March 2004 and highest manganese concentration measured to date in April 2004 - highest iron concentrations measured to date in March and April 2004 at 2.11 and 2.26 mg/L, respectively - TDS, hardness, alkalinity levels measured in February and/or March 2004 were the lowest measured to date - the lowest sodium concentration measured to date was reported in September 2004 - unionized ammonia consistently below 0.02 mg/L since July 2001 - BOD consistently below or at 1 mg/L in 2003 and 2004	iron, silicon, turbidity	• surface water station SW9 is located in the South Nation River immediately upstream of Ravine No. 1 discharge (see Figure 2). • surface water conditions at this location are interpreted to be periodically affected by landfill leachate
SW10 (11 sampling events in 2004)	- iron (7) - silver (1) - total phosphorous (10) - unionized ammonia (1) - zinc (2)	- chloride concentrations are generally higher in the winter season - highest iron concentration measured in March 2004 at 1.87 mg/L since March 2000 - highest total ammonia concentrations measured in March and July 2004 (at 0.65 and 0.68 mg/L, respectively) since September 2000 - first exceedances of unionized ammonia measured in July 2004 (at 0.041 mg/L) since July 2001 - BOD consistently below or at 1 mg/L in 2003 and 2004	iron, silicon, turbidity	• surface water station SW10 is located in the South Nation River immediately downstream of Ravine No. 1 discharge (see Figure 2). • surface water conditions at this location are interpreted to be periodically affected by landfill leachate.

Notes: PWQO - Provincial Water Quality Objectives (Ministry of the Environment, 1994b)

^a A parameter was evaluated to be exceeding background conditions when at least 5 measurements out of the 10 or 11 sampling events were found to exceed the background condition by a value greater than the uncertainty associated with the corresponding analytical method. The background condition is established for any given sampling event as the concentrations measured at SW7 during that same sampling event.

TABLE 6
SUMMARY OF SELECTED LEACHATE INDICATOR
PARAMETER CONCENTRATIONS IN SURFACE WATER
DECEMBER 1999 THROUGH DECEMBER 2004
(see last page for footnotes)

Parameter/ Sampling Session	SW7	SW9	SW10	SW8	SW6	SW3
Chloride						
December 30, 1999	49	49	48	49	165	76
January 31, 2000	23	25 *	26 *	27 *	186	70
February 29, 2000	12	12	12	12	--	--
March 30, 2000	17	19 *	19 *	18	--	--
April 28, 2000	19	20	20	19	69	67
May 27, 2000	20	20	20	20	51	66
June 28, 2000	21	24 *	24 *	25 *	73	69
July 25, 2000	25	28 *	30 *	25	452	77
August 28, 2000	38	42 *	38	38	153	76
November 1, 2000	47	45	46	46	148	--
June 22, 2001	39	40	40	41 *	155	--
July 31, 2001	50	51	50	49	163	--
August 24, 2001	61	58	60	68 *	202	--
September 22, 2001	55	58 *	56	55	212	--
October 15, 2001	59	65 *	66 *	65 *	163	--
December 3, 2001	66	63	63	67	120	--
January 11, 2002	34	55 *	32	53 *	167	--
April 9, 2002	28	28	29	28	43	--
May 17, 2002	31	28	26	27	75	--
June 21, 2002	22	22	4	20	10	60
July 30, 2002	29	29	30	30	256	--
August 21, 2002	40	43 *	38	40	245	--
September 23, 2002	46	46	46	46	229	--
October 31, 2002	59	60	60	59	191	--
November 28, 2002	56	55	57	55	170	--
December 30, 2002	66	65	65	64	216	--
January 31, 2003	85	86	85	84	--	--
February 19, 2003	89	89	90	84	255	--
March 20, 2003	--	--	--	--	174 **	--
April 25, 2003	35	38 *	38 *	37 *	57	53
May 15, 2003	33	39 *	39 *	38 *	73	--
June 13, 2003	41	41	38	38	169	--
July 17, 2003	36	37	37	40 *	227	--
August 24, 2003	36	35	39 *	45 *	215	--
September 23, 2003	42	41	40	41	232	--
October 27, 2003	44	31	31	31	79	42
November 26, 2003	31	31	31	30	128	--
December 23, 2003	36	34	36	35	134	--
January 29, 2004	35.6	36.5	36.1	37.0	--	--
February 20, 2004	55.9	54.3	55.2	55.2	--	--
March 26, 2004	32.3	33.5	34.0	36.6 *	43.7	--
April, 29, 2004	35.5	36.0	35.9	34.1	58.8	37.3
May 26, 2004	30.8	30.8	31.7	29.3	89.9	--
June 29, 2004	36.0	36.5	35.3	35.6	134	--
July 20, 2004	29.2	29.8	29.4	31.2 *	128	--
August 20, 2004	36.3	35.9	37.1	35.2	121	--
September 20, 2004	22.6	22.7	23.1	24.2	107	--
October 25, 2004	49.1	49.0	49.8	48.7	148	--
November 24, 2004	52.8	53.5	54.1	53.7	142	--
December 24, 2004	--	--	--	--	86.2	--

TABLE 6 (continued)

Parameter/ Sampling Session	SW7	SW9	SW10	SW8	SW6	SW3
Iron (PWQO = 0.3 mg/L)						
December 30, 1999	0.29	0.21	0.27	0.21	0.15	11.2
January 31, 2000	0.49	0.30	0.31	0.12	0.08	1.62
February 29, 2000	0.89	0.81	0.81	0.85	--	--
March 30, 2000	1.62	2.24 *	2.24 *	1.65	--	--
April 28, 2000	0.77	0.48	0.61	0.51	0.49	0.42
May 27, 2000	0.61	0.07	0.72 *	0.58	1.17	0.12
June 28, 2000	0.63	0.58	0.74 *	0.56	0.77	0.22
July 25, 2000	0.12	1.38 *	0.03	0.90 *	0.07	0.66
August 28, 2000	0.04	0.03	0.06	0.03	0.14	0.06
November 1, 2000	0.19	0.16	0.06	0.25 *	1.41	--
June 22, 2001	0.21	0.24	0.36 *	0.37 *	1.15	--
July 31, 2001	0.23	0.21	0.23	0.13	2.26	--
August 24, 2001	0.29	0.29	0.57 *	0.37 *	1.78	--
September 22, 2001	0.55	0.34	0.31	0.32	1.35	--
October 15, 2001	0.55	0.37	0.26	0.29	0.86	--
December 3, 2001	0.28	0.24	0.25	0.26	0.94	--
January 11, 2002	0.05	0.13 *	0.05	0.14 *	0.65	--
April 9, 2002	0.03	0.03	0.03	0.03	1.20	--
May 17, 2002	0.36	0.54 *	0.50 *	0.42 *	1.10	--
June 21, 2002	0.43	0.55 *	0.34	0.53 *	5.97	1.08
July 30, 2002	0.25	0.29	0.40 *	0.35 *	4.45	--
August 21, 2002	0.08	0.09	0.11	0.09	5.11	--
September 23, 2002	0.73	0.30	0.31	0.30	1.00	--
October 31, 2002	0.04	0.04	0.06	0.23 *	0.49	--
November 28, 2002	0.29	0.47 *	0.23	0.21	1.31	--
December 30, 2002	0.15	0.16	0.79 *	0.18	0.55	--
January 31, 2003	0.11	0.09	0.10	0.09	--	--
February 19, 2003	0.09	0.10	0.09	0.11	0.27	--
March 20, 2003	--	--	--	--	3.79 **	--
April 25, 2003	0.33	0.50 *	0.29	0.25	0.55	1.56
May 15, 2003	0.30	0.25	0.26	0.29	0.17	--
June 13, 2003	0.28	0.28	0.29	0.31	1.17	--
July 17, 2003	0.03	0.02	0.16 *	0.19 *	2.13	--
August 24, 2003	0.30	0.22	0.30	0.64 *	1.45	--
September 23, 2003	1.10	0.30	0.27	1.07	0.52	--
October 27, 2003	0.36	0.34	0.32	0.29	0.42	0.81
November 26, 2003	0.18	0.18	0.19	0.20	0.41	--
December 23, 2003	0.22	0.19	0.19	0.20	0.36	--
January 29, 2004	0.25	0.22	0.30 *	0.23	--	--
February 20, 2004	0.19	0.19	0.23	0.21	--	--
March 26, 2004	1.64	2.11 *	1.87 *	1.73 *	1.90	--
April, 29, 2004	1.71	2.26 *	0.73	1.71	0.22	1.62
May 26, 2004	0.66	0.57	0.72 *	1.11 *	0.86	--
June 29, 2004	0.47	0.47	0.66 *	0.84 *	4.69	--
July 20, 2004	0.22	0.39 *	0.33 *	0.35 *	3.35	--
August 20, 2004	0.51	1.40 *	0.86 *	0.50	2.12	--
September 20, 2004	0.47	0.64 *	0.49	0.56 *	0.98	--
October 25, 2004	0.37	0.43 *	0.26	0.21	1.10	--
November 24, 2004	0.24	0.34 *	0.25	0.25	1.01	--
December 24, 2004	--	--	--	--	0.94	--

TABLE 6 (continued)

Parameter/ Sampling Session	SW7	SW9	SW10	SW8	SW6	SW3
<i>Total Phosphorous (PWQO = 0.03 mg/L)</i>						
December 30, 1999	0.04	0.04	0.04	0.04	0.96	3.74
January 31, 2000	0.08	0.06	0.06	0.08	0.02	0.38
February 29, 2000	0.30	0.25	0.25	0.27	--	--
March 30, 2000	0.36	0.37 *	0.37 *	0.38 *	--	--
April 28, 2000	0.13	0.11	0.18 *	0.03	0.04	0.04
May 27, 2000	0.07	0.07	0.07	0.07	0.03	0.02
June 28, 2000	0.07	0.14 *	0.14 *	0.07	0.08	0.06
July 25, 2000	0.23	0.21	0.21	0.16	0.03	3.63
August 28, 2000	0.24	0.08	0.08	0.10	0.11	0.05
November 1, 2000	0.04	0.04	0.06 *	0.21 *	0.17	--
June 22, 2001	0.06	0.05	0.08 *	0.07 *	0.18	--
July 31, 2001	0.08	0.08	0.07	0.08	0.30	--
August 24, 2001	0.13	0.10	0.11	0.11	0.22	--
September 22, 2001	0.13	0.08	0.13	0.11	0.21	--
October 15, 2001	0.08	0.07	0.05	0.06	0.14	--
December 3, 2001	0.03	0.04 *	0.05 *	0.05 *	0.10	--
January 11, 2002	0.03	0.03	0.04 *	0.03	0.15	--
April 9, 2002	0.40	0.31	0.11	0.14	0.07	--
May 17, 2002	0.07	0.07	0.07	0.05	0.03	--
June 21, 2002	0.13	0.15 *	0.10	0.16 *	0.16	0.10
July 30, 2002	0.10	0.12 *	0.12 *	0.13 *	2.07	--
August 21, 2002	0.11	0.12 *	0.11	0.10	3.61	--
September 23, 2002	0.22	0.16	0.16	0.15	0.50	--
October 31, 2002	0.09	0.07	0.11 *	0.19 *	0.20	--
November 28, 2002	0.11	0.18 *	0.08	0.09	0.17	--
December 30, 2002	0.06	0.05	0.05	0.05	0.19	--
January 31, 2003	0.05	0.06 *	0.04	0.05	--	--
February 19, 2003	0.11	0.05	0.05	0.06	0.12	--
March 20, 2003	--	--	--	--	0.24 **	--
April 25, 2003	0.19	0.21 *	0.16	0.15	0.14	0.21
May 15, 2003	0.05	0.04	0.04	0.04	0.06	--
June 13, 2003	0.05	0.04	0.29 *	0.11 *	0.13	--
July 17, 2003	0.12	0.14 *	0.16 *	0.07	0.64	--
August 24, 2003	0.10	0.10	0.11 *	0.15 *	0.18	--
September 23, 2003	0.10	0.07	0.06	0.07	0.11	--
October 27, 2003	0.13	0.26 *	0.16 *	0.14 *	0.08	0.11
November 26, 2003	0.07	0.05	0.07	0.04	0.05	--
December 23, 2003	0.06	0.06	0.05	0.05	0.10	--
January 29, 2004	0.049	0.043	0.042	0.045	--	--
February 20, 2004	0.070	0.048	0.047	0.057	--	--
March 26, 2004	0.143	0.161 *	0.160 *	0.143	0.078	--
April, 29, 2004	0.100	0.141 *	0.068	0.107	0.040	0.070
May 26, 2004	0.093	0.072	0.078	0.098	0.132	--
June 29, 2004	0.076	0.076	0.072	0.080	0.250	--
July 20, 2004	0.086	0.085	0.078	0.091	0.276	--
August 20, 2004	0.033	0.072 *	0.067 *	0.066 *	0.135	--
September 20, 2004	0.119	0.102	0.099	0.098	0.127	--
October 25, 2004	0.063	0.077 *	0.068	0.068	0.086	--
November 24, 2004	0.026	0.035	0.026	0.030	0.089	--
December 24, 2004	--	--	--	--	0.090	--

TABLE 6 (continued)

Parameter/ Sampling Session	SW7	SW9	SW10	SW8	SW6	SW3
<i>Unionized Ammonia (PWQO = 0.02 mg/L)</i>						
December 30, 1999	<0.02	<0.02	<0.02	<0.02	0.33	<0.02
January 31, 2000	<0.02	<0.02	<0.02	<0.02	0.23	<0.02
February 29, 2000	<0.02	<0.02	<0.02	<0.02	--	--
March 30, 2000	<0.02	<0.02	<0.02	<0.02	--	--
April 28, 2000	<0.02	<0.02	<0.02	<0.02	0.04	<0.02
May 27, 2000	<0.02	<0.02	<0.02	<0.02	0.06	<0.02
June 28, 2000	<0.02	<0.02	<0.02	<0.02	0.06	<0.02
July 25, 2000	<0.02	0.08 *	0.09 *	<0.02	0.31	<0.02
August 28, 2000	0.037	<0.02	0.027	<0.02	0.59	<0.02
November 1, 2000	<0.02	<0.02	<0.02	<0.02	0.17	--
June 22, 2001	<0.02	<0.02	<0.02	<0.02	0.80	--
July 31, 2001	0.03	0.03	0.07 *	0.03	0.90	--
August 24, 2001	<0.02	<0.02	<0.02	<0.02	0.87	--
September 22, 2001	<0.02	<0.02	<0.02	<0.02	0.33	--
October 15, 2001	<0.02	<0.02	<0.02	<0.02	0.25	--
December 3, 2001	<0.02	<0.02	<0.02	<0.02	0.25	--
January 11, 2002	<0.02	<0.02	<0.02	<0.02	0.28	--
April 9, 2002	<0.02	<0.02	<0.02	<0.02	<0.02	--
May 17, 2002	<0.02	<0.02	<0.02	<0.02	<0.02	--
June 21, 2002	<0.02	<0.02	<0.02	<0.02	0.06	0.10
July 30, 2002	<0.02	<0.02	<0.02	<0.02	0.20	--
August 21, 2002	<0.02	<0.02	<0.02	<0.02	0.21	--
September 23, 2002	<0.02	<0.02	<0.02	<0.02	0.05	--
October 31, 2002	<0.02	<0.02	<0.02	<0.02	0.03	--
November 28, 2002	<0.02	<0.02	<0.02	<0.02	0.19	--
December 30, 2002	<0.02	<0.02	<0.02	<0.02	0.15	--
January 31, 2003	<0.02	<0.02	<0.02	<0.02	--	--
February 19, 2003	<0.02	<0.02	<0.02	<0.02	0.03	--
March 20, 2003	--	--	--	--	0.04 **	--
April 25, 2003	<0.02	<0.02	<0.02	<0.02	<0.02	0.03
May 15, 2003	<0.02	<0.02	<0.02	<0.02	0.07	--
June 13, 2003	<0.02	<0.02	<0.02	<0.02	0.27	--
July 17, 2003	<0.02	<0.02	<0.02	<0.02	0.31	--
August 24, 2003	<0.02	<0.02	<0.02	<0.02	0.31	--
September 23, 2003	<0.02	<0.02	<0.02	<0.02	0.11	--
October 27, 2003	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
November 26, 2003	<0.02	<0.02	<0.02	<0.02	<0.02	--
December 23, 2003	<0.02	<0.02	<0.02	<0.02	<0.02	--
January 29, 2004	<0.02	<0.02	<0.02	<0.02	--	--
February 20, 2004	<0.02	<0.02	<0.02	<0.02	--	--
March 26, 2004	<0.02	<0.02	<0.02	<0.02	<0.02	--
April, 29, 2004	<0.02	<0.02	<0.02	<0.02	0.12	0.52
May 26, 2004	<0.02	<0.02	<0.02	<0.02	0.132	--
June 29, 2004	<0.02	<0.02	<0.02	<0.02	0.142	--
July 20, 2004	<0.02	<0.02	<0.02	<0.02	0.302	--
August 20, 2004	<0.02	<0.02	0.041 *	<0.02	0.209	--
September 20, 2004	<0.02	<0.02	<0.02	<0.02	0.088	--
October 25, 2004	<0.02	<0.02	<0.02	<0.02	0.020	--
November 24, 2004	<0.02	<0.02	<0.02	<0.02	<0.02	--
December 24, 2004	--	--	--	--	<0.02	--

TABLE 6 (continued)

- Notes: PWQO - Provincial Water Quality Objectives (Ministry of the Environment, 1994a)
Shaded parameter concentration exceeds the PWQO
-- no sample
* assessed as an elevated concentration in the South Nation River compared to background sampling station SW7
** sample was necessarily collected at station SW5 due to frozen conditions at SW6

TABLE 7
CENTRAL LANDFILL
PROPOSED GROUNDWATER MONITORING PROGRAM FOR 2005
NATION MUNICIPALITY, ONTARIO

1.0 MONITORING SESSIONS

Water Level and Quality Monitoring

Fall (October)

2.0 SAMPLING LOCATIONS

Groundwater Monitoring Wells:

- G00-4A, G00-4B, G00-4C (background monitors) and P2, G02-1A, G02-1B (compliance monitors)

3.0 FIELD-MEASURED PARAMETERS

- Groundwater levels in all operational monitoring wells installed on site
- Temperature, conductivity, pH for all groundwater samples

4.0 LABORATORY MEASURED PARAMETERS

- calcium, magnesium, sodium, potassium, aluminum, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, total phosphorus, dissolved reactive phosphorous, silicon, silver, strontium, sulphur, thallium, tin, titanium, vanadium, zinc
- hardness (calculated from laboratory calcium and magnesium analyses)
- alkalinity, TDS, chloride, sulphate, nitrate, nitrite, ortho-phosphate, BOD
- ammonia, DOC, COD

Special Note For Parameters with Established Provincial Water Quality Criteria - All laboratory analyses on groundwater samples will be performed by a private analytical laboratory and the method detection limits (MDLs) for the specific analyses should be commensurate with the standards established in the Ontario Drinking Water Quality Standards (Ministry of the Environment, 2003).

TABLE 8
CENTRAL LANDFILL
PROPOSED SURFACE WATER MONITORING PROGRAM FOR 2005
NATION MUNICIPALITY, ONTARIO

1.0 MONITORING SESSIONS

Water Quality Monitoring

- Monthly from January 2005 to December 2005 at sampling stations located along Ravine No. 1 and in South Nation River (see detailed list below)
- Once during the spring (April/May) and once during the fall (October) at two sampling stations located along Ravine No. 2, if any flow is found to be present

Aqueous Toxicity Testing

- Once during the late winter (February/March) and once during the summer (July/August)

2.0 SAMPLING LOCATIONS

2.1 Surface Water Monitoring Stations along Ravine No. 1/South Nation River

CSW-1, SW6, SW7, SW8, SW9 and SW10

2.2 Surface Water Monitoring Stations along Ravine No. 2 at Northeast Corner of Site

SW13, SW3

2.3 Aqueous Toxicity Testing (*Daphnia magna* and Rainbow Trout)

CSW-1 and SW6

3.0 FIELD-MEASURED PARAMETERS

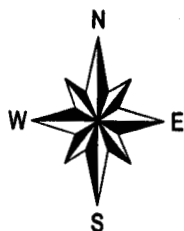
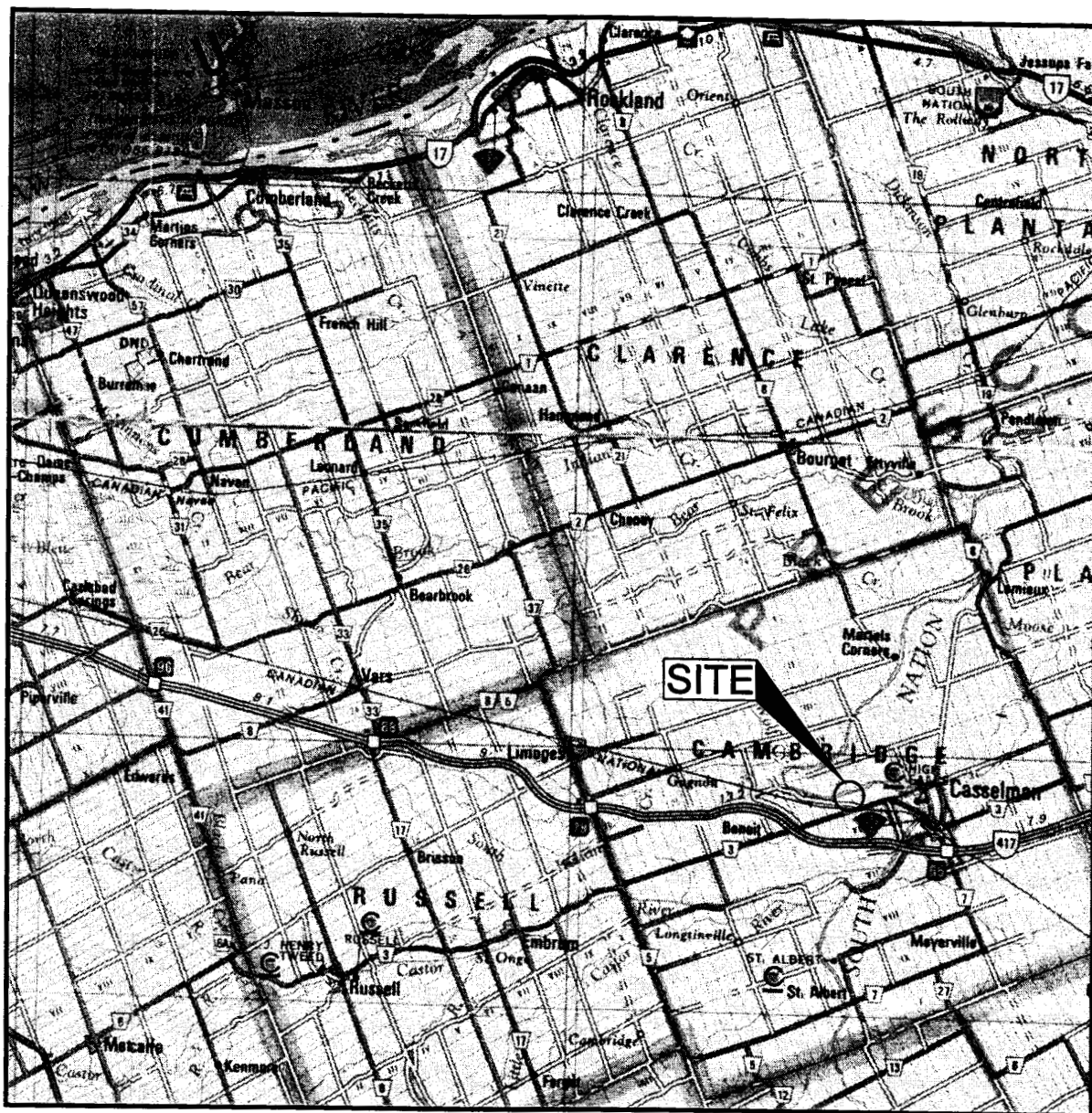
Temperature, conductivity, pH, and dissolved oxygen, for all surface water samples.

Flow estimates in Ravine No. 1 (at SW6) and Ravine No. 2 (at SW3); assessment of presence of flow in Ravine No. 3.

4.0 LABORATORY MEASURED PARAMETERS

- calcium, magnesium, sodium, potassium, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, total phosphorus, silicon, silver, strontium, sulphur, thallium, tin, titanium, vanadium, zinc
- hardness (calculated from laboratory calcium and magnesium analyses)
- alkalinity, BOD, TDS, chloride, sulphate, nitrate, nitrite, ortho-phosphate
- ammonia, DOC, COD
- nitrate, nitrite, TKN, sulphate, turbidity, TSS

Special Note For Parameters with Established Provincial Water Quality Criteria - All laboratory analyses on surface water samples will be performed by a private analytical laboratory and the method detection limits (MDLs) for the specific analyses should be commensurate with the standards established in the Provincial Water Quality Objectives (Ministry of the Environment, 1994)



SPECIAL NOTE
THIS DRAWING IS TO BE READ IN CONJUNCTION
WITH ACCOMPANYING REPORT



SCALE	1:250,000
DATE	02/22/05
DESIGN	
CADD	J.M.
CHECK	M.G.
REVIEW	P.A.S.

TITLE

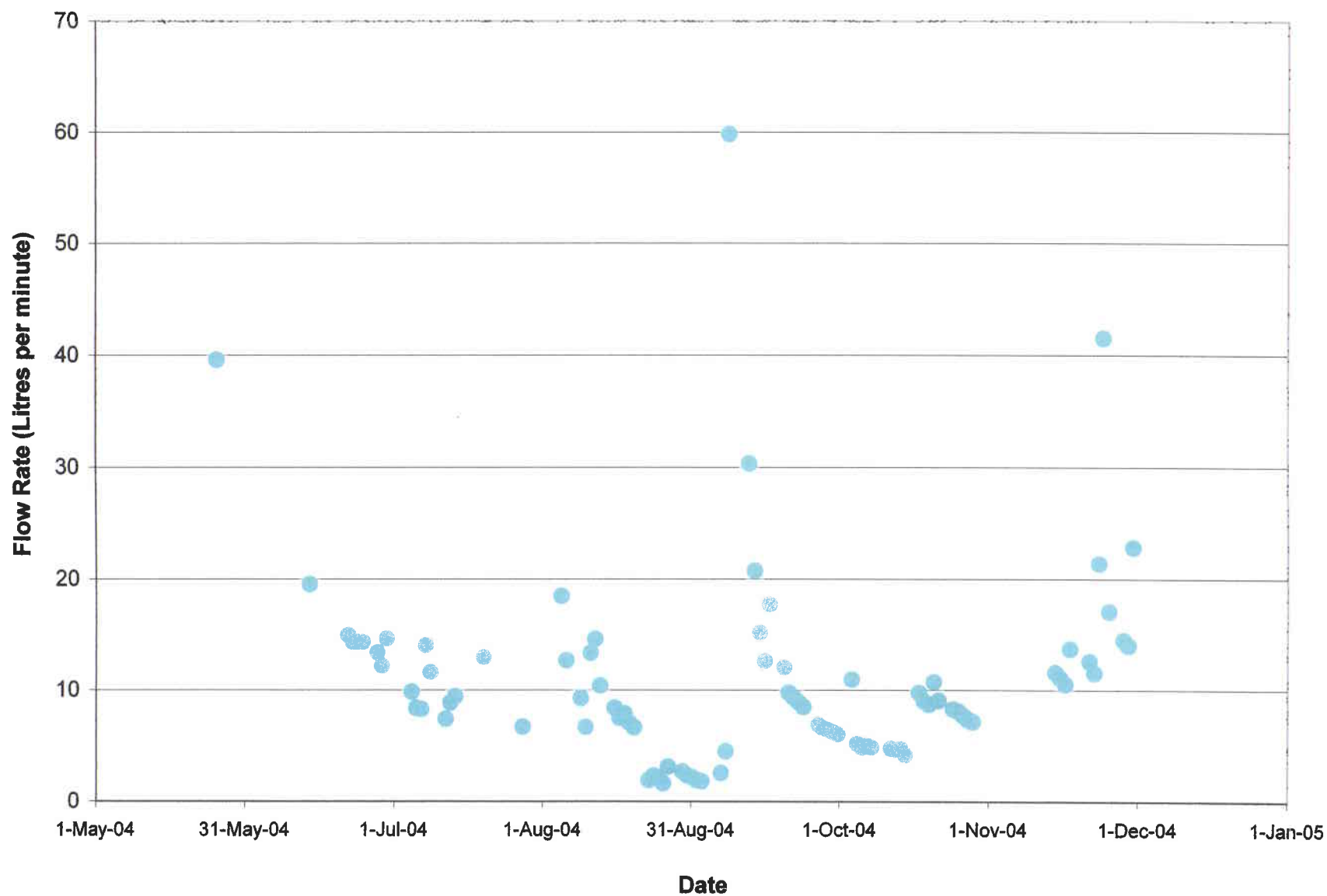
KEY PLAN

FILE No. 051120712-5000-01

PROJECT No. 05-1120-712 REV.

FIGURE

1



Date: March 2005

Drawn: MG

Project: 05-1120-712

Chkd: PAS

**DAILY FLOW MEASUREMENTS IN RAVINE NO. 1
MAY TO DECEMBER 2004**

FIGURE 3

APPENDIX A
CERTIFICATE OF APPROVAL
AND
MOE CORRESPONDENCE



Ministry
of the
Environment

REVISED
Provisional Certificate No.
A 471101

PROVISIONAL CERTIFICATE OF APPROVAL WASTE DISPOSAL SITE

Under the Environmental Protection Act and the regulations and subject to the limitations thereof, this Provisional Certificate of Approval is issued to:

Township of Cambridge,
R.R. #1,
St. Albert, Ontario.

THIS IS A TRUE COPY OF THE
ORIGINAL CERTIFICATE MAILED

ON June 14/82
AB

for the use and operation of a landfilling site

all in accordance with the following plans and specifications:

Located: ^{1/4} Part of Lot 28, Concession 5,
Township of Cambridge,
Counties of Prescott & Russell.

which includes the use of the site only for the 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) domestic, commercial, and 'other' limited to agricultural
waste, wire and wood waste.

and subject to the following conditions:

1. No operation shall be carried out at the site after sixty days from this condition becoming enforceable unless this certificate including the reasons for this condition has been registered by the applicant as an instrument in the appropriate Land Registry Office against title to the site and a duplicate registered copy thereof has been returned by the applicant to the Director.
2. The wastes shall be compacted and covered at least once each month from April 15th to November 15th, inclusive, and at least four times during the remainder of the year.
3. The practice of open burning of municipal refuse at the landfill site shall be discontinued immediately.

Dated this 7th day of June, 19 82.

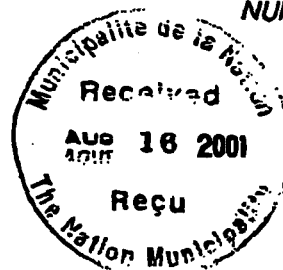
J. V. [Signature]
Director, Section 38
Environmental Protection Act



Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A471101
Notice No. 1



Corporation of the Nation Municipality
958 Highway 500 West
Casselman, Ontario
K0A 1M0

Site Location: Central Landfill
Lot 14, Concession 5, the former Township of Cambridge, Part 1 & 3 R.P. 4127
The Nation Municipality, United Counties Of Prescott & Russell

You are hereby notified that I have amended Provisional Certificate of Approval No. A471101 issued on June 7, 1982 for the use and operation of 3 hectare landfill within 16.37 hectare total Site area, as follows:

1. No waste shall be disposed of at the Central Landfill Site effective the issuance date of this Notice.
2. All work related to the closure of the Central Landfill shall be completed by August 31, 2002.
3. The Central Landfill Site shall be closed as per the closure plan and final contours indicated on Figure 5 of the 2001 supporting documentation prepared by Stantec Consulting Limited for the site. Groundwater and Surface Water monitoring shall be carried out as per Tables 4 and 5 of the same document.
4. Within six months of the issuance date of this Notice, The Nation Municipality shall install appropriate number of additional monitoring wells along the eastern boundary of the Central Landfill and submit justification for the number of wells and a map showing the location of the same to the District Manager, Cornwall District Office, Ministry of the Environment.
5. By August 31, 2002, the Corporation of the Nation Municipality shall address off-site leachate contamination so that the Central Landfill Site complies with the Reasonable Use Guideline of the Ministry of the Environment.

all in accordance with the application for Certificate of Approval dated February 22, 2001, and the supporting information and documentation prepared by Stantec Consulting Limited.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A471101 dated June 7, 1982, as amended.

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 Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. 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 Appeal Board
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

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

* Further information on the Environmental Appeal Board's requirements for an appeal can be obtained directly from the Board 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 1st day of August, 2001



Henry Jun, P.Eng.
Director
Section 39, *Environmental Protection Act*

TG/

c: District Manager, MOE Cornwall



Ontario

Ministry
of the
Environment

Ministère
de
l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A471101
Notice No. 2

The Corporation of The Nation Municipality
Rural Route, No. 3
Casselman, Ontario
K0A 1M0

Site Location: Central (Cambridge) Waste Disposal Site
1081 County Road 3
The Nation Municipality, United Counties of Prescott and Russell
K0A 1M0

You are hereby notified that I have amended Provisional Certificate of Approval No. A471101 issued on June 7, 1982 for the disposal of solid municipal waste, as follows:

6. Approval is hereby granted to increase the size of the waste disposal property for the Central (Cambridge) Landfill Site from 16.37 hectares to 22.73 hectares.

The reason for this amendment to the Certificate of Approval is as follows: The Nation Municipality has complied with Condition 5 of the Certificate by increasing the property size to include a 6.36 hectare Contaminant Attenuation Zone.

all in accordance with the June 30, 2004 letter from Golder Associates Ltd. and attached Figure No.1 (Leachate Attenuation Zone to the East) showing the new site area.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A471101 dated June 7, 1982, as amended.

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

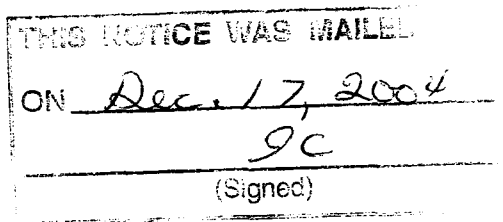
AND

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 14th day of December, 2004



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

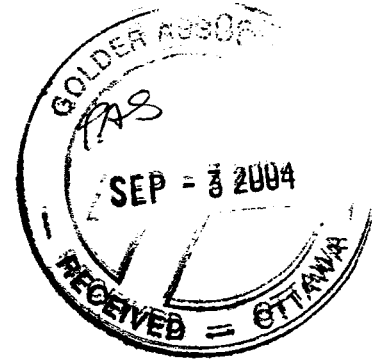
TG/

c: District Manager, MOE Cornwall
M. Gauthier, M Sc., Project Manager, Golder Associates Ltd. ✓



Corporation de la Municipalité de La Nation
Corporation of The Nation Municipality

03420 718 15010 PAS ✓
MAY ✓
RG ✓



August 25, 2004

Mr. Real Delaquis,
Ministry of the Environment,
113 Amelia Street,
Cornwall, Ont.
K6H 3P1

Dear Sir,

Re: Central Landfill Site Management of Leachate Impacted Surface Water

Please be advised that The Nation Municipality has resolved to bring the closed Central Landfill Site located in the former Township of Cambridge, (Certificate of Approval #A471101) into compliance through the following course of action:

- The groundwater compliance issue along the east boundary has been resolved through registering the 510 metre property located at the northeast corner of the landfill (acquired by the Municipality in 2003) as a leachate attenuation zone on the Certificate of Approval for the landfill site. An application to amend the Certificate of Approval has been submitted to the MOE on June 30, 2004;
- The surface water quality associated with a ditch at the northeast boundary of the landfill is expected to improve through filling in the on-site drainage ditch located along the southern and eastern edges of the waste mound. The Nation Municipality conducted grading works during July 2004 to prevent impacted surface water from being discharged to the South Nation River at the northeast corner of the property via Ravine No. 2. On site monitoring is expected to confirm that we are in compliance.
- The surface water compliance issue at the northwest corner of the landfill, consisting of discharge of leachate-impacted surface water (LISW) to the South Nation River through Ravine No. 1 is intended to be resolved, although independently of the Village of Casselman as described below. The timing for

implementing a solution with respect to requirements on the Central Landfill site (if any) will be entirely dependant on the schedule adopted by the Village of Casselman to bring their site into compliance.

The Nation Municipality has already expended considerable effort in attempting to resolve the LISW issue at the Central Landfill since the issue was identified in the mid 1990's. The two municipalities have been willing to work together in developing a cost-effective solution based on diversion of un-impacted groundwater and surface water to Ravine No. 1. These proposed works represented a cost effective solution to manage the impacted discharge to the South Nation River. However, the MOE rejected this option based on the fact that the principle of this solution was not considered acceptable by the Ministry. The conceptual design of long term alternatives for the management of LISW in Ravine No. 1, completed as a collaborative effort by The Nation Municipality and the Village of Casselman, is in the process of being finalized and will be submitted to the Ministry.

As you are aware, the installation of clay cover on the wastes at the Casselman Landfill was scheduled to take place in the fall of 2003. However, it is our understanding that the application of the clay cap was only started in August, 2004 and the works are in progress at the time of writing of this letter. The clay cap at Casselman Landfill is expected to significantly reduce the quantity and improve the quality of surface water discharging onto the Central Landfill property to Ravine No. 1. As a result of the clay capping being delayed and the inability to obtain approval for the diversion works, the municipalities are now faced with the obligation to collect and transport the discharge water from Ravine No. 1 for off-site treatment as early as the end of summer of 2004 if the quality of surface water still exceeds objectives set out by the Ministry. This short term solution represents considerable costs (in excess of \$300,000.00 annually) until a long term solution can be approved and implemented.

The Nation Municipality has been the main point of contact with the Ministry for dealing with the LISW issue. However, a report prepared by Golder Associates (dated July 28, 2003) as part of the joint work plan has demonstrated that the majority of the surface water quality impacts in Ravine No. 1 are predominantly associated with leachate discharge from the Casselman Landfill, and that only a minor portion of the impacts are potentially related to discharge from Central Landfill. Based on our consultant's assessment, it is clear that we cannot bring Central Landfill into compliance until the Village of Casselman has brought their own site into compliance.

In our letter of November 4, 2003, we had requested that the MOE invoke Guideline B-7 onto the Village of Casselman in order to remedy the leachate migrating in the subsurface beyond the property boundary on its east side. The response of the MOE (see attachment herein - review comments from Frank Crossley, groundwater technical reviewer with the MOE in Kingston dated February 20, 2004) was that the MOE would not apply Guideline B-7 since the downgradient property is a landfill "where the protection of groundwater for drinking water purposes is not required." However, we

understand that Guideline B-7 is being applied to landfill sites regardless of downgradient land use. A clear example of the inconsistency in the way with which the Ministry has been applying Guideline B-7 is the situation for Central Landfill, where leachate-impacted groundwater is migrating towards land located on the east side of the fill area. This land to the east has historically been used for aggregate extraction. The presence of a thin sand layer underlain by a thick clay formation at this location precludes any use of groundwater of the shallow deposits for potable water usage. This inconsistent application of Guideline B-7 by the Ministry has resulted in The Nation Municipality spending several thousand dollars for the acquisition of the leachate attenuation zone lands east of the Central Landfill.

In his review, Mr. Crossley also stated that the "responsibility [to manage discharge of LISW from Ravine No. 1 to the South Nation River] is to be shared by The Nation Municipality and the Village of Casselman and how the municipality and the village wish to divide responsibility is between these parties." Before an assessment of the relative contribution from each landfill to leachate impacts to Ravine No. 1 was done, the responsibility was arbitrarily shared as a 50/50 split of costs. Now that it has become apparent according to the results of the on site work undertaken by our consultants in July 2003 (Golder report July 28th, 2003 - copy enclosed) that the Casselman landfill contribution is much greater , The Nation Municipality cannot justify to its taxpayers the significant cost associated with addressing this problem to which The Nation Central Landfill is only contributing a minor part. However, The Nation Municipality does not have the authority to impose a cost sharing that is more representative of reality onto the Village of Casselman.

In conclusion, we are requesting the following:

- A. That the Ministry of Environment requirements for performance of landfill sites be applied separately to each of the two (2) adjoining sites. Presently, according to our consultants (Golder) report the Village of Casselman landfill site is the source of discharge of surface water onto the Nation Central Landfill site which is not within the acceptable limits as set out by the Ministry of the Environment. This present situation is totally unacceptable to the Nation Municipality and must be terminated as quickly as possible. Our request for a separation of the sites will, in our opinion, lead to a timely and cost effective re-mediation program.
- B. A meeting with you (Nation Clerk, representatives of Golder's and our legal Counsel) to discuss and explain in detail with supporting data the merits of and basis for our request that the landfill sites be dealt with separately by the Ministry of the Environment.

We look forward to an early and favorable reply to our two requests herein.

Yours truly,



Mary J. McCuaig,
Clerk

Cc: Barry Burns, Ministry of the Environment, Kingston
Gilles Lortie, Clerk, The Village of Casselman
Dave Shelly, Nation Municipality Solicitor
Gerry Lalonde, Stantec Consultants
✓Paul Smolkin, Golder Associates

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Ministry of the Environment

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Ontario



September 27, 2004

Mary McGuaig, Clerk
Corporation of the Nation Municipality
958 Road 500 West, R.R. #3
Casselton ON K0A 1M0

Cambridge (Central) Waster Disposal Site
Compliance Inspection Report
Reference Number 3578-5YNNCR

Dear Mrs. McCuaig:

The above-mentioned facility was inspected by Marc Robert, Sr. Environmental Officer of this office, on September 15, 2004.

Your attention is directed to Section 5.0 (Action(s) Required) and Section 6.0 (Other Inspection Findings) of the report. If you have any questions or comments, please contact Rheal Delaquis at office at extension 230.

Yours truly,

Marc F. Robert
Senior Environmental Officer (bil.)
Cornwall Area Office

File Storage Number: SIRUCAC5252

MR

Enclosure




 Ministry of the
Environment
Closed Waste Disposal Site Inspection Report

Client:	The Corporation of The Nation Municipality Mailing Address: Rural Route 3, Casselman, Ontario, Canada, K0A 1M0 Physical Address: 958 Route 500 West, Concession 5, Plan: The Nation Municipality, United Counties of Prescott and Russell, Ontario, Canada Telephone: (613) 764-5444, FAX: (613) 764-3310 Client #: 8881-4GBRZH, Client Type: Municipal Government		
Inspection Site Address:	Central (Cambridge) Waste Disposal Site Address: 1881 County Road 3, Concession 5, Plan: The Nation Municipality, United Counties of Prescott and Russell, K0A 1M0 District Office: Cornwall Geocoordinate: Map Datum: NAD83, Zone: 18, Accuracy Estimate: 10-100 metres as per Geomatics Map Method: Map, UTM Easting: 18498650.00, UTM Northing: 501844300		
Contact Name:	Mary McCush	Title:	Clerk
Contact Telephone:	(613) 764-5444 ext 222	Contact Fax:	(613) 764-3310
Last Inspection Date:	2002/11/28		
Inspection Start Date:	2004/09/15	Inspection Finish Date:	2004/09/27
Region:	Eastern		

1.0 INTRODUCTION

The purpose of the compliance inspection program is to confirm that closed solid non-hazardous waste disposal sites are in compliance with the Ministry of the Environment (MOE) legislation and control documents and are in conformance with waste management policies and guidelines pertaining to closed waste disposal sites.

Specifically, this includes compliance/conformance with:

- The Environmental Protection Act (EPA);
- Ontario's General - Waste Regulation (O.Reg. 347);
- Certificates of Approval (C of A); and
- Orders (Provincial Officers' Orders and/or Director's Orders).

The Nation Municipality's Central (Cambridge) municipal waste disposal site is located on Lot 14, Concession 5, in the former Township of Cambridge, now The Nation Municipality. The landfill site abuts the Village of Casselman waste disposal site that is located immediately to its west.

Photos of the Central waste disposal site taken at the time of the inspection, are included in Appendix 1 of this report.

2.0 INSPECTION OBSERVATIONS

Certificate of Approval Number(s): ☒ Yes ☐ No

Certificate of Approval (C of A) No. A421401, dated June 7, 1982, was amended by a Notice (same number) dated August 1, 2001, for closure of the landfill site. In general, the Notice forbids the depositing of waste at the landfill site effective the date of issuance of the Notice.

Details of the Certificate of Approval are found in Appendix "B" of this report.

2.1 FINANCIAL ASSURANCE

MOE Guideline F-15 (Financial Assurance) identifies the criteria for the use of financial assurance to ensure that various regulatory requirements are met. In general, financial assurance is required as a condition of an approval under Part V of the Environmental Protection Act (EPA) for private landfill sites for which a hearing is required under Section 30 of the EPA; or which will accept non-hazardous solid industrial, commercial or domestic wastes and which have a lifetime capacity of at least 40,000 cubic meters (1500 people).

The Central waste disposal site is municipally owned. Therefore, there was no record of financial assurance for the landfill site at the time of my inspection, nor is one required.

CLOSURE PLAN

A closure plan which was submitted as part of an application for Certificate of Approval dated February 22, 2001, was approved by the MOE by way of the August 1, 2001 Notice to amend Certificate of Approval No. A471101.

Condition 2 of the Notice states that all work related to the closure of the Central landfill site shall be completed by August 31, 2002. At the time of the inspection, most of the landfill site closure work had been completed. The seeding of Areas 2 and 3 remained to be done as well as the construction of sewage works to address the problem of leachate-impacted surface water (LISW) that flows to the South Nation River (see Section 2.5 of this report).

2.3 ACCESS CONTROL

Since issuance of the August 1, 2002 Notice, the landfill site has been closed to all waste disposal operations and access to the site is restricted. A sign to this effect has been posted at the main entrance to the site. Access control is important for discouraging unauthorized entry to the site.

Direct public access to the Central waste disposal site is by a main entrance to the site off County Road 3, west of the Nation Municipality's municipal offices and garage. A secondary entrance located behind the Nation Municipality's offices provides municipal employees with access to the landfill site. There is no fence around the landfill site, however dense forest vegetation prevents easy access to the site. Direct access to the site is controlled by steel gates erected across both entrances. At the time of my inspection, these gates were closed and locked.

At the time of my inspection there was no evidence of waste having been left at the entrances to the waste disposal site.

2.4 FINAL COVER

The closure of a landfill site requires the application of final cover to isolate the landfilled waste from surface exposure for public health and aesthetic reasons. As well, the final cover determines the infiltration of precipitation and thereby greatly influences the waste decomposition rate and long term management of leachate; provides control of landfill gas; provides the appropriate ground, contours and landscape for the planned end-use of the landfill site. (source: MOE's Guidance Manual For Landfill Sites Receiving Municipal Waste, Nov. 1993).

The Closure Plan for the Central waste disposal site which was approved as part of the August 1, 2001 Notice to amend C of A No. A471101, requires the application of a final cover over three areas of the landfill site (Areas 1 to 3) where waste has been deposited (see Appendix "C").

At the time of my inspection, final cover appeared to have been uniformly applied and contoured over the three areas of the waste disposal site. The thickness of the final cover appeared adequate as no waste was seen protruding through the cover material. Seeding of the soil layer in Area 1 appeared also to have been completed as a uniform vegetative cover was visible. The seeding of Areas 2 and 3 and of land east of Area 1 is required as these lands were mostly barren of any vegetation.

LEACHATE CONTROL SYSTEM

LISW that originates from the Casselman and Central landfill sites flows through a ravine located on the property of the Central landfill site and into the South Nation River. The MOE has requested that both the Nation Municipality and the Village of Casselman work collaboratively to correct the leachate problem. Both municipalities have taken, and continue to take steps at their respective landfill sites to reduce the volume and presumably ameliorate the quality of LISW discharging to the South Nation River. Most of this work has consisted of shaping waste disposal areas and the application of final cover material. Monitoring of the LISW is on-going and will assist in determining a future course of action.

2.6 METHANE GAS CONTROL SYSTEM

Closed Waste Disposal Site Inspection Report

The Central waste disposal site is without a methane gas control system, nor has one been required by way of a C of A or an Order. Also, the landfill site's closure plan did not state the need for such a system. At the time of my inspection, methane gas control was not required at the site.

2.7 MONITORING PROGRAMS:

A ground and surface water monitoring program was approved under Condition 3 of the August 1, 2001, Notice to amend C of A No. A471101. A breakdown of the surface and groundwater monitoring programs are found in Appendix "D" of this report. Findings of the monitoring program are described in the following section. As part of the November 10, 2003 revised workplan for the management of LISW from the Casselman and Central landfill sites toxicity monitoring and assessment of the LISW is continuing.

Monitoring for landfill site gases is not required at the Central landfill site by way of a control document.

2.8 GROUND WATER/SURFACE WATER IMPACTS

Surface water studies have demonstrated that LISW flows from the Casselman and Central waste disposal sites, through the Central landfill site into the South Nation River. Monitoring has demonstrated that the concentration of unionized ammonia in these waters surpasses that of the Provincial Water Quality Objectives and the discharge is having a localized adverse impact on the water quality of the South Nation River. Also, toxicity testing of the LISW has shown that it is toxic to rainbow trout. Measures to control and prevent the LISW are required. The recent application of final cover over areas 2 and 3 of the Central waste disposal site and, especially, the very recent installation of clay cover material over the north-east portion of the Casselman landfill site's waste footprint is expected to reduce the quantity and improve the quality of the LISW that flows to the South Nation River.

Groundwater monitoring carried out during 2001 indicated that the Central landfill site was not in compliance with the MOE's Guideline B-7 (Incorporation of the Reasonable Use Concept into MOE Groundwater Management Activities) along the east boundary of the site. Also, the seasonal discharge of leachate impacted surface water onto the east adjoining property was resulting in an adverse impact to off-site water quality at this location. In order to address these problems, the Nelson Municipality has:

1) acquired a 510 m by 125 m piece of property along the east property boundary of the site. The Nelson Municipality has made application to the MOE to amend the waste disposal site's C of A to include the piece of property as a leachate attenuation zone. The application is currently under review. Groundwater monitoring conducted during 2003, and detailed in a report dated July 2004, indicated that the groundwater problem has been fully resolved. The MOE has not yet reviewed the July 2004 report.

2) filled in an on-site drainage ditch located along the southern and eastern edges of the waste mound (Area 1 of the landfill site) to prevent any seasonal discharges of LISW onto the east adjoining property that could result in an adverse impact to off-site water quality at this location.

At the time of my inspection, there was no evidence of LISW along the south and east sides of the Area 1 waste mound.

2.9 Registration On Title:

Is the site registered on title as an historic landfill?

On December 8, 1986, the existence and location of the Central waste disposal site was registered on title. If and when the newly acquired leachate attenuation zone (see Section 2.8) receives MOE approval, it should also be registered on title.

3.0 REVIEW OF PREVIOUS NON-COMPLIANCE ISSUES

The Nelson Municipality has taken important steps to address non-compliance issues pertaining to the off-property contamination of groundwater. Additional work to address the discharge of LISW to the South Nation River is still required.

4.0 SUMMARY OF INSPECTION FINDINGS (HEALTH/ENVIRONMENTAL IMPACT)

Was there any indication of a known or anticipated human health impact during the inspection and/or review of relevant material, related to this Ministry's mandate?

No

Specifics:

Was there any indication of a known or anticipated environmental impact during the inspection and/or review of relevant material?

Yes

Closed Waste Disposal Site Inspection Report

Specimen: Studies have indicated that leachate-impacted surface water from the Central waste disposal site is having an adverse effect on surface waters beyond the approved limits of the landfill site.

Was there any indication of a known or suspected violation of a legal requirement during the inspection and/or review of relevant material which could cause a human health impact or environmental impairment?

Response:

Was there any indication of a potential for environmental impairment during the inspection and/or the review of relevant material?

Specimen:

ACTIONS REQUIRED

The Nation Municipality has completed a significant amount of work to close the Central waste disposal site in accordance with Part A. Additional work to address the discharge of LISW to the South Nation River is still required.

OTHER INSPECTION FINDINGS

The Closure Plan for the Central waste disposal site which was approved as part of the August 1, 2001 Notice to amend C of A No. A471401 described work that was required for proper closure of the landfill site and a biannual (twice-a-year) maintenance program for the site. It also remarked that a summary of the maintenance program inspections would be provided in the site's post-closure annual monitoring reports.

The Municipality should ensure that its landfill site's annual groundwater and surface water monitoring report contains this information.

INCIDENT REPORT

Not Applicable

ATTACHMENTS

Required attachments:



05Central.mpppt-150904.wpd

PREPARED BY:
Environmental Officer:

Date:
District Office:
Signature

Marc F. Robert
Cornwall Area Office
2004/09/27

REVIEWED BY:

District Supervisor:

Kevin Hosler

District Office:

Corwall Area Office

Date:

2004/08/28

Signature:



File Storage Number:

SIRUCAC5252

Note:

"This inspection report does not in any way suggest that there is or has been compliance with applicable legislation and regulations as they may apply to this facility. It is, and remains, the responsibility of the owner and/or the operating authority to ensure compliance with all applicable legislative and regulatory requirements"



Golder Associates Ltd.

1796 Courtwood Crescent
Ottawa, Ontario, Canada K2C 2B5
Telephone 613-224-5864
Fax 613-224-9928



November 11, 2004

04-1120-712/7000

Ministry of Environment
2 Amelia Street, 2nd Floor
Cornwall, Ontario
K6H 3P1

Attention: Mr. Rheal Delaquis, Environmental Officer

**RE: RESPONSE TO COMPLIANCE INSPECTION REPORT (REF. # 3578-
5YNNCR) – CAMBRIDGE (CENTRAL) WASTE DISPOSAL SITE
NATION MUNICIPALITY, ONTARIO**

Dear Sir,

This letter provides a response, on behalf of the Nation Municipality, to the report on compliance inspection (the Report) at Cambridge (Central) Waste Disposal Site (the Site) by Mr. Marc Robert of your office, dated September 27, 2004.

With respect to the recommendation included in Section 2.0 of the Report that seeding of Areas 2 and 3 at the site should be completed, it is confirmed that a layer of topsoil was placed on the reshaped areas along the eastern edge of the main ravine (Ravine No. 1), near the eastern boundary of the Site at the former location of the constructed drainage ditch, and along Ravine No. 2, located near the northeast corner of the Site. Reseeding was done at these locations and will be completed during the spring of 2005, as required.

As stated in Section 2.7 of the Report, Golder Associates Ltd. (Golder) confirms that ongoing surface water and groundwater monitoring programs are being conducted at the site as outlined in our report on 2003 annual monitoring at the Site.

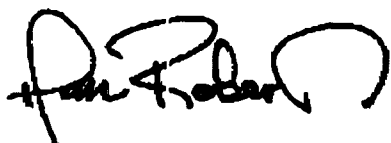
Section 5.0 (Action Required) of the Report reads as follows: "Additional work to address the discharge of LISW [Leachate-Impacted Surface Water] to the South Nation River is still required". With respect to this issue, it is noted that a letter dated August 25, 2004 was sent to your office by the Nation Municipality. In this letter, the Nation Municipality requested that the Ministry of the Environment (MOE) ensure that "requirements for performance of landfill sites be applied separately to each of the two adjoining sites [i.e., Nation Municipality's Central Landfill and Village of Casselman Landfill]. A request was also made in this letter to set up a meeting with MOE, the Nation Municipality and its consultant and legal counsel to discuss this matter.



MOE's position that the control and elimination of un-ionized ammonia and of other contaminants, from the LISW that flows from the landfill sites into the South Nation River, continues to be a matter of utmost importance and urgency.

Therefore, no later than May 15, 2005, the Nation Municipality (with or without the Village of Casselman) must make application to the MOE for a Certificate of Approval for works for the long-term management of the LISW that flows from its waste disposal site. These proposed works must manage the LISW in a manner acceptable to the MOE. Until such works are approved and constructed, toxicity testing of the LISW must continue at a greater frequency and the Nation Municipality (with or without the Village of Casselman) must implement the measures outlined in the short-term contingency plan for the management of LISW (hauling and off-site treatment of LISW) that was submitted to the MOE on April 29, 2004.

Yours truly,

A handwritten signature in black ink, appearing to read "Marc F. Robert", is written over a horizontal line.

Marc F. Robert
Senior Environmental Officer (bil.)
Cornwall Area Office

File Storage Number: SIRUCAC5-610
Enclosures

Ministry of the
Environment

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Ministère de
l'Environnement

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Ontario

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MEMORANDUM

January 28, 2005

TO: M. Robert
Sr. Environmental Officer
Cornwall Area Office
Eastern Region

FROM: F. Crossley
Hydrogeologist
Technical Support Section
Eastern Region

MINISTRY OF THE
ENVIRONMENT

JAN 31 2005

CORNWALL

RE: 2003 Groundwater and Surface Water Monitoring Program
Central Landfill Site, Nation Municipality, A471101

Purpose

The purpose of this review is to evaluate the "2003 Monitoring Report" dated July, 2004 (received January, 2005) by Golder Associates Limited (GAL) with respect to Guideline B-7/B-9.

Summary

- The Central waste disposal site is in conformance with Guideline B-7 and Guideline B-9.
- The hydrogeological conceptual model is leachate migration in the shallow surficial sand unit to the north (northwest and northeast) with limited vertical migration due to the underlying aquitard (silty clay unit). The shallow groundwater flow is to the northwest discharging to Ravine 1 which in turn flows to the South Nation River, another component to the north discharging to Ravines 2 and 3 which in turn flow to the South Nation River and another component to the northeast which flows to the South Nation River.
- The leachate impacted groundwater discharges to the surface water (drainage ditches and/or Ravine (1, 2, 3) and/or South Nation River due to the geology. Therefore the potential for leachate to impact the surface water quality is considered high.
- The proposed groundwater monitoring program (Table 7) is acceptable.

The site is closed.

The Nation Municipality and the Village of Casselman have to address the surface water impacts in the Ravine/South Nation River as a joint venture as both landfills are contributing to the impacts.

Certificate of Approval

The Central waste disposal site operates under Certificate of Approval, A471101. The site is located in Lot 14, Concession V, Geographic Region of Cambridge Township, Nation Municipality. The site is licenced for the use and operation of a landfill on 3 hectares within a total site area of 22.73 hectares. The area was increased from 16.37 hectares to 22.73 hectares to include a contaminant attenuation zone along the eastern licenced property (December, 2004). The site is licenced to receive domestic, commercial and other limited to agricultural waste, wire and wood waste. The site closed August 2001. The landfill operates as a naturally attenuating site.

Background

The adjacent property, directly to the west of the Central landfill, is operated as a landfill (A471106) by the Village of Casselman. The present status of this site is "semi-closed". The municipality wishes to "mothball" the site (Village of Casselman).

Geology

The consultants determined the geology to be:

- A silty sand unit ranging in thickness up to 4.0 metres (surficial sand unit).
- A silty clay unit with an average depth of approximately 22-32 metres below ground surface based on water well records information.
- A sand and gravel unit overlying bedrock (water well records).
- The bedrock unit consists of limestone (water well records).
- The maximum depth of the subsurface investigation is 10.36 metres (silty clay unit).

Hydrogeology

GAL determined the hydrogeological characteristics to be:

- The surficial sand unit is an upper groundwater bearing unit.

- The horizontal hydraulic gradient is 0.013.
- The estimated hydraulic conductivity (rising head) of the surficial sand unit is 8.3×10^{-5} to 4.2×10^{-4} cm/sec.
- The shallow groundwater flow is to the northwest (towards Ravine 1) to the north (Ravines 2 and 3) towards the South Nation River and to the northeast (Figure 2).
- The silty clay unit is an aquitard.
- The estimated hydraulic conductivity (rising head) of the silty clay unit ranges from 2.3×10^{-6} to 7.0×10^{-5} cm/sec. within the weathered zone with expected lower hydraulic conductivities in the intact zone (1×10^{-8} to 1×10^{-7} cm/sec.).
- The hydrogeological conceptual model is leachate migration in the surficial sand unit with limited vertical migration due to the underlying aquitard (silty clay unit) and discharging to the ravine (Ravine 1) which in turn discharges to the South Nation River.

Background Water Quality

Monitoring wells P4, G99-8, G00-3 and G00-4C are completed in the surficial sand unit and located upgradient of the waste. These monitoring wells have not been sampled since 2000.

Monitoring wells G00-4A and G00-4B are completed in the silty clay unit and are located upgradient of the waste. The water quality in these monitoring wells appear to be representative of background water quality.

Leachate Water Quality

Chloride and boron have been determined to be the leachate indicator parameters at this site. These parameters are good conservative tracers of leachate.

Downgradient Water Quality

Leachate impacts are evident in the following monitoring wells during the 2003 sampling event: P2; 99-6; 99-7 and 02-3. This shows that leachate impacted groundwater is migrating to the northwest and discharging to the ravine (Ravine 1) and to the northeast. The potential also exists for leachate impacted groundwater to discharge to the small ravines (Ravines 2 and 3).

Guideline B-7/B-9

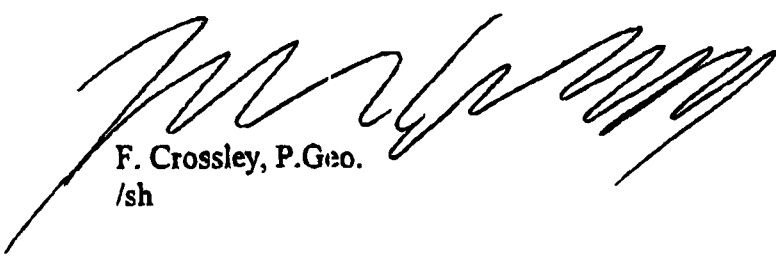
The Central waste disposal site is in conformance with Guideline B-7 as the municipality recently (December, 2004) amended their Certificate of Approval to bring their site into conformance with the inclusion of additional lands (6.36 hectares) as contaminant attenuation zone along the eastern licenced property boundary. The waste disposal site is in conformance with Guideline E1-9 as there are no downgradient water wells located between the waste and the suspected discharge point.

Closure

The consultants state that the waste area was covered with 600 mm of clay originating from the excavation of the wastewater lagoons in St. Albert which in turn is covered with topsoil and subsequently seeded to provide a vegetative cover. This meets the minimum requirements in the "Landfill Standards guideline" (MOE, 1998). The site is closed with a low permeable cover.

Groundwater Monitoring

The groundwater monitoring program is outlined in Table 6. The proposed groundwater monitoring program for 2004 is similar to the 2003. The consultants intend to continue assessing the eastern property boundary. The proposed groundwater monitoring program is acceptable.



F. Crossley, P.Geo.

/sh

c: B.W. Metcalfe
B.D. Burns/V. Castro
K. Hosler
File SI LU CA CV/GW-07-04, Cambridge Township (A471101)
FC/IDS #7460-68KMCZ

Ministry of the
Environment

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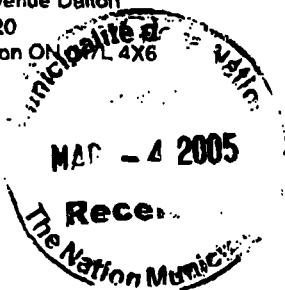
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MEMORANDUM

02 February 2005

TO: Marc Robert
Senior Environmental Officer
Cornwall Area Office
Eastern Region

FROM: B. W. Metcalfe
Senior Environmental Officer (Surface Water)
Technical Support Section
Eastern Region

RE: 2003 Groundwater and Surface Water Monitoring Program
Central Landfill Site, Nation Municipality, A471101

MINISTRY OF THE
ENVIRONMENT

FEB - 4 2005

CORNWALL

I have reviewed the noted report dated July 2004 prepared by Golder Associates Limited (GAL) for the Corporation of the Nation Municipality and the following comments are offered relative to surface water impact concerns:

Background Information

The Central Landfill, which is owned by the Corporation of the Nation Municipality ceased receiving wastes since August 1, 2001 and closure works were completed during 2001 - 2002.

The adjacent property to the west of the Central Landfill is a landfill site owned and operated by the Village of Casselman. In June 2001, the Corporation of the Village of Casselman entered into a 20 year contract with Lafleche Environmental Ltd. for the disposal of its waste at the Lafleche Environmental Landfill located in Moose Creek. The Village of Casselman Landfill Site will be maintained in a "mothballed" condition over the 20 year period of the contract with Lafleche Environmental Ltd. In 2003, the entire waste stream from the Village of Casselman was diverted to the Lafleche Landfill Site.

Site Description

The Central Landfill Site is located approximately 3 km northwest of the Village of Casselman and is situated along the southern bank of the South Nation River. The site is situated on Part of Lot 14, Concession 5, in the former Township of Cambridge in the Nation Municipality. The adjacent property to the west of the Central LFS is a landfill site owned and operated by the Village of Casselman. It is noted that the Village of Casselman is an independent entity which is not part of the amalgamated Nation Municipality.

Surface Water Regime and Area Drainage

The drainage of the surface water on the Central Landfill is generally northward towards the South Nation River via natural gullies and ravines. A main ravine (Ravine No. 1) originates from the Village of Casselman LFS crosses onto the Central LFS and is located between the two landfills. Leachate impacted waters discharge from both landfills to the shared ravine. As part of the approved works under the Central LFS C of A, a berm was constructed creating an impoundment pond situated within the ravine and there is near-continuous flow of water from the ravine to the South Nation River. There are also two additional smaller ravines (Ravines No. 2 and No. 3) which cut into the riverbank at the northern end of the site property, and discharge from these two ravines to the South Nation River has been determined to be intermittent. GAL reported that during 2003 there was no flow discharging from Ravine No. 3.

Precipitation over the central part of the landfill area infiltrates the waste and is expected to discharge to the South Nation River via the on-site ravines. Shallow groundwater flow not intercepted by the surface features discharges into the South Nation River.

Surface Water Monitoring Program

During 2003 Golder conducted monthly surface water monitoring sessions at surface water monitoring stations located along the South Nation River (SW6, SW7, SW8, SW9 and SW10). Biannual (spring and fall) monitoring sessions were conducted at surface water locations positioned along the east drainage ditch that discharges into the South Nation River via Ravine No. 2 near the northeast corner of the site (SW1, SW11, SW12, SW13 and SW3). During 2003 there was no surface water discharge from Ravine No. 3 to the South Nation River.

Monthly monitoring of the surface water quality at station CSW-1 was incorporated into the monitoring program in March 2003. CSW-1 was established to characterize the waters discharging from the Casselman Landfill onto the Central Landfill property within the main ravine (Ravine No. 1) shared by both landfill sites and which discharges to the South Nation River.

Toxicity testing was conducted on the surface waters collected at CSW-1 (located at the shared property boundary between both landfills) and from SW5/SW6 (i.e the outflow of the main ravine (Ravine No. 1) to the South Nation River).

Streamflow Information

GAL did provide streamflow information for Ravine No. 1 at sampling location SW6 estimating that since 2000 flow to be in the order of 40 litres/min and to be typically in the order of 15 to 20 Lpm or less during the July to September period. The South Nation River streamflow for the 2003 sampling program was not provided. Streamflow in Ravine No. 2 was reported to be intermittent being typically dry during the summer months and frozen during the winter months. GAL reported that there was no visible flow observed in Ravine No. 3 during 2003.

Surface Water Sampling Results

Ravine No. 1 (CSW-1) is located at the shared property boundary between both landfills and monitors the water quality of the main ravine waters discharging to the South Nation River.

General water quality at CSW-1 was characterized having concentrations for BOD (<1 - 20 mg/L; mean), Conductivity (2040 - 4110 μ S/cm; mean), pH (6.3 - 6.9; mean), Chlorides (32 - 321 mg/L; mean), Total Ammonia (8.9 - 95 mg/L; mean) Un-ionized Ammonia (<0.02 - 0.13 mg/L; mean), Total Phosphorus (0.100 - 0.880 mg/L; mean), and Total Suspended Solids (11 - 430 mg/L; mean).

The water quality at CSW-1 during 2003 was characterized having PWQO exceedances for Dissolved Oxygen (0.4 - 3.2 mg/L), Alkalinity (mg/L), Un-ionized Ammonia (0.03, 0.04, 0.05, 0.06, 0.08, 0.13 mg/L), Total Phosphorus (0.120 - 0.880 mg/L), Boron (0.45 - 1.61 mg/), Cobalt (0.0016 - 0.0049 mg/L), Copper (0.0180 mg/L), Iron (4.62 - 52.1 mg/L), pH (6.3, 6.4), Vanadium (0.0080 - 0.018 mg/L), and Zinc (0.040 - 0.37 mg/L). Thallium concentrations were measured at <0.001 mg/L method detection limit compared to the PWQO of 0.0003 mg/L. The current PWQOs for Chromium are 0.0001 mg/L (Cr^{+6}) and 0.0089 mg/L (Cr^{+3}), the data reported was for Total Chromium and the reported concentrations which ranged 0.011 - 0.058 mg/L (i.e. would exceed the combined $\text{Cr}^{+6} + \text{Cr}^{+3}$ PWQOs of 0.0090 mg/L).

South Nation River (SW6) monitors the quality of leachate impacted surface water immediately discharging from the No. 1 Ravine into the receiving South Nation River.

General water quality at SW6 was characterized having concentrations for BOD (<1 - 69 mg/L; mean), Conductivity (890 - 2000 μ S/cm; mean), pH (6.7 - 7.6; mean), Chlorides (57 - 255 mg/L; mean), Total Ammonia (9.0 - 50 mg/L; mean), Un-ionized Ammonia (<0.02 - 0.31 mg/L; mean), Total Phosphorus (0.05 - 0.64 mg/L; mean), and Total Suspended Solids (7 - 705 mg/L; mean).

The water quality at SW6 during 2003 was characterized having PWQO exceedances for Dissolved Oxygen (2.2 - 4.0 mg/L), Alkalinity (mg/L), Un-ionized Ammonia (0.03, 0.07, 0.11, 0.27, 0.31 mg/L), Total Phosphorus (0.05 - 0.64 mg/L), Boron (0.54 - 1.41 mg/), Cobalt (0.0010 - 0.0027 mg/L), Copper (0.0180 mg/L), Iron (0.36 - 2.13 mg/L), Vanadium (0.007 - 0.008 mg/L), and Zinc (0.032 - 0.69 mg/L). Thallium concentrations were measured at <0.001 mg/L method detection limit compared to the PWQO of 0.0003 mg/L. The current PWQOs for Chromium are 0.0001 mg/L (Cr^{+6}) and 0.0089 mg/L (Cr^{+3}), the data reported was for Total Chromium and reported concentrations which ranged 0.012 - 0.025 mg/L (i.e. would exceed the combined $\text{Cr}^{+6} + \text{Cr}^{+3}$ PWQOs of 0.0090 mg/L).

Ravine No. 2 (SW13) is located at the northeast corner area of the Nation LFS and sample location SW13 monitors the water quality of the ravine waters discharging to the South Nation River. Surface water samples were collected during April and October of 2003.

General water quality at SW13 was characterized having concentrations for BOD (1 - 2 mg/L), Conductivity (480 - 505 μ S/cm) pH (7.1 - 7.8), Chlorides (42 - 46 mg/L), Total Ammonia (7.53 - 8.4 mg/L), Un-ionized Ammonia (<0.02 - 0.07 mg/L), Total Phosphorus (0.120 mg/L), and Total Suspended Solids (8 - 47 mg/L).

The water quality at SW13 during 2003 was characterized having PWQO exceedances for Dissolved Oxygen (2.8 mg/L), Un-ionized Ammonia (0.07 mg/L), Total Phosphorus (0.120 mg/L), Cobalt (0.0019 - 0.0026 mg/L), Iron (0.86 - 1.54 mg/L). Thallium concentrations were measured at <0.001 mg/L method detection limit compared to the PWQO of 0.0003 mg/L.

South Nation River (SW3) is located on the South Nation River and monitors the water quality of the immediate nearshore confluence waters of the No. 2 Ravine discharge and the receiving South Nation River. Surface water samples were collected during April and October of 2003.

General water quality at SW3 was characterized having concentrations for BOD (<1 - 2 mg/L), Conductivity (490 - 610 μ S/cm), pH (7.1 - 7.6), Chlorides (42 - 53 mg/L), Total Ammonia (7.39 - 7.98 mg/L), Un-ionized Ammonia (<0.02 - 0.03 mg/L), Total Phosphorus (0.110 - 0.210 mg/L), and Total Suspended Solids (39 - 54 mg/L).

The water quality at SW3 during 2003 was characterized having PWQO exceedances for Dissolved Oxygen (3.6 mg/L), Un-ionized Ammonia (0.03 mg/L), Total Phosphorus (0.110 - 0.210 mg/L), Cobalt (0.0010 - 0.0027 mg/L), Iron (0.81 - 1.56 mg/L). Thallium concentrations were measured at <0.001 mg/L method detection limit compared to the PWQO of 0.0003 mg/L.

Toxicity Testing Results - Ravine No. 1 (CSW-1, SW5/SW6)

Toxicity testing was conducted on the surface water samples collected at CSW-1 (located at the property boundary between the Central Landfill and the Village of Casselman Landfill and from SW5/SW6 located near the outlet of the main ravine (Ravine No. 1) to the South Nation River in March and July 2003. The reviewer is not clear on the specific sample location and requests confirmation from GAL whether it is the SW5 or the SW6 sampling station.

The analyses consisted of "Acute Toxicity Testing" (LC_{50}) for *Daphnia magna* and for rainbow trout (*Oncorhynchus mykiss*).

The results of the surface water sampled at CSW-1 showed the landfill leachate impacted water in Ravine No. 1 was toxic to both *Daphnia magna* and rainbow trout during both the March and July 2003 sampling events.

The results of the surface water sampled at SW5/SW6, the discharge from Ravine No. 1 was also determined to be toxic for rainbow trout for both the March and July 2003 sampling events. It is GAL's assessment that the main toxic parameter for the rainbow trout was likely un-ionized ammonia.

Annual Report 2003, Village of Casselman Landfill Site - Stantec Consulting Ltd.

I have also reviewed the Annual Report 2003, Village of Casselman Landfill Site dated March 2004 prepared by Stantec Consulting Ltd. (Stantec) for the Corporation of the Village of Casselman. [Please refer to memorandum dated February 2, 2005 from B. Metcalfe, Technical Support Sector., Eastern Region to M. Robert, Cornwall Area Office, Eastern Region.]

The surface water quality data presented in the Stantec report included data for sampling station SW-5 which monitors the water quality of the Ravine impoundment pond prior to discharging to the South Nation River. The water quality at SW5 during 2003 was characterized having un-ionized ammonia concentrations of 0.030 mg/L, 0.106 mg/L, and 0.547 mg/L which consistently and significantly exceeded the PWQO of 0.02 mg/L.

For the 2001 - 2003 period for sample location SW5 the historical data presented in the Stantec Report showed un-ionized ammonia concentrations to range as follows: 0.248 - 0.438 mg/L (2001), 0.163 - 1.086 mg/L (2002) and 0.030 - 0.547 mg/L (2003).

In the main ravine (Ravine No. 1) shared by both landfill sites the un-ionized ammonia concentrations have historically continued to significantly exceed the PWQO of 0.02 mg/L. The reviewer would note that literature reports suggest an acute toxicity threshold of 0.29 mg/L for un-ionized ammonia concentrations and this level and above is strongly toxic to many fish.

Stantec has suggested that another source such as the Central Landfill might be contributing un-ionized ammonia to the surface water quality of the main ravine. It is the reviewer's opinion that regardless of the portion of contaminants being attributed to the Casselman Landfill versus the adjacent Central Landfill Site which are both discharging leachate impacted waters to the South Nation River the contamination sources must be controlled and remediated. The onus is on both landfill site owners to demonstrate they have control of the contaminants of concern and remediate them in order to protect the receiving stream water quality of the South Nation River.

Summary and Recommendations

1. The GAL monitoring data for 2003 indicated that the water quality coming off-site to the South Nation River continues to remain significantly impacted and consistent with historical data. GAL did not provide calculated loading rates for contaminants of concern to the South Nation River for 2003 and GAL noted that streamflow rates for the South Nation River were not available.
2. GAL determined the surface water quality at sample location SW6 monitoring the No. 1 Ravine discharge to the receiving South Nation River to be characterized having elevated concentrations for a majority of parameters including alkalinity, total ammonia, un-ionized ammonia, barium, BOD, boron, chloride, chromium, cobalt, COD, DOC, hardness, iron, manganese, nitrate, nitrite, phosphate, total phosphorus, potassium, silicon, sodium, strontium, TDS, TKN, TSS, vanadium and zinc. This water quality data is indicative of landfill leachate impacts to the ravine.

The water quality at SW6 during 2003 was determined to have PWQO exceedances for Dissolved Oxygen (2.2 - 4.0 mg/L), Total Phosphorus (0.05 - 0.64 mg/L), Boron (0.54 - 1.41 mg/L), Cobalt (0.0010 - 0.0027 mg/L), Copper (0.0180 mg/L), Iron (0.36 - 2.13 mg/L), Vanadium (0.007 - 0.008 mg/L), and Zinc (0.032 - 0.069 mg/L). Thallium concentrations were measured at <0.001 mg/L method detection limit compared to the PWQO of 0.0003 mg/L. The current PWQOs for Chromium are 0.0001 mg/L for Cr^{+6} and 0.0089 mg/L for Cr^{+3} , the data reported was for Total Chromium and reported concentrations which ranged 0.012 - 0.025 mg/L (i.e. would exceed the combined $\text{Cr}^{+6} + \text{Cr}^{+3}$ PWQOs of 0.0090 mg/L).

Additionally and of particular concern was the PWQO exceedances for Un-ionized ammonia (0.03 mg/L, 0.07 mg/L, 0.11 mg/L, 0.27 mg/L, 0.31 mg/L). Concentrations of un-ionized ammonia should not exceed 0.02 mg/L for the protection of aquatic life.

3. The results of the Toxicity Testing of the surface water sampled at CSW-1 showed the landfill leachate impacted water in Ravine No. 1 was toxic to both *Daphnia magna* and rainbow trout during both the March and July 2003 sampling events. The discharge from Ravine No. 1 monitored at sample location SW5/SW6 was also determined to be toxic for rainbow trout during both the March and July 2003 sampling events. It was GAL's assessment that the main toxic parameter for the rainbow trout was likely un-ionized ammonia.

Based on GAL's evidence showing consistent toxicity to *Daphnia magna* and rainbow trout at CSW-1 and to rainbow trout at SW6 from the sampling conducted during both sampling events during 2003 it is the reviewer's recommendation toxicity testing of the leachate impacted water discharging from the landfill site to the South Nation River be routinely conducted at CSW-1 (located at the property boundary between the Central Landfill and the Village of Casselman Landfill and from SW5/SW6 monitoring the main ravine (Ravine No. 1) discharge to the South Nation River.

The toxicity testing employing *Daphnia magna* and rainbow trout test species is recommended to be continued and conducted on a weekly frequency for the site monitoring program. The toxicity testing is recommended to be continued until such time as the discharge water from the main ravine (Ravine No. 1) is shown to be consistently non-toxic.

4. GAL determined that the seasonal discharge of leachate impacted surface water onto the adjoining property to the east and to the South Nation River through Ravine No. 2 has resulted in adverse impact to off-site water quality at these locations. The east drainage ditch was acquired by the Nation Municipality in 2003 with the intention of including it in the Leachate Attenuation Zone (LAZ). The municipality has proposed to fill in the east drainage ditch during 2004 in order to limit or eliminate the discharge of leachate impacted groundwater to the ditch. The reviewer requests confirmation that east drainage

ditch has in fact been filled in. GAL states that it is the Municipality's intention to evaluate the impact to the South Nation River through Ravine No. 2 following the proposed remedial measures.

5. In the Annual Report 2003, Village of Casselman Landfill Site dated March 2004 prepared by Stantec Consulting Ltd. (Stantec) for the Corporation of the Village of Casselman it has been suggested that another source such as the Central Landfill might be contributing un-ionized ammonia to the surface water quality. Conversely GAL has suggested that the Village of Casselman Landfill is contributing un-ionized ammonia to the surface water quality.

It is the reviewer's recommendation that regardless of the portion of contaminants being attributed to the Casselman Landfill versus the adjacent Central Landfill Site which are both discharging leachate impacted waters to the South Nation River that the contamination sources must be controlled and remediated. The onus is on both landfill site owners, the Nation Municipality and the Village of Casselman to respectively demonstrate they have control of the contaminants of concern and to remediate them for the protection of the receiving stream water quality of the South Nation River. To date remediation measures by both landfill site owners to eliminate the elevated levels of contaminants and in particular to eliminate the high concentrations of toxic un-ionized ammonia from entering the South Nation River have been unsuccessful.

It is the reviewer's recommendation that for the purposes of protecting the receiving water quality of the South Nation River that the owner of the landfill site implement the contingency to capture and collect the leachate impacted surface water for transfer to an approved wastewater treatment facility.



Bruce Metcalfe
BWM/gl

- c: F. Crossley
V. Castro
B. Burns
K. Hosler
B. Metcalfe (Aba2005\aba0705.mem) IDS# 7460-68KMCZ
File SW-05-04 Central Landfill Site, Nation Municipality (A471101)
File SW-13-06-02 South Nation River

APPENDIX B

**REPORTS OF ANALYSIS
PSC ANALYTICAL SERVICES LTD.**

APPENDIX B-I

GROUNDWATER MONITORING SESSIONS

2004 Sampling Sessions and Stations

- **Spring: May 26, 2004**

G99-7

G00-4A

G00-4B

G02-1A

G02-1B

G02-2

G02-3

G02-4A

G02-4B

P2

- **Fall: October 25, 2004**

G00-4A

G00-4B

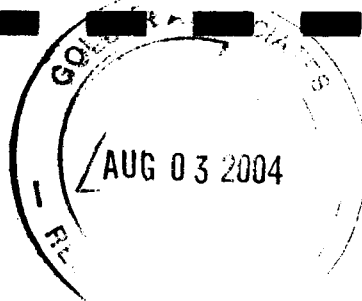
G02-1A

G02-1B

P2



ANALYTICAL SERVICES



22-Jul-2004

GOLDER ASSOCIATES LTD.
1796 Courtwood Crescent
Ottawa, ON
K2C 2B5

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Attn: Marie Gauthier
Project: 04-1120-71

Received: 28-May-2004 11:07

PO #:

Job: 2454831

Status: Final

Revised Final Report

Ground Water Samples

Sample Id	Alk 4.5 SM 2320B mg CaCO3/L	Cl- SM 4110B mg/L	SO4= SM 4110B mg/L	NO2-N SM 4110B mg/L	NO3-N SM 4110B mg/L	PO4-3 SM 4110B mg/L	TDS SM 2540C mg/L	BOD (5) SM 5210B mg/L
G1 P2	382	89.9	10.0	<0.2	4.6	<1	732	2.2
G2 G-44-7	466	50.1	2.6	<0.2	0.2	<1	550	<0.5
G3 G-02-3	714	70.4	715.	<0.2	<0.2	<1	1702	0.7
G4 G-02-1B	338	0.6	30.4	<0.2	<0.2	<1	378	<0.5
G5 G-02-1A	99	0.6	13.9	<0.2	0.2	<1	204	<0.5
G6 G-02-2	456	0.5	315.	<0.2	<0.2	<1	846	1.4
G7 G-02-4A	189	0.7	16.9	<0.2	0.2	<1	228	1.0
G8 G-02-4B	536	0.5	12.2	<0.2	<0.2	<1	508	<0.5
G9 G-00-4A	163	0.5	6.6	<0.2	0.3	<1	444	2.3
G10 G-00-4B	122	1.0	10.1	<0.2	0.4	<1	190	<0.5
Sample+Spike (found)	---	---	---	---	---	---	---	7.6
Sample+Spike (expected)	---	---	---	---	---	---	---	11.1
Blank	<1	<0.5	<0.5	<0.2	<0.2	<1	<2	<0.5
QC Standard (found)	250	1.9	4.7	1.0	1.0	5	244	5.7
QC Standard (expected)	250	2.0	5.0	1.0	1.0	5	250	6.0
Repeat G1	386	90.6	9.9	<0.2	4.6	<1	770	1.1

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Sample Id	NH3-N SM 4500H mg/L	DOC SM 5310C mg/L	COD SM 5220D mg/L	Ortho P (Dis.) SM 4500-P-F mg/L	Phenols SM 5530D mg/L	C-Hard. SM 2340B mg CaCO3/L	Ag ICP/MS mg/L
G1	0.14	17.1	50	<0.003	<0.005	350.3	<0.0001
G2	0.19	9.9	30	<0.003	0.001	344.5	<0.0001
G3	<0.03	7.4	23	<0.003	0.001	1469.	<0.0001
G4	<0.03	2.2	8	<0.003	<0.001	384.7	<0.0001
G5	0.23	1.3	12	0.154	0.001	54.0	<0.0001
G6	<0.03	2.2	10	<0.003	<0.001	734.5	<0.0001
G7	0.22	1.6	12	0.06	<0.001	129.6	<0.0001
G8	<0.03	7.4	17	<0.003	0.001	507.5	<0.0001
G9	0.41	3.7	24	0.207	<0.001	39.6	<0.0001
G10	0.55	2.6	29	0.103	<0.001	63.8	<0.0001
Sample+Spike (found)	0.69	28.6	94	0.044	0.008	nan	---
Sample+Spike (expected)	0.73	30.5	90	0.048	0.008	nan	---
Blank	<0.03	<0.2	<5	<0.003	<0.001	1.5	<0.0001
QC Standard (found)	1.55	10.1	40	0.122	0.030	16.8	0.0037
QC Standard (expected)	1.50	10	40	0.12	0.030	16.6	0.0030
Repeat G1	0.14	16.6	48	<0.003	<0.005	352.1	<0.0001

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Sample Id	Al ICP/MS mg/L	B ICP/MS mg/L	Ba ICP/MS mg/L	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L
G1	<0.005	0.245	0.079	<0.001	84.1	<0.0001	0.0017	<0.005
G2	<0.005	0.220	0.112	<0.001	90.6	<0.0001	0.0024	<0.005
G3	<0.005	0.063	0.033	<0.001	343.	<0.0001	0.0026	<0.005
G4	<0.005	<0.005	0.067	<0.001	102.	<0.0001	<0.0001	<0.005
G5	0.019	0.036	0.008	<0.001	12.0	<0.0001	0.0001	<0.005
G6	<0.005	0.029	0.054	<0.001	153.	<0.0001	0.0008	<0.005
G7	0.021	0.046	0.030	<0.001	30.8	<0.0001	0.0003	<0.005
G8	0.006	0.020	0.087	<0.001	122.	<0.0001	0.0016	<0.005
G9	0.058	0.126	0.007	<0.001	7.1	<0.0001	<0.0001	<0.005
G10	0.132	0.035	0.008	<0.001	14.2	<0.0001	0.0001	<0.005
Sample+Spike (found)	0.531	---	0.707	0.521	---	0.544	0.532	0.512
Sample+Spike (expected)	0.505	---	0.663	0.500	---	0.500	0.502	0.500
Blank	<0.005	<0.005	<0.005	<0.001	<0.5	<0.0001	<0.0001	<0.005
QC Standard (found)	0.940	0.049	0.052	0.050	5.0	0.0501	0.0503	0.048
QC Standard (expected)	1.00	0.050	0.050	0.050	5.0	0.0500	0.0500	0.050
Repeat G1	<0.005	0.246	0.080	<0.001	84.3	<0.0001	0.0017	<0.005

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Ground Water Samples

Sample Id	Cu ICP/MS mg/L	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L	Na ICP/MS mg/L	Ni ICP/MS mg/L
G1	0.0182	<0.03	7.9	34.0	<0.005	0.003	85.1	0.010
G2	0.0014	<0.03	11.1	28.7	0.507	0.001	53.3	0.009
G3	0.0022	<0.03	9.7	148.	0.537	<0.001	87.8	0.012
G4	0.0025	<0.03	5.1	31.1	0.008	<0.001	6.1	0.001
G5	0.0010	<0.03	2.6	5.83	0.027	0.004	23.3	<0.001
G6	<0.0005	0.75	10.5	85.5	0.486	0.004	26.9	0.003
G7	<0.0005	<0.03	3.1	12.8	0.070	0.002	32.8	0.002
G8	<0.0005	0.35	6.1	49.2	0.544	<0.001	18.1	0.003
G9	0.0006	<0.03	3.9	5.28	0.015	0.006	53.6	0.002
G10	<0.0005	0.14	2.6	6.88	0.027	0.003	27.6	<0.001
Sample+Spike (found)	0.532	0.56	---	---	1.82	0.563	---	0.516
Sample+Spike (expected)	0.524	0.50	---	---	1.75	0.500	---	0.516
Blank	<0.0005	<0.03	<0.1	<0.05	<0.005	<0.001	<0.1	<0.001
QC Standard (found)	0.0497	0.05	1.0	1.08	0.051	0.058	4.6	0.048
QC Standard (expected)	0.0500	0.05	1.0	1.00	0.050	0.055	5.0	0.050
Repeat G1	0.0185	<0.03	7.8	34.4	<0.005	0.003	84.9	0.010

22-Jul-2004

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Project: 04-1120-71

PO #:

Received: 28-May-2004 11:07

Job: 2454831

Status: Final

Revised Final Report

Ground Water Samples

Sample Id	P ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L	Tl ICP/MS mg/L	V ICP/MS mg/L
G1	<0.05	<0.0005	6.02	<0.001	0.578	<0.005	<0.00005	<0.0100
G2	<0.05	0.0008	5.23	<0.001	0.432	<0.005	<0.00005	<0.0100
G3	<0.05	0.0009	3.36	<0.001	0.892	<0.005	<0.00005	<0.0100
G4	<0.05	0.0007	3.13	<0.001	0.307	<0.005	<0.00005	<0.0100
G5	0.17	0.0006	5.10	<0.001	0.073	<0.005	<0.00005	0.0042
G6	<0.05	0.0007	4.58	<0.001	0.803	<0.005	<0.00005	<0.0100
G7	0.11	0.0007	6.50	<0.001	0.142	<0.005	<0.00005	0.0012
G8	<0.05	0.0009	5.84	<0.001	0.525	<0.005	<0.00005	<0.0100
G9	0.13	0.0006	4.19	<0.001	0.062	<0.005	<0.00005	0.0043
G10	0.13	0.0008	5.93	<0.001	0.080	0.010	<0.00005	0.0027
Sample+Spike (found)	---	0.536	---	---	---	0.528	0.528	0.551
Sample+Spike (expected)	---	0.500	---	---	---	0.500	0.500	0.500
Blank	<0.05	<0.0005	<0.05	<0.001	<0.001	<0.005	<0.00005	<0.0005
QC Standard (found)	0.10	0.0510	0.10	0.052	0.051	0.050	0.0998	0.0508
QC Standard (expected)	0.10	0.0500	0.10	0.050	0.050	0.050	0.100	0.0500
Repeat G1	<0.05	<0.0005	6.09	<0.001	0.579	<0.005	<0.00005	<0.0100



ANALYTICAL SERVICES

22-Jul-2004

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Attn: Marie Gauthier
Project: 04-1120-71

PO #:

Received: 28-May-2004 11:07

Job: 2454831

Status: Final

Revised Final Report

Ground Water Samples

Sample Id	Zn ICP/MS mg/L
G1	<0.005
G2	0.005
G3	0.009
G4	0.010
G5	<0.005
G6	<0.005
G7	0.007
G8	0.016
G9	<0.005
G10	<0.005
Sample+Spike (found)	0.533
Sample+Spike (expected)	0.508
Blank	<0.005
QC Standard (found)	0.049
QC Standard (expected)	0.050
Repeat G1	0.013



ANALYTICAL SERVICES

22-Jul-2004

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Attn: Marie Gauthier
Project: 04-1120-71

PO #:

Received: 28-May-2004 11:07

Job: 2454831

Status: Final

Revision: Phosphorus added to this project.

Revised: Ortho P renamed Ortho P (Dis.)

Revised: B, Ba, Co, Cu corrected for Repeat G1. Comment regarding analysis of unpreserved bottle added.

Note: Significant differences were noted for ICP/MS metals between unpreserved bottle and HNO3 preserved bottle for G1. Results for this samples were reported from the unpreserved bottle.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

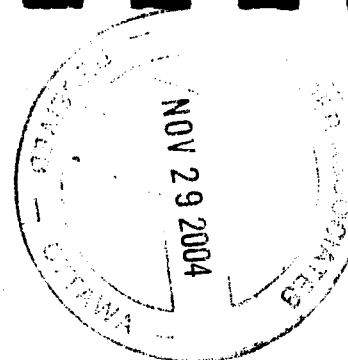
Signed:

.....
Ralph Siebert, B.Sc.
Section Supervisor, Metals

for

5735 McADAM ROAD, MISSISSAUGA, ONTARIO, CANADA L4Z 1N9 T 905 890 8566 F 905 890 8575 W www.pscanalytical.com

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13-Nov-2004

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Attn: Marie Gauthier
Project: 04-1120-712

PO #:

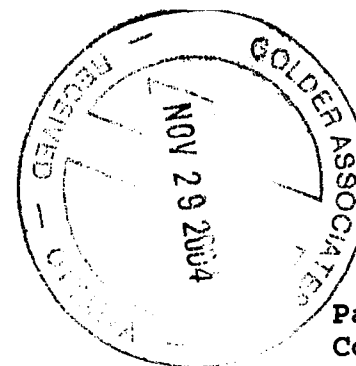
Received: 1-Nov-2004 09:31

Job: 2461455

Status: Final

Ground Water Samples

Sample Id	C-Hard. SM 2340B mg CaCO3/L	Alk 4.5 SM 2320B mg CaCO3/L	BOD (5) SM 5210B mg/L	NH3-N SM 4500H mg/L	TDS SM 2540C mg/L	Cl- SM 4110B mg/L	SO4= SM 4110B mg/L
C-1 G-00-4A	34.9	178	7.4	0.93	302	0.6	5.9
C-2 G-00-4B	59.0	120	1.7	0.26	184	1.2	8.1
C-3 G-02-1A	56.2	99	2.5	0.19	168	0.8	12.6
C-4 G-02-1B	389.5	398	<0.5	0.07	436	<0.5	35.9
C-5 P2	943.8	1180	1.9	0.46	1298	152.	10.7
Sample+Spike (found)	nan	---	---	---	---	---	---
Sample+Spike (expected)	nan	---	---	---	---	---	---
Blank	1.5	<1	<0.5	<0.03	<2	<0.5	<0.5
QC Standard (found)	16.7	251	6.1	1.50	252	2.0	5.0
QC Standard (expected)	16.6	250	6.0	1.50	250	2.0	5.0
Repeat C-1	35.2	177	12.8	0.94	312	0.6	6.0



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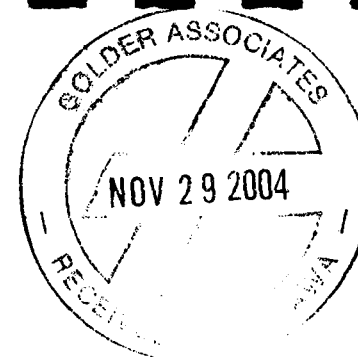
Status: Final

Ground Water Samples

Sample Id	NO2-N	NO3-N	PO4-3	Phenols	DOC	COD	Ortho P (Dis.)
	SM 4110B mg/L	SM 4110B mg/L	SM 4110B mg/L	SM 5530D mg/L	SM 5310C mg/L	SM 5220D mg/L	SM 4500F mg/L
C-1	<0.2	0.3	<1	<0.001	5	44	0.225
C-2	<0.2	0.2	<1	<0.001	3.5	9	0.179
C-3	<0.2	0.2	<1	<0.001	18.4	57	0.235
C-4	<0.2	<0.2	<1	<0.001	3.4	6	<0.003
C-5	<0.2	<0.2	<1	0.001	36.1	81	<0.003
Sample+Spike (found)	---	---	---	0.006	21	64	---
Sample+Spike (expected)	---	---	---	0.008	18.4	64	---
Blank	<0.2	<0.2	<1	<0.001	<0.2	<5	<0.003
QC Standard (found)	1.0	1.0	5	0.031	10.2	40	0.120
QC Standard (expected)	1.0	1.0	5	0.03	10	40	0.120
Repeat C-1	<0.2	0.3	<1	<0.001	5.4	48	0.227



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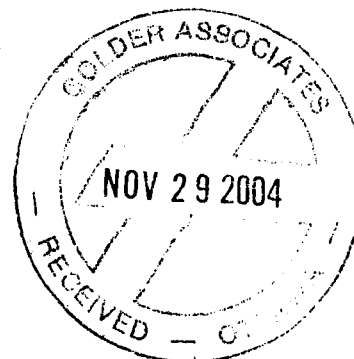
Job: 2461455

Status: Final

Ground Water Samples

Sample Id	Ag ICP/MS mg/L	Al ICP/MS mg/L	B ICP/MS mg/L	Ba ICP/MS mg/L	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L
C-1	<0.0001	0.137	0.134	0.005	<0.0005	6.3	<0.0001	0.0001
C-2	<0.0001	0.051	0.045	0.006	<0.0005	13.3	<0.0001	<0.0001
C-3	<0.0001	0.007	0.047	0.007	<0.0005	12.7	<0.0001	<0.0001
C-4	<0.0001	0.006	0.011	0.076	<0.0005	104.	<0.0001	<0.0001
C-5	<0.0001	0.005	0.462	0.300	<0.0005	249.	<0.0001	0.0045
Sample+Spike (found)	---	0.689	---	0.519	0.538	---	0.488	0.471
Sample+Spike (expected)	---	0.637	---	0.505	0.500	---	0.500	0.500
Blank	<0.0001	<0.005	<0.005	<0.005	<0.0005	<0.5	<0.0001	<0.0001
QC Standard (found)	0.0032	1.03	0.050	0.050	0.0502	5.0	0.0509	0.0483
QC Standard (expected)	0.0030	1.00	0.050	0.050	0.0500	5.0	0.0500	0.0500
Repeat C-1	<0.0001	0.139	0.142	0.005	<0.0005	6.2	<0.0001	0.0001

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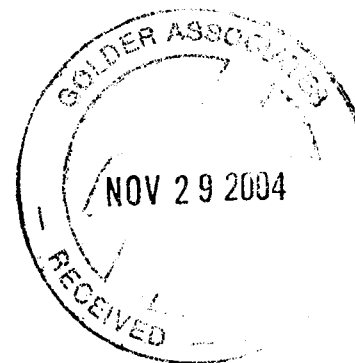
Job: 2461455

Status: Final

Ground Water Samples

Sample Id	Cr ICP/MS mg/L	Cu ICP/MS mg/L	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L	Na ICP/MS mg/L
C-1	<0.005	0.0012	0.10	3.8	4.67	0.018	0.005	61.4
C-2	<0.005	0.0005	0.04	2.4	6.27	0.028	0.002	29.3
C-3	<0.005	0.0013	0.03	2.9	5.93	0.031	0.003	24.1
C-4	<0.005	0.0029	0.04	5.7	31.2	<0.005	0.001	13.3
C-5	<0.005	0.0148	0.04	18.9	77.6	1.54	<0.001	126.
Sample+Spike (found)	0.478	0.508	0.58	---	5.40	0.489	0.508	---
Sample+Spike (expected)	0.500	0.501	0.60	---	5.17	0.518	0.505	---
Blank	<0.005	<0.0005	<0.03	<0.1	<0.05	<0.005	<0.001	<0.1
QC Standard (found)	0.049	0.0490	0.05	0.9	1.03	0.049	0.057	4.8
QC Standard (expected)	0.050	0.0500	0.05	1.0	1.00	0.050	0.055	5.0
Repeat C-1	<0.005	0.0006	0.10	3.7	4.80	0.017	0.005	58.0

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Job: 2461455

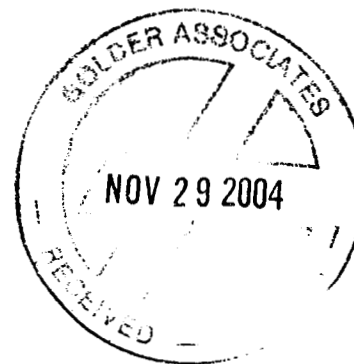
Status: Final

Ground Water Samples

Sample Id	Ni ICP/MS mg/L	P ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L	Tl ICP/MS mg/L
C-1	0.002	0.22	0.0007	5.06	<0.001	0.055	0.009	<0.00005
C-2	0.001	0.17	0.0007	7.35	<0.001	0.074	<0.005	<0.00005
C-3	0.001	0.20	<0.0005	6.01	<0.001	0.077	<0.005	<0.00005
C-4	0.002	<0.05	0.0006	3.88	<0.001	0.320	<0.005	<0.00005
C-5	0.023	<0.05	0.0014	8.94	<0.001	1.31	<0.005	<0.00005
Sample+Spike (found)	0.460	---	0.504	---	---	---	0.477	0.502
Sample+Spike (expected)	0.502	---	0.500	---	---	---	0.509	0.500
Blank	<0.001	<0.05	<0.0005	<0.05	<0.001	<0.001	<0.005	<0.00005
QC Standard (found)	0.048	0.10	0.0490	0.09	0.052	0.050	0.048	0.0973
QC Standard (expected)	0.050	0.10	0.0500	0.10	0.050	0.050	0.050	0.100
Repeat C-1	0.002	0.22	0.0006	5.08	<0.001	0.055	0.008	<0.00005



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13-Nov-2004

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Attn: Marie Gauthier
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Received: 1-Nov-2004 09:31

Job: 2461455

Status: Final

Ground Water Samples

Sample Id	V	Zn
	ICP/MS mg/L	ICP/MS mg/L
C-1	0.0011	<0.005
C-2	<0.0005	<0.005
C-3	0.0028	0.008
C-4	0.0006	0.007
C-5	0.0028	0.009
Sample+Spike (found)	0.476	0.508
Sample+Spike (expected)	0.501	0.500
Blank	<0.0005	<0.005
QC Standard (found)	0.0489	0.050
QC Standard (expected)	0.0500	0.050
Repeat C-1	0.0013	<0.005



13-Nov-2004

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Page: 7
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Job: 2461455Status: Final

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. PSC Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PSC Analytical for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed:

Ralph Siebert
.....
Ralph Siebert, B.Sc.
Section Supervisor, Metals



5735 McAdam Road
Mississauga
Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Toll Free: 1-800-263-9040

LABORATORY USE ONLY

Work Order: 1011453
Comments: _____

CHAIN OF CUSTODY RECORD

Client: Golden Assoc
1796 Courtwood Cres
Offshore ON
Contact: M. Gauthier
Phone: 2245 8641 Fax: _____

PASC Quote #: 10 2004 BC (A)
Client P.O. #: _____
Client Project #: 04/126712
Sampled by: C. Albert Bottle Order #: _____

Page 1 of 1

Invoice to (if other than above):

Analysis Required:

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE
FOR RUSH PROJECTS

Some exceptions apply. Please contact Lab

STD 5-7 Business Days ☒

RUSH

Specify Date: _____

Time: _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	Analysis Required	Drinking Water Sample - Y/N	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	C-1	04/28/04		102 (A)		N 124	7	
2	C-2							
3	C-3							
4	C-4							
5	C-5							
6								
7								
8								
9								
10								
11								
12								

Samples Relinquished to PASC by:
(Client Signature)

Date: 04/26/04

Time: _____

Method of
Shipment:

Samples Received in lab by:

Date: 04/26/04

Time: _____

Condition of samples
upon receipt at lab:

APPENDIX B-II

SURFACE WATER MONITORING SESSIONS

2004 Sampling Sessions

January 29, 2004
February 20, 2004
March 26, 2004
April 29, 2004
May 26, 2004
June 29, 2004
July 20, 2004
August 20, 2004
September 20, 2004
October 25, 2004
November 24, 2004
December 23, 2004

2004 Sampling Stations

i) Ravine No. 1 and South Nation River

(monthly):

CSW-1

SW6

SW7

SW8

SW9

SW10

ii) East Boundary

(annually or bi-annually):

SW1

SW11

SW12

SW13

SW3



ANALYTICAL SERVICES

GOLDER ASSOCIATES LTD.
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9-Feb-2004

Page: 1
Copy: 1 of 2

Attn: Marie Gauthier
Project: 04-1120-712

Received: 31-Jan-2004 09:08
PO #: 04-1120-712

Job: 2450677

Status: Final

Surface Water Samples

Sample Id	Turb.	Alk 4.5	Cl-	NO2-N	NO3-N	PO4-3	SO4=	BOD (5)
	SM 2130B NTU	SM 2320B mg CaCO3/L	SM 4110B mg/L	SM 4110B mg/L	SM 4110B mg/L	SM 4110B mg/L	SM 4110B mg/L	SM 5210B mg/L
SA-1 SW7	4.7	252	35.6	<0.2	2.4	<1	47.0	<0.5
SA-2 SW8	3.9	253	37.0	<0.2	2.5	<1	48.2	<0.5
SA-3 SW9	4.1	256	36.5	<0.2	2.5	<1	47.2	<0.5
SA-4 SW10	2.8	253	36.1	<0.2	2.6	<1	47.0	<0.5
SA-5 CSW-1	463.	1370	291.	<0.2	<0.2	<1	53.0	5.3
Blank	<0.2	<1	<0.5	<0.2	<0.2	<1	<0.5	<0.5
QC Standard (found)	18.3	250	20.0	10.0	9.9	51	48.8	5.5
QC Standard (expected)	18.0	250	20.0	10.0	10.0	50	50.0	6.0
Repeat SA-1	4.7	250	35.7	<0.2	2.4	<1	46.5	<0.5

9-Feb-2004

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Attn: Marie Gauthier
Project: 04-1120-712

Received: 31-Jan-2004 09:08
PO #: 04-1120-712

Job: 2450677

Status: Final

Surface Water Samples

	TSS	COD	DOC	TDS	NH3-N	Total P	TKN	Phenols
	SM 2540B	SM 5220D	SM 5310C	SM 2540C	SM 4500H	SM 4500C	SM 4500B	SM 5530D
Sample Id	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
SA-1	1	36	10.6	406	0.10	0.049	0.85	<0.001
SA-2	3	36	10.8	412	0.09	0.045	0.89	<0.001
SA-3	3	36	11.1	408	0.09	0.043	0.87	0.001
SA-4	3	37	10.9	408	0.09	0.042	0.90	<0.001
SA-5	127	169	52.2	1628	96.5	0.120	97.2	0.004
Blank	<1	<5	<0.2	2	<0.03	<0.002	<0.03	<0.001
QC Standard (found)	50	41	9.9	248	1.55	0.084	0.79	0.030
QC Standard (expected)	50	40	10	250	1.50	0.084	0.84	0.031
Repeat SA-1	1	36	11.3	410	0.09	0.050	0.87	<0.001

9-Feb-2004

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Surface Water Samples

Sample Id	C-Hard. SM 2340B	Al (Dis.) ICP/MS	Ag ICP/MS	Al ICP/MS	B ICP/MS	Ba ICP/MS
	mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L
SA-1	314.3	0.007	<0.0001	0.189	0.022	0.064
SA-2	323.0	0.007	<0.0001	0.163	0.021	0.064
SA-3	317.8	0.007	<0.0001	0.164	0.020	0.060
SA-4	316.1	0.007	<0.0001	0.258	0.022	0.067
SA-5	859.4	<0.005	<0.0001	0.417	1.15	0.506
Blank	0.3	<0.005	<0.0001	<0.005	<0.005	<0.005
QC Standard (found)	166.6	0.909	0.0028	0.941	0.049	0.098
QC Standard (expected)	172.6	1.00	0.0030	1.00	0.050	0.100
Repeat SA-1	313.0	0.007	<0.0001	0.186	0.025	0.066

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Received: 31-Jan-2004 09:08
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Status: Final

Surface Water Samples

Sample Id	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L	Cu ICP/MS mg/L
SA-1	<0.001	86.0	<0.0001	<0.0001	<0.005	0.0016
SA-2	<0.001	83.9	<0.0001	<0.0001	<0.005	0.0016
SA-3	<0.001	79.1	<0.0001	<0.0001	<0.005	0.0017
SA-4	<0.001	92.8	<0.0001	0.0001	<0.005	0.0019
SA-5	<0.001	222.	<0.0001	0.0022	<0.005	0.0012
Blank	<0.001	<0.5	<0.0001	<0.0001	<0.005	<0.0005
QC Standard (found)	0.005	5.0	0.0506	0.0531	0.052	0.0507
QC Standard (expected)	0.005	5.0	0.0500	0.0500	0.050	0.0500
Repeat SA-1	<0.001	86.3	<0.0001	0.0001	<0.005	0.0016



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Project: 04-1120-712

Received: 31-Jan-2004 09:08
PO #: 04-1120-712

Job: 2450677

Status: Final

Surface Water Samples

Sample Id	Fe	K	Mg	Mn	Mo	Na
	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L
SA-1	0.25	2.5	22.6	0.032	0.001	19.1
SA-2	0.23	2.5	22.9	0.028	0.001	19.5
SA-3	0.22	2.3	21.3	0.030	0.001	18.1
SA-4	0.30	2.6	23.4	0.042	0.001	19.5
SA-5	38.5	101.	61.8	1.00	0.001	191.
Blank	<0.03	<0.1	<0.05	<0.005	<0.001	<0.1
QC Standard (found)	1.02	0.9	1.01	0.053	0.052	4.9
QC Standard (expected)	1.00	1.0	1.00	0.050	0.050	5.0
Repeat SA-1	0.26	2.6	23.1	0.032	0.001	19.7



ANALYTICAL SERVICES

9-Feb-2004

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Attn: Marie Gauthier
Project: 04-1120-712

Received: 31-Jan-2004 09:08
PO #: 04-1120-712

Job: 2450677

Status: Final

Surface Water Samples

Sample Id	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICAP mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L
SA-1	<0.001	<0.0005	4.68	<0.001	0.515	0.010
SA-2	0.001	<0.0005	4.84	<0.001	0.523	0.009
SA-3	<0.001	<0.0005	4.72	<0.001	0.491	0.010
SA-4	0.001	<0.0005	4.67	<0.001	0.525	0.011
SA-5	0.010	0.0005	10.0	<0.001	1.36	0.035
Blank	<0.001	<0.0005	<0.05	<0.001	<0.001	<0.005
QC Standard (found)	0.051	0.0519	2.15	0.099	0.050	0.052
QC Standard (expected)	0.050	0.0500	2.00	0.100	0.050	0.050
Repeat SA-1	0.001	<0.0005	4.62	<0.001	0.529	0.010



ANALYTICAL SERVICES

9-Feb-2004

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Project: 04-1120-712

Received: 31-Jan-2004 09:08
PO #: 04-1120-712

Job: 2450677

Status: Final

Surface Water Samples

Sample Id	Tl	V	Zn
	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L
SA-1	<0.00005	0.0011	0.038
SA-2	<0.00005	0.0011	<0.005
SA-3	<0.00005	0.0011	0.007
SA-4	<0.00005	0.0014	0.112
SA-5	<0.00005	0.0022	0.105
Blank	<0.00005	<0.0005	<0.005
QC Standard (found)	0.101	0.0526	0.050
QC Standard (expected)	0.100	0.0500	0.050
Repeat SA-1	<0.00005	0.0012	0.027



ANALYTICAL SERVICES

9-Feb-2004

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Project: 04-1120-712

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PO #: 04-1120-712

Job: 2450677

Status: Final

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed:

.....
Ralph Siebert, B.Sc.
Section Supervisor, Metals

Tel: (905) 890-8566
Fax: (905) 890-8575
Toll Free: 1-800-263-9040

5735 McAdam Road
Mississauga
Ontario L4Z 1N9

Work Order:

Comments:

CHAIN OF CUSTODY RECORD

Page _____ of _____

PASC Quote #:

Client P.O. #:

Client Project #:

Sampled by:

Please specify Guideline (if applicable)

TAT (Turnaround Time)

**PLEASE PROVIDE ADVANCE NOTICE
FOR RUSH PROJECTS**

Some exceptions apply. Please contact Lab

STD 5-7 Business Days

RUSH Specify Date:

Time:

Sample #	Client Sample I.D.	Date Sampled	Time Sampled
1	SA 1	08/09/00	
2	SA 2		
3	SA 3		
4	SA 4		
5	SA 5		
6	SA 6		
7			
8			
9			
10			
11			
12			

Samples Relinquished to PASC by:
(Client Signature)

Samples Received in lab by:

Date:	Time:

Date: _____

Method of Shipment:

Condition of samples upon receipt at lab:

White: PSC	Yellow: Mail	Pink: Receiver	Goldenrod: Client



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2-Mar-2004

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Attn: Marie Gauthier
Project: 04-1120-712

Received: 21-Feb-2004 09:05

PO #:

Job: 2451266

Status: Final

Surface Water Samples

Sample Id	Alk 4.5 SM 2320B mg CaCO3/L	Turb. SM 2130B NTU	Cl- SM 4110B mg/L	NO2-N SM 4110B mg/L	NO3-N SM 4110B mg/L	PO4-3 SM 4110B mg/L	SO4= SM 4110B mg/L	BOD (5) SM 5210B mg/L
SA-1 SW 7	274	4.8	55.9	<0.2	1.9	<1	59.1	0.7
SA-2 SW 8	272	4.8	55.2	<0.2	1.9	<1	59.7	<0.5
SA-3 SW 9	272	4.0	54.3	<0.2	1.8	<1	59.2	<0.5
SA-4 SW 10	276	4.6	55.2	<0.2	1.9	<1	60.3	<0.5
SA-5 CSW-1	1380	770.	327.	<0.2	<0.2	<1	30.6	<0.5
Sample+Spike (found)	---	---	---	---	---	---	---	12.4
Sample+Spike (expected)	---	---	---	---	---	---	---	10.0
Blank	<1	<0.2	<0.5	<0.2	<0.2	<1	<0.5	<0.5
QC Standard (found)	249	17.9	2.2	1.0	1.0	5	4.8	6.2
QC Standard (expected)	250	18.0	2.0	1.0	1.0	5	5.0	6.0
Repeat SA-1	275	4.9	55.9	<0.2	1.9	<1	59.2	<0.5

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Surface Water Samples

Sample Id	TSS SM 2540B mg/L	DOC SM 5310C mg/L	COD SM 5220D mg/L	TKN SM 4500B mg/L	NH3-N SM 4500H mg/L	Phenols SM 5530D mg/L	TDS SM 2540C mg/L
SA-1	6	11.7	40	1.16	0.16	<0.001	482
SA-2	3	11.6	37	1.02	0.16	<0.001	512
SA-3	8	11.4	37	1.05	0.16	<0.001	484
SA-4	5	11.3	36	1.02	0.16	<0.001	488
SA-5	126	46.6	187	93.0	96.8	0.114	1590
Sample+Spike (found)	---	16.4	58	---	0.68	0.008	---
Sample+Spike (expected)	---	16.5	60	---	0.75	0.008	---
Blank	<1	<0.2	<5	<0.03	<0.03	<0.001	<1
QC Standard (found)	48	9.8	40	1.34	1.56	0.03	240
QC Standard (expected)	50	10	40	1.40	1.50	0.03	250
Repeat SA-1	6	12.2	40	1.11	0.16	<0.001	492

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Surface Water Samples

Sample Id	Total P SM 4500-P F mg/L	C-Hard. SM 2340B mg CaCO3/L	Al (Dis.) ICP/MS mg/L	Ag ICP/MS mg/L	Al ICP/MS mg/L	B ICP/MS mg/L
SA-1	0.070	356.3	0.006	0.0004	0.167	0.029
SA-2	0.057	359.2	0.005	0.0002	0.209	0.032
SA-3	0.048	357.8	0.007	<0.0001	0.173	0.030
SA-4	0.047	357.0	0.008	0.0002	0.172	0.033
SA-5	0.275	844.3	<0.005	0.0001	0.046	1.11
Sample+Spike (found)	0.085	nan	0.522	---	0.665	---
Sample+Spike (expected)	0.084	nan	0.506	---	0.667	---
Blank	<0.002	0.3	<0.005	<0.0001	<0.005	<0.005
QC Standard (found)	0.140	176.3	0.959	0.0031	0.959	0.049
QC Standard (expected)	0.140	172.6	1.00	0.0030	1.00	0.050
Repeat SA-1	0.070	356.3	0.005	0.0006	0.176	0.033

2-Mar-2004

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Surface Water Samples

Sample Id	Ba ICP/MS mg/L	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L
SA-1	0.077	<0.001	87.6	<0.0001	0.0001	<0.005
SA-2	0.080	<0.001	95.3	0.0002	0.0002	<0.005
SA-3	0.080	<0.001	91.5	<0.0001	<0.0001	<0.005
SA-4	0.082	<0.001	93.3	<0.0001	0.0001	<0.005
SA-5	0.589	<0.001	210.	<0.0001	0.0016	<0.005
Sample+Spike (found)	0.566	0.488	---	0.487	0.504	0.502
Sample+Spike (expected)	0.577	0.500	---	0.500	0.500	0.500
Blank	<0.005	<0.001	<0.5	<0.0001	<0.0001	<0.005
QC Standard (found)	0.103	0.005	5.1	0.0493	0.0520	0.051
QC Standard (expected)	0.100	0.005	5.0	0.0500	0.0500	0.050
Repeat SA-1	0.083	<0.001	90.9	<0.0001	0.0001	<0.005

2-Mar-2004

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Surface Water Samples

Sample Id	Cu ICP/MS mg/L	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L
SA-1	0.0019	0.19	4.1	25.2	0.053	0.001
SA-2	0.0022	0.21	3.5	26.4	0.059	0.002
SA-3	0.0020	0.19	3.2	25.8	0.055	0.001
SA-4	0.0042	0.23	3.3	26.8	0.057	0.001
SA-5	<0.0005	52.8	106.	62.8	0.798	0.001
Sample+Spike (found)	0.490	0.76	---	---	0.548	0.513
Sample+Spike (expected)	0.501	0.69	---	---	0.553	0.501
Blank	<0.0005	<0.03	<0.1	<0.05	<0.005	<0.001
QC Standard (found)	0.0508	1.02	0.9	1.07	0.052	0.052
QC Standard (expected)	0.0500	1.00	1.0	1.00	0.050	0.050
Repeat SA-1	0.0022	0.25	4.4	26.6	0.057	0.001

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Surface Water Samples

Sample Id	Na ICP/MS mg/L	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L
SA-1	29.3	<0.001	<0.0005	4.36	<0.001	0.630
SA-2	30.4	<0.001	<0.0005	4.57	<0.001	0.660
SA-3	30.2	<0.001	<0.0005	4.54	<0.001	0.651
SA-4	30.6	<0.001	<0.0005	4.67	<0.001	0.665
SA-5	215.	0.007	<0.0005	9.97	<0.001	1.22
Sample+Spike (found)	---	0.495	0.499	---	---	---
Sample+Spike (expected)	---	0.500	0.500	---	---	---
Blank	<0.1	<0.001	<0.0005	<0.05	<0.001	<0.001
QC Standard (found)	5.5	0.051	0.0508	1.01	0.098	0.050
QC Standard (expected)	5.0	0.050	0.0500	1.00	0.100	0.050
Repeat SA-1	31.1	<0.001	<0.0005	4.74	<0.001	0.671

2-Mar-2004

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Job: 2451266

Status: Final

Surface Water Samples

Sample Id	Ti ICP/MS mg/L	Tl ICP/MS mg/L	V ICP/MS mg/L	Zn ICP/MS mg/L
SA-1	0.009	<0.00005	0.0007	0.010
SA-2	0.010	0.00011	0.0010	0.052
SA-3	0.010	<0.00005	0.0009	0.009
SA-4	0.009	<0.00005	0.0009	0.014
SA-5	<0.005	<0.00005	0.0010	0.132
Sample+Spike (found)	0.502	0.484	0.511	0.486
Sample+Spike (expected)	0.509	0.500	0.500	0.510
Blank	<0.005	<0.00005	<0.0005	<0.005
QC Standard (found)	0.051	0.0985	0.0523	0.050
QC Standard (expected)	0.050	0.100	0.0500	0.050
Repeat SA-1	0.010	<0.00005	0.0009	0.010



ANALYTICAL SERVICES

2-Mar-2004

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Note: Many silicon compounds are not soluble in acidic solutions. The values reported for Si represent acid soluble Si only.

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Job approved by:

Signed:

.....
Ralph Siebert, B.Sc.
Section Supervisor, Metals

Work Order: 7471104
Comments: _____

CHAIN OF CUSTODY RECORD

Client: 1776 Ave. Leonard Ave.
Mississauga, ON L4Z 0B5
Contact: Maria Comthier
Phone: 905-271-1111 Fax: 905-271-9928

PASC Quote #: 10 2004 PL (B)
Client P.O. #: 01 1120 712
Client Project #: 01 1120 712
Sampled by: Trevor Clark

Page 1 of 1

Invoice to (if other than above):

Please specify Guideline (if applicable) _____

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Some exceptions apply. Please contact Lab

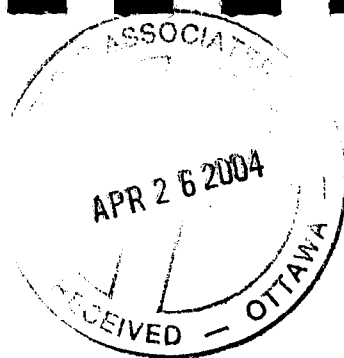
STD 5-7 Business Days ☒
RUSH Specify Date: _____
Time: _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	Analysis Required	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	SA-1	11/20/04	AM	✓	ESW	7	
2	SA-2	↓	↓	✓	↓	↓	
3	SA-3	↓	↓	✓	↓	↓	
4	SA-4	↓	↓	✓	↓	↓	
5	SA-5	↓	↓	✓	↓	↓	
6							
7							
8							
9							
10							
11							
12							

Samples Relinquished to PASC by: Trevor Clark Date: 11/20/04 Time: PM Method of Shipment: _____
(Client Signature)

Samples Received in lab by: _____ Date: 11/21/04 Time: 7:05 Condition of samples upon receipt at lab: Good





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6-Apr-2004

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Attn: Marie Gauthiere
Project: 04-1120-712

Received: 27-Mar-2004 10:07
PO #: 04-1120-712

Job: 2452394

Status: Final

Surface Water Samples

Sample Id	TDS SM 2540C mg/L	TSS SM 2540B mg/L	BOD (5) SM 5210B mg/L	Alk 4.5 SM 2320B mg CaCO ₃ /L	Turb. SM 2130B NTU	Cl- SM 4110B mg/L	SO ₄ = SM 4110B mg/L	PO ₄ -3 SM 4110B mg/L
SA-1 SW6	616	34	0.9	305	37.0	43.7	158.	<1
SA-2 CSW-1	1524	119	3.4	1110	580.	209.	196.	<1
SA-3 SW7	280	40	1.4	151	38.0	32.3	40.9	<1
SA-4 SW8	292	38	1.3	155	44.0	36.6	37.4	<1
SA-5 SW9	268	50	0.6	143	47.0	33.5	34.7	<1
SA-6 SW10	268	44	0.9	143	42.0	34.0	35.2	<1
Blank	<2	<1	<0.5	<1	<0.2	<0.5	<0.5	<1
QC Standard (found)	242	48	5.6	245	18.5	2.0	4.9	5
QC Standard (expected)	250	50	6.0	250	18.0	2.0	5.0	5
Repeat SA-1	628	35	1.3	306	36.0	44.3	160.	<1

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6-Apr-2004

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Attn: Marie Gauthiere
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Job: 2452394

Status: Final

Surface Water Samples

	NO2-N	NO3-N	TKN	NH3-N	Total P	DOC	COD	Phenols
	SM 4110B	SM 4110B	SM 4500B	SM 4500H	SM 4500-P F	SM 5310C	SM 5220D	SM 5530D
Sample Id	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
SA-1	<0.2	2.3	8.52	8.70	0.078	14.6	40	<0.005
SA-2	<0.2	<0.2	58.6	56.9	0.213	41.4	142	0.002
SA-3	<0.2	1.1	1.40	0.52	0.143	9.7	29	0.001
SA-4	<0.2	1.2	1.60	0.50	0.143	10	42	0.001
SA-5	<0.2	1.1	1.67	0.62	0.161	10.3	39	0.001
SA-6	<0.2	1.2	1.72	0.65	0.160	10.3	40	0.001
Blank	<0.2	<0.2	<0.03	<0.03	<0.002	<0.2	<5	<0.001
QC Standard (found)	1.0	1.0	1.32	1.55	0.140	10.5	41	0.031
QC Standard (expected)	1.0	1.0	1.40	1.50	0.140	10	40	0.030
Repeat SA-1	<0.2	2.4	8.50	8.70	0.077	13.9	40	<0.005

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Status: Final

Surface Water Samples

Sample Id	C-Hard. SM 2340B mg CaCO3/L	Al (Dis.) ICP/MS mg/L	Ag ICP/MS mg/L	Al ICP/MS mg/L	B ICP/MS mg/L	Ba ICP/MS mg/L
SA-1	405.0	0.012	<0.0001	1.25	0.544	0.093
SA-2	884.4	0.017	<0.0001	0.217	1.41	0.489
SA-3	203.1	0.066	<0.0001	1.50	0.021	0.059
SA-4	206.7	0.018	<0.0001	1.59	0.018	0.061
SA-5	201.6	0.057	<0.0001	1.93	0.022	0.062
SA-6	197.2	0.073	<0.0001	1.68	0.020	0.057
Blank	1.5	<0.005	<0.0001	<0.005	<0.005	<0.005
QC Standard (found)	17.5	1.01	0.0027	0.921	0.046	0.097
QC Standard (expected)	16.6	1.00	0.0030	1.00	0.050	0.100
Repeat SA-1	397.2	0.012	<0.0001	1.25	0.544	0.093

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Attn: Marie Gauthiere
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Surface Water Samples

Sample Id	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L	Cu ICP/MS mg/L
SA-1	<0.001	120.	0.0002	0.0008	<0.005	0.0033
SA-2	<0.001	251.	<0.0001	0.0017	<0.005	0.0006
SA-3	<0.001	57.1	<0.0001	0.0006	<0.005	0.0031
SA-4	<0.001	53.9	<0.0001	0.0007	<0.005	0.0030
SA-5	<0.001	54.1	<0.0001	0.0009	<0.005	0.0033
SA-6	<0.001	50.4	<0.0001	0.0008	<0.005	0.0032
Blank	<0.001	<0.5	<0.0001	<0.0001	<0.005	<0.0005
QC Standard (found)	0.005	5.0	0.0481	0.0483	0.047	0.0493
QC Standard (expected)	0.005	5.0	0.0500	0.0500	0.050	0.0500
Repeat SA-1	<0.001	121.	<0.0001	0.0008	<0.005	0.0033

6-Apr-2004

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Project: 04-1120-712

Received: 27-Mar-2004 10:07
PO #: 04-1120-712

Job: 2452394

Status: Final

Surface Water Samples

Sample Id	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L	Na ICP/MS mg/L
SA-1	1.90	23.1	23.1	0.298	<0.001	35.4
SA-2	46.6	89.3	64.4	1.08	0.001	147.
SA-3	1.64	3.5	17.2	0.062	0.002	18.6
SA-4	1.73	3.5	16.3	0.061	0.002	18.6
SA-5	2.11	4.1	16.0	0.073	0.002	18.5
SA-6	1.87	3.8	15.0	0.067	0.002	17.4
Blank	<0.03	<0.1	<0.05	<0.005	<0.001	<0.1
QC Standard (found)	0.99	1.0	1.02	0.048	0.051	4.6
QC Standard (expected)	1.00	1.0	1.00	0.050	0.050	5.0
Repeat SA-1	1.91	23.4	23.2	0.299	<0.001	35.2

6-Apr-2004

GOLDER ASSOCIATES LTD.
1796 Courtwood Crescent
Ottawa, ON
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Attn: Marie Gauthiere
Project: 04-1120-712

Received: 27-Mar-2004 10:07
PO #: 04-1120-712

Job: 2452394

Status: Final

Surface Water Samples

Sample Id	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L
SA-1	0.005	0.0011	6.29	<0.001	0.597	0.074
SA-2	0.008	0.0008	9.90	<0.001	1.24	0.016
SA-3	0.002	0.0008	5.20	<0.001	0.358	0.083
SA-4	0.002	0.0009	5.28	<0.001	0.365	0.088
SA-5	0.003	0.0011	5.86	<0.001	0.350	0.111
SA-6	0.003	0.0010	5.21	<0.001	0.326	0.096
Blank	<0.001	<0.0005	<0.05	<0.001	<0.001	<0.005
QC Standard (found)	0.047	0.0498	0.95	0.101	0.048	0.050
QC Standard (expected)	0.050	0.0500	1.00	0.100	0.050	0.050
Repeat SA-1	0.005	0.0012	6.33	<0.001	0.603	0.075

6-Apr-2004

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Attn: Marie Gauthiere
Project: 04-1120-712

Received: 27-Mar-2004 10:07
PO #: 04-1120-712

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Status: Final

Surface Water Samples

Sample Id	Tl	V	Zn
	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L
SA-1	<0.00005	0.0025	0.136
SA-2	<0.00005	0.0012	0.222
SA-3	<0.00005	0.0031	0.031
SA-4	<0.00005	0.0032	0.012
SA-5	<0.00005	0.0039	0.013
SA-6	<0.00005	0.0035	0.013
Blank	<0.00005	<0.0005	<0.005
QC Standard (found)	0.0984	0.0472	0.046
QC Standard (expected)	0.100	0.0500	0.050
Repeat SA-1	<0.00005	0.0023	0.129

6-Apr-2004

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Attn: Marie Gauthiere
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Job: 2452394

Status: Final

Note: Many silicon compounds are not soluble in acidic solutions. The values reported for Si represent acid soluble Si only.

Phenols Analysis of Water:

Sample SA-1 was run at an extra 1:5 dilution due to matrix interference
EQLs were adjusted accordingly.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed:

.....
Malgorzata Dancziger
Project Manager

CHAIN OF CUSTODY RECORD

Client: Golden Assoc.
1796 Courtwood Cres.
Ontario, ON
K2C2B5
Contact: 224-5864 Fax: 224-9928

PASC Quote #: 10 2004 BC (B)
Client P.O. #: 04-1120-712
Client Project #: 04-1120-712
Sampled by: T. Clark

Please specify Guideline (if applicable)

Invoice to (if other than above):

TAI (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Some exceptions apply. Please contact Lab

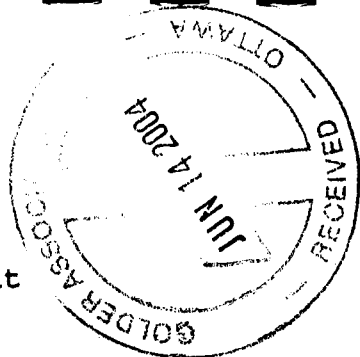
STD 5-7 Business Days ☐

RUSH Specify Date: _____

Time: _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	SA-1	Mar 10	AM	SW	7	Landfill
2	SA-2	↓	↓	↓	7	↓
3	SA-3	↓	↓	↓	7	↓
4	SA-4	↓	↓	↓	7	↓
5	SA-5	↓	↓	↓	7	↓
6	SA-6	↓	↓	↓	7	↓
7						
8						
9						
10						
11						
12						
Samples Relinquished to PASC by: <u>T. Clark</u>		Date: <u>Mar 10</u>	Time: <u>PM</u>	Method of Shipment: <u>Para later</u>		
Samples Received in lab by: <u>T. Clark</u>		Date: <u>Mar 10</u>	Time: <u>10:07</u>	Condition of samples upon receipt at lab: <u>10" 13"</u>		





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17-May-2004

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Attn: Marie Gauthier
Project: 04-1120-712/6000

PO #:

Received: 1-May-2004 11:50

Job: 2453636

Status: Final

Surface Water Samples

Sample Id	TDS SM 2540C mg/L	TSS SM 2540B mg/L	BOD (5) SM 5210B mg/L	Alk 4.5 SM 2320B mg CaCO ₃ /L	Turb. SM 2130B NTU	Cl- SM 4110B mg/L	SO ₄ = SM 4110B mg/L	PO ₄ -3 SM 4110B mg/L
SA-1 SW7	328	280	<0.5	210	29.0	35.5	38.2	<1
SA-2 SW3	486	39	4.5	383	37.0	37.3	22.1	<1
SA-3 SW13	462	4	1.2	407	5.7	39.8	17.7	<1
SA-4 SW12	464	11	1.4	432	9.8	38.2	14.9	<1
SA-5 SW11	260	24	2.5	239	16.7	13.4	15.8	<1
SA-6 SW8	324	52	0.7	210	44.0	34.1	36.5	<1
SA-7 SW-1	1430	327	8.3	1120	700.	216.	98.7	<1
SA-8 SW6	722	8	11.3	358	4.9	58.8	181.	<1
SA-9 SW9	348	110	<0.5	208	48.0	36.0	38.1	<1
SA-10 SW10	344	33	<0.5	211	43.0	35.9	38.0	<1
Blank	<2	<1	<0.5	<1	<0.2	<0.5	<0.5	<1
QC Standard (found)	250	48	5.5	248	18.4	2.0	4.9	5
QC Standard (expected)	250	50	6.0	250	18.0	2.0	5.0	5
Repeat SA-1	334	29	1.1	207	29.0	35.9	38.5	<1



ANALYTICAL SERVICES

17-May-2004

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Attn: Marie Gauthier
Project: 04-1120-712/6000

PO #:

Received: 1-May-2004 11:50

Job: 2453636

Status: Final

Surface Water Samples

Sample Id	NO2-N	NO3-N	TKN	NH3-N	Total P	DOC	COD	Phenols
	SM 4110B mg/L	SM 4110B mg/L	SM 4500B mg/L	SM 4500H mg/L	SM 4500-P F mg/L	SM 5310C mg/L	SM 5220D mg/L	SM 5530D mg/L
SA-1	<0.2	2.2	1.02	0.18	0.100	21.4	34	<0.001
SA-2	0.9	2.5	8.42	7.62	0.070	16.8	44	<0.001
SA-3	0.4	0.3	9.41	9.80	0.035	18.2	46	<0.001
SA-4	<0.2	<0.2	12.2	13.0	0.033	19.7	54	0.001
SA-5	0.6	1.0	3.41	2.66	0.060	12.8	40	<0.001
SA-6	<0.2	2.1	0.92	0.14	0.107	9.2	31	<0.001
SA-7	<0.2	<0.2	59.5	59.8	0.441	44.7	130	0.002
SA-8	<0.2	9.9	6.46	5.83	0.040	16.8	48	<0.001
SA-9	<0.2	2.2	1.03	0.19	0.141	10.6	40	<0.001
SA-10	<0.2	2.2	0.84	0.15	0.068	9.1	31	<0.001
Blank	<0.2	<0.2	<0.03	<0.03	<0.002	<0.2	<5	<0.001
QC Standard (found)	1.0	1.0	1.39	1.49	0.142	10.1	41	0.031
QC Standard (expected)	1.0	1.0	1.40	1.50	0.140	10	40	0.030
Repeat SA-1	<0.2	2.3	1.03	0.11	0.103	22.1	34	<0.001

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Attn: Marie Gauthier
Project: 04-1120-712/6000

PO #:

Received: 1-May-2004 11:50

Job: 2453636

Status: Final

Surface Water Samples

Sample Id	C-Hard. SM 2340B mg CaCO ₃ /L	Al (Dis.) ICP/MS mg/L	Ag ICP/MS mg/L	Al ICP/MS mg/L	B ICP/MS mg/L	Ba ICP/MS mg/L
SA-1	260.4	0.009	<0.0001	1.44	0.023	0.071
SA-2	329.3	0.009	<0.0001	1.18	0.159	0.127
SA-3	326.3	<0.005	<0.0001	0.015	0.143	0.153
SA-4	343.5	<0.005	<0.0001	0.059	0.156	0.174
SA-5	218.1	0.011	<0.0001	0.142	0.038	0.080
SA-6	239.0	0.010	<0.0001	1.53	0.021	0.063
SA-7	799.6	0.007	<0.0001	1.40	1.20	0.500
SA-8	458.8	0.006	<0.0001	0.120	0.587	0.108
SA-9	265.7	0.013	<0.0001	1.96	0.028	0.077
SA-10	267.0	<0.005	<0.0001	0.664	0.026	0.064
Blank	1.5	<0.005	<0.0001	<0.005	<0.005	<0.005
QC Standard (found)	16.7	1.07	0.0030	0.980	0.048	0.103
QC Standard (expected)	16.6	1.00	0.0030	1.00	0.050	0.100
Repeat SA-1	263.4	0.012	<0.0001	1.46	0.024	0.072



ANALYTICAL SERVICES

17-May-2004

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Surface Water Samples

Sample Id	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L	Cu ICP/MS mg/L
SA-1	<0.001	69.8	<0.0001	0.0008	<0.005	0.0029
SA-2	<0.001	92.3	<0.0001	0.0020	<0.005	0.0047
SA-3	<0.001	93.1	<0.0001	0.0020	<0.005	0.0013
SA-4	<0.001	99.2	<0.0001	0.0026	<0.005	0.0012
SA-5	<0.001	62.8	<0.0001	0.0004	<0.005	0.0021
SA-6	<0.001	64.5	<0.0001	0.0008	<0.005	0.0031
SA-7	<0.001	219.	<0.0001	0.0023	<0.005	0.0161
SA-8	<0.001	136.	<0.0001	0.0004	<0.005	0.0022
SA-9	<0.001	71.0	<0.0001	0.0012	<0.005	0.0043
SA-10	<0.001	71.8	<0.0001	0.0004	<0.005	0.0024
Blank	<0.001	<0.5	<0.0001	<0.0001	<0.005	<0.0005
QC Standard (found)	0.005	5.0	0.0500	0.0520	0.051	0.0517
QC Standard (expected)	0.005	5.0	0.0500	0.0500	0.050	0.0500
Repeat SA-1	<0.001	70.4	<0.0001	0.0008	<0.005	0.0031

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Attn: Marie Gauthier
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Status: Final

Surface Water Samples

Sample Id	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L	Na ICP/MS mg/L
SA-1	1.71	2.8	20.9	0.109	0.002	20.1
SA-2	1.62	17.1	23.9	0.105	<0.001	35.1
SA-3	0.93	17.7	22.7	0.204	<0.001	33.7
SA-4	1.87	19.7	23.2	0.233	<0.001	35.6
SA-5	0.57	6.0	14.9	0.060	<0.001	12.0
SA-6	1.71	2.6	18.9	0.105	0.002	17.3
SA-7	48.9	81.9	61.1	1.12	<0.001	163.
SA-8	0.22	23.9	28.8	0.425	<0.001	43.7
SA-9	2.26	3.0	21.4	0.117	0.002	20.5
SA-10	0.73	2.7	21.2	0.074	0.002	20.8
Blank	<0.03	<0.1	<0.05	<0.005	<0.001	<0.1
QC Standard (found)	1.03	0.9	1.01	0.053	0.051	5.0
QC Standard (expected)	1.00	1.0	1.00	0.050	0.050	5.0
Repeat SA-1	1.72	2.8	21.3	0.109	0.002	20.2



ANALYTICAL SERVICES

17-May-2004

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Attn: Marie Gauthier
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Surface Water Samples

Sample Id	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L
SA-1	0.002	0.0009	4.16	<0.001	0.469	0.088
SA-2	0.005	0.0008	7.10	<0.001	0.357	0.073
SA-3	0.003	<0.0005	5.16	<0.001	0.322	<0.005
SA-4	0.003	<0.0005	5.45	<0.001	0.340	<0.005
SA-5	<0.001	<0.0005	4.37	<0.001	0.164	0.008
SA-6	0.002	0.0008	4.28	<0.001	0.416	0.091
SA-7	0.008	0.0014	11.4	<0.001	1.20	0.114
SA-8	0.003	<0.0005	4.85	<0.001	0.723	0.007
SA-9	0.003	0.0012	4.93	<0.001	0.475	0.110
SA-10	0.001	<0.0005	2.69	<0.001	0.472	0.035
Blank	<0.001	<0.0005	<0.05	<0.001	<0.001	<0.005
QC Standard (found)	0.051	0.0528	0.96	0.105	0.052	0.050
QC Standard (expected)	0.050	0.0500	1.00	0.100	0.050	0.050
Repeat SA-1	0.002	0.0009	4.26	<0.001	0.470	0.088



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17-May-2004

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Attn: Marie Gauthier
Project: 04-1120-712/6000
Received: 1-May-2004 11:50
PO #:

Job: 2453636

Status: Final

Surface Water Samples

Sample Id	Tl		V		Zn	
	ICP/MS	mg/L	ICP/MS	mg/L	ICP/MS	mg/L
SA-1	<0.00005		0.0031		0.014	
SA-2	<0.00005		0.0036		0.005	
SA-3	<0.00005		0.0006		<0.005	
SA-4	<0.00005		0.0009		0.019	
SA-5	<0.00005		0.0010		<0.005	
SA-6	<0.00005		0.0040		0.013	
SA-7	<0.00005		0.0048		0.111	
SA-8	<0.00005		<0.0005		0.076	
SA-9	<0.00005		0.0051		0.016	
SA-10	<0.00005		0.0022		0.009	
Blank	<0.00005		<0.0005		<0.005	
QC Standard (found)	0.103		0.0526		0.051	
QC Standard (expected)	0.100		0.0500		0.050	
Repeat SA-1	<0.00005		0.0040		0.010	



ANALYTICAL SERVICES

17-May-2004

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Attn: Marie Gauthier
Project: 04-1120-712/6000

PO #:

Received: 1-May-2004 11:50

Job: 2453636

Status: Final

Note: Many silicon compounds are not soluble in acidic solutions. The values reported for Si represent acid soluble Si only.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed:

.....
Malgorzata Dancziger
Project Manager

Work Order: _____
Comments: _____

CHAIN OF CUSTODY RECORD

Client: Goldenrod Receivers
1799 Cartmoad Cr
Orangeville K2C 2B5
Contact: Mike Gauthier
Phone: 416-291-3504 Fax: 416-291-9728

PASC Quote #: _____
Client P.O. #: _____
Client Project #: _____
Sampled by: _____

Page 1 of 1

Please specify Guideline (if applicable) _____

Invoice to (if other than above): _____

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Some exceptions apply. Please contact Lab

STD 5-7 Business Days ☒

RUSH Specify Date: _____

Time: _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	SA-1	Apr. 29/04	PM	SW	60	
2	SA-2				60	
3	SA-3				60	
4	SA-4				60	
5	SA-5				60	
6	SA-6				60	
7	SA-7				60	
8	SA-8				60	
9	SA-9				60	
10	SA-10				60	
11						
12						

Samples Relinquished to PASC by: _____
(Client Signature)

Date: Apr. 29/04 Time: PM

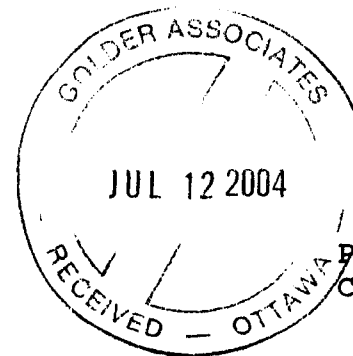
Samples Received in lab by: _____

Method of Shipment: Courier

Time: _____

White: PSC Yellow: Mail Pink: Receiver Goldenrod: Client





28-Jun-2004

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Attn: Marie Gauthier
Project: 04-1120-712

Received: 28-May-2004 11:10

PO #:

Job: 2454832

Status: Final

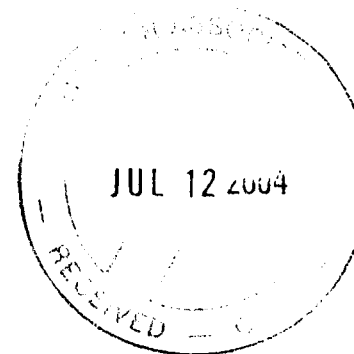
Revised Final Report

Surface Water Samples

Sample Id	Alk 4.5 SM 2320B mg CaCO3/L	Turb. SM 2130B NTU	Cl- SM 4110B mg/L	NO2-N SM 4110B mg/L	NO3-N SM 4110B mg/L	PO4-3 SM 4110B mg/L	SO4= SM 4110B mg/L	TSS SM 2540B mg/L
S1 SW7	222	8.4	30.8	<0.2	3.2	<1	29.7	18
S2 CSW-1	1130	9.1	236.	<0.2	<0.2	<1	52.2	125
S3 SW3	217	3.6	29.3	<0.2	3.1	<1	28.5	26
S4 SW6	480	5.5	89.9	<0.2	11.8	<1	124.	45
S5 SW9	218	11.0	30.8	<0.2	3.3	<1	29.7	14
S6 SW10	222	9.6	31.7	<0.2	3.4	<1	30.9	17
Blank	<1	<0.2	<0.5	<0.2	<0.2	<1	<0.5	<1
QC Standard (found)	250	18.6	1.9	1.0	1.0	5	4.7	49
QC Standard (expected)	250	18.0	2.0	1.0	1.0	5	5.0	50
Repeat S1	220	8.4	30.7	<0.2	3.2	<1	29.6	17



ANALYTICAL SERVICES



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Attn: Marie Gauthier
Project: 04-1120-712

PO #:

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Job: 2454832

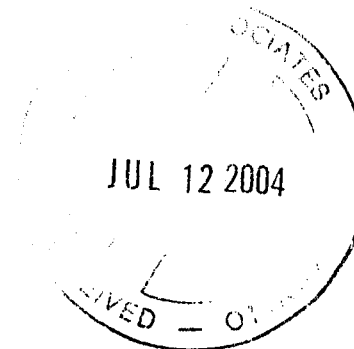
Status: Final

Revised Final Report

Surface Water Samples

Sample Id	TDS	BOD (5)	TKN	NH3-N	DOC	COD	Total P	Phenols
	SM 2540C mg/L	SM 5210B mg/L	SM 4500B mg/L	SM 4500H mg/L	SM 5310C mg/L	SM 5220D mg/L	SM 4500-P F mg/L	SM 5530D mg/L
S1	342	<0.5	1.07	0.09	12.3	42	0.093	<0.001
S2	1382	8.6	83.1	63.1	42.3	145	0.242	0.002
S3	326	0.6	1.01	0.12	11.6	40	0.098	<0.001
S4	876	11.0	10.7	10.3	20.8	75	0.132	0.001
S5	342	0.8	1.05	0.11	11.8	39	0.072	<0.001
S6	334	0.8	0.99	0.12	11.4	40	0.078	0.001
Blank	<2	<0.5	<0.03	<0.03	<0.2	<5	<0.002	<0.001
QC Standard (found)	244	5.7	1.45	1.55	10.1	41	0.137	0.030
QC Standard (expected)	250	6.0	1.40	1.50	10	40	0.140	0.030
Repeat S1	346	<0.5	1.14	0.07	---	42	0.097	<0.001

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28-Jun-2004

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Attn: Marie Gauthier
Project: 04-1120-712

PO #:

Received: 28-May-2004 11:10

Job: 2454832

Status: Final

Revised Final Report

Surface Water Samples

Sample Id	Al (Dis.) ICP/MS mg/L	C-Hard. SM 2340B mg CaCO ₃ /L	Ag ICP/MS mg/L	Al ICP/MS mg/L	B ICP/MS mg/L	Ba ICP/MS mg/L
S1	0.024	270.0	<0.0001	0.621	0.024	0.059
S2	0.007	811.2	<0.0001	0.398	0.992	0.482
S3	0.010	274.0	<0.0001	0.970	0.028	0.062
S4	0.006	585.8	<0.0001	0.421	0.727	0.134
S5	0.009	267.3	<0.0001	0.514	0.030	0.058
S6	0.009	278.4	<0.0001	0.670	0.031	0.062
Blank	<0.005	1.5	<0.0001	<0.005	<0.005	<0.005
QC Standard (found)	1.07	17.3	0.0019	0.978	0.042	0.102
QC Standard (expected)	1.00	16.6	0.0030	1.00	0.050	0.100
Repeat S1	0.023	270.1	<0.0001	0.633	0.025	0.060



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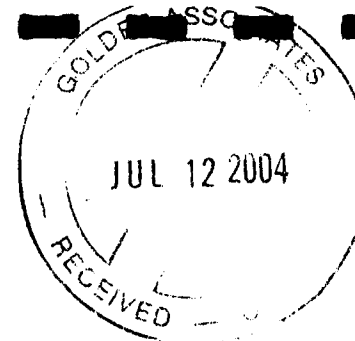
Job: 2454832

Status: Final

Revised Final Report

Surface Water Samples

Sample Id	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L	Cu ICP/MS mg/L
S1	<0.001	73.5	<0.0001	0.0004	<0.005	0.0030
S2	<0.001	217.	<0.0001	0.0018	<0.005	0.0007
S3	<0.001	74.9	<0.0001	0.0006	<0.005	0.0028
S4	<0.001	172.	<0.0001	0.0011	<0.005	0.0012
S5	<0.001	73.2	<0.0001	0.0004	<0.005	0.0020
S6	<0.001	75.8	<0.0001	0.0004	<0.005	0.0021
Blank	<0.001	<0.5	<0.0001	<0.0001	<0.005	<0.0005
QC Standard (found)	0.004	5.2	0.0478	0.0489	0.047	0.0525
QC Standard (expected)	0.005	5.0	0.0500	0.0500	0.050	0.0500
Repeat S1	<0.001	73.3	<0.0001	0.0004	<0.005	0.0031



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Surface Water Samples

Sample Id	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L	Na ICP/MS mg/L
S1	0.66	2.6	20.9	0.042	0.002	16.7
S2	46.2	87.6	65.3	1.02	0.001	164.
S3	1.11	2.8	21.1	0.057	0.002	16.8
S4	0.86	36.4	37.8	0.501	<0.001	68.8
S5	0.57	2.7	20.5	0.043	0.002	16.7
S6	0.72	2.9	21.6	0.048	0.002	17.4
Blank	<0.03	<0.1	<0.05	<0.005	<0.001	<0.1
QC Standard (found)	1.01	0.9	1.08	0.050	0.052	4.8
QC Standard (expected)	1.00	1.0	1.00	0.050	0.050	5.0
Repeat S1	0.71	2.7	21.1	0.043	0.002	17.0



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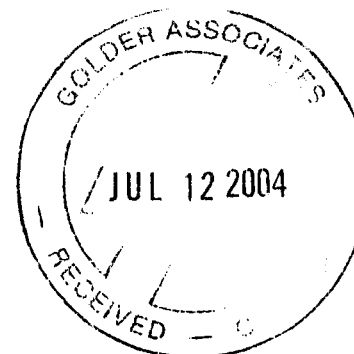
Status: Final

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Surface Water Samples

Sample Id	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L
S1	0.001	<0.0005	3.66	<0.001	0.440	0.035
S2	0.007	<0.0005	10.0	<0.001	1.20	0.032
S3	0.001	0.0006	4.53	<0.001	0.440	0.055
S4	0.004	<0.0005	6.06	<0.001	0.927	0.026
S5	<0.001	<0.0005	3.55	<0.001	0.432	0.029
S6	<0.001	<0.0005	4.10	<0.001	0.454	0.038
Blank	<0.001	<0.0005	<0.05	<0.001	<0.001	<0.005
QC Standard (found)	0.047	0.0512	0.95	0.099	0.048	0.050
QC Standard (expected)	0.050	0.0500	1.00	0.100	0.050	0.050
Repeat S1	0.001	<0.0005	3.72	<0.001	0.440	0.035

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Surface Water Samples

Sample Id	Tl ICP/MS mg/L	V ICP/MS mg/L	Zn ICP/MS mg/L
S1	<0.00005	0.0021	0.009
S2	<0.00005	0.0017	0.068
S3	<0.00005	0.0029	0.014
S4	<0.00005	0.0010	0.045
S5	<0.00005	0.0019	0.009
S6	<0.00005	0.0023	<0.005
Blank	<0.00005	<0.0005	<0.005
QC Standard (found)	0.105	0.0492	0.048
QC Standard (expected)	0.100	0.0500	0.050
Repeat S1	<0.00005	0.0022	0.011



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Revised: Tin added.

Revised: Copper for S1 revised upon re-analysis. DOC replicate for S2
reported in comment field. S2 Repeat DOC = 43.7

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed:

.....
Ralph Siebert, B.Sc.
Section Supervisor, Metals



ANALYTICAL SERVICES

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13-Jul-2004

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Attn: Marie Gauthier
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PO #:

Received: 30-Jun-2004 09:23

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Status: Final

Surface Water Samples

Sample Id	Alk 4.5	BOD (5)	Cl-	NO2-N	NO3-N	PO4-3	SO4=
	SM 2320B mg CaCO3/L	SM 5210B mg/L	SM 4110B mg/L	SM 4110B mg/L	SM 4110B mg/L	SM 4110B mg/L	SM 4110B mg/L
S-1 SW6	546	4.5	134.	<0.2	12.4	<1	68.1
S-2 SW9	218	<0.5	36.5	<0.2	1.0	<1	38.3
S-3 SW10	218	<0.5	35.3	<0.2	1.0	<1	37.8
S-4 SW7	216	<0.5	36.0	<0.2	1.0	<1	37.8
S-5 SW8	214	0.7	35.6	<0.2	1.3	<1	37.5
Blank	<1	<0.5	<0.5	<0.2	<0.2	<1	<0.5
QC Standard (found)	259	5.0	2.0	1.0	1.0	5	4.9
QC Standard (expected)	250	6.0	2.0	1.0	1.0	5	5.0
Repeat S-1	550	6.0	136.	<0.2	12.2	<1	70.5



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Surface Water Samples

Sample Id	C-Hard.	TDS	TSS	TKN	COD	DOC	NH3-N
	SM 2340B mg CaCO3/L	SM 2540C mg/L	SM 2540B mg/L	SM 4500B mg/L	SM 5220D mg/L	SM 5310C mg/L	SM 4500H mg/L
S-1	536.4	932	52	17.1	113	30.7	13.4
S-2	251.3	358	18	0.96	40	12.9	0.16
S-3	255.2	370	18	0.88	41	12.8	0.11
S-4	274.8	354	26	1.11	40	12.6	0.11
S-5	276.1	362	25	1.04	41	12.7	0.09
Blank	1.5	<2	<1	<0.03	<5	<0.2	<0.03
QC Standard (found)	17.3	252	48	1.35	40	10.6	1.56
QC Standard (expected)	16.6	250	50	1.40	40	10	1.50
Repeat S-1	551.9	950	55	18.9	119	30.7	13.4

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Surface Water Samples

Sample Id	Total P SM 4500-P F mg/L	Al (Dis.) ICP/MS mg/L	Phenols SM 5530D mg/L	Turb. SM 2130B NTU	Ag ICP/MS mg/L	Al ICP/MS mg/L
S-1	0.250	0.007	<0.001	20.0	<0.0001	2.32
S-2	0.076	0.007	<0.001	7.3	<0.0001	0.439
S-3	0.072	0.013	<0.001	9.6	<0.0001	0.625
S-4	0.076	0.007	<0.001	7.9	<0.0001	0.444
S-5	0.080	<0.005	<0.001	19.0	<0.0001	0.795
Blank	<0.002	<0.005	<0.001	<0.2	<0.0001	<0.005
QC Standard (found)	0.137	1.01	0.030	18.6	0.0026	0.951
QC Standard (expected)	0.140	1.00	0.030	18.0	0.0030	1.00
Repeat S-1	0.238	0.009	<0.001	20.0	<0.0001	2.41



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Surface Water Samples

Sample Id	B ICP/MS mg/L	Ba ICP/MS mg/L	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L
S-1	0.938	0.189	<0.001	148.	<0.0001	0.0030
S-2	0.044	0.055	<0.001	64.9	<0.0001	0.0004
S-3	0.038	0.058	<0.001	66.0	<0.0001	0.0005
S-4	0.037	0.059	<0.001	72.2	<0.0001	0.0004
S-5	0.037	0.059	<0.001	73.1	<0.0001	0.0006
Blank	<0.005	<0.005	<0.001	<0.5	<0.0001	<0.0001
QC Standard (found)	0.051	0.105	0.005	5.2	0.0516	0.0523
QC Standard (expected)	0.050	0.100	0.005	5.0	0.0500	0.0500
Repeat S-1	0.968	0.193	<0.001	153.	<0.0001	0.0032



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Surface Water Samples

Sample Id	Cr ICP/MS mg/L	Cu ICP/MS mg/L	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L
S-1	0.006	0.0037	4.69	45.5	40.1	1.07
S-2	<0.005	0.0018	0.47	2.3	21.6	0.052
S-3	<0.005	0.0020	0.66	2.1	21.9	0.067
S-4	<0.005	0.0020	0.47	2.1	22.9	0.061
S-5	<0.005	0.0023	0.84	2.3	22.7	0.070
Blank	<0.005	<0.0005	<0.03	<0.1	<0.05	<0.005
QC Standard (found)	0.052	0.0513	1.05	1.0	1.02	0.053
QC Standard (expected)	0.050	0.0500	1.00	1.0	1.00	0.050
Repeat S-1	0.007	0.0040	5.02	47.6	41.2	1.12



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Surface Water Samples

Sample Id	Mo ICP/MS mg/L	Na ICP/MS mg/L	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L
S-1	<0.001	96.0	0.009	0.0025	11.1	<0.001
S-2	0.003	20.0	0.001	<0.0005	1.78	<0.001
S-3	0.003	19.9	0.001	<0.0005	2.11	<0.001
S-4	0.003	20.6	0.001	<0.0005	1.73	<0.001
S-5	0.003	20.2	0.002	<0.0005	2.45	<0.001
Blank	<0.001	<0.1	<0.001	<0.0005	<0.05	<0.001
QC Standard (found)	0.053	4.9	0.051	0.0533	0.93	0.108
QC Standard (expected)	0.050	5.0	0.050	0.0500	1.00	0.100
Repeat S-1	<0.001	98.7	0.010	0.0027	11.4	<0.001

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Surface Water Samples

Sample Id	Sr ICP/MS mg/L	Ti ICP/MS mg/L	Tl ICP/MS mg/L	V ICP/MS mg/L	Zn ICP/MS mg/L
S-1	0.965	0.153	<0.00005	0.0059	0.086
S-2	0.483	0.023	<0.00005	0.0037	0.015
S-3	0.494	0.034	<0.00005	0.0043	0.020
S-4	0.507	0.024	<0.00005	0.0042	0.077
S-5	0.499	0.043	<0.00005	0.0047	0.100
Blank	<0.001	<0.005	<0.00005	<0.0005	<0.005
QC Standard (found)	0.051	0.052	0.110	0.0528	0.049
QC Standard (expected)	0.050	0.050	0.100	0.0500	0.050
Repeat S-1	1.00	0.161	<0.00005	0.0063	0.087



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Note: Many silicon compounds are not soluble in acidic solutions. The values reported for Si represent acid soluble Si only.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed:

.....
Ralph Siebert, B.Sc.
Section Supervisor, Metals



5735 McAdam Road
Mississauga
Ontario L4Z 1N9

Tel: (905) 890-8366
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LABORATORY USE ONLY
Work Order: _____
Comments: _____

CHAIN OF CUSTODY RECORD

Client: Golden Assoc. PASC Quote #: 10 2004 BC (B) Page 1 of 1

Contact: 1716 Courtwood Cres. Client P.O. #: _____

1716 Courtwood Cres. Client Project #: 04-1120-717

Marie Brathier Sampled by: T. Clark

Phone: 416 258 6141 Fax: 224-9928

Please specify Guideline (if applicable) _____

Invoice to (if other than above): _____

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Some exceptions apply. Please contact Lab

STD 5-7 Business Days ☒

RUSH Specify Date: _____

Time: _____

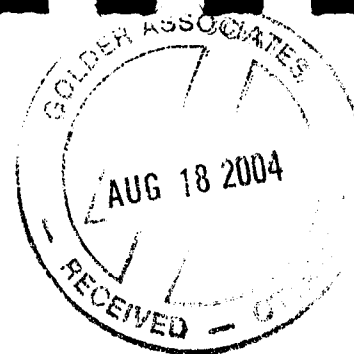
Sample #	Client Sample I.D.	Date Sampled	Time Sampled	Analysis Required	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	S-1	Jun 29/04	AM	✓	SW	7	
2	S-2	↓	↓	✓	↓	↓	
3	S-3	↓	↓	✓	↓	↓	
4	S-4	↓	PM	✓	↓	↓	
5	S-5	↓	↓	✓	↓	↓	
6							
7							
8							
9							
10							
11							
12							

Samples Relinquished to PASC by: [Signature] Date: Jun 29/04 Time: PM Method of Shipment: Courier

Samples Received in lab by: [Signature] Date: Jun 29/04 Time: PM Condition of samples upon receipt at lab: Y



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5-Aug-2004

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Project: 04-1120-712

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Received: 21-Jul-2004 09:55

Job: 2457063

Status: Final

Surface Water Samples

Sample Id	Alk 4.5 SM 2320B mg CaCO3/L	Cl- SM 4110B mg/L	NO2-N SM 4110B mg/L	NO3-N SM 4110B mg/L	PO4-3 SM 4110B mg/L	SO4= SM 4110B mg/L	Turb. SM 2130B NTU	TSS SM 2540B mg/L
S1 SW7	203	29.2	<0.2	0.6	<1	22.1	5.0	7
S2 SW8	197	31.2	<0.2	1.0	<1	20.7	5.4	11
S3 SW10	199	29.4	<0.2	0.7	<1	22.8	3.9	9
S4 SW9	200	29.8	<0.2	0.6	<1	21.0	7.9	14
S5 SW6	536	128.	<0.5	6.2	<1	75.9	42.0	134
Blank	<1	<0.5	<0.2	<0.2	<1	<0.5	<0.2	<1
QC Standard (found)	245	2.1	1.0	1.0	5	4.8	18.5	48
QC Standard (expected)	250	2.0	1.0	1.0	5	5.0	18.0	50
Repeat S1	198	28.9	<0.2	0.6	<1	20.6	5.0	7

5-Aug-2004

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Status: Final

Surface Water Samples

Sample Id	BOD (5)	TDS	TKN	NH3-N	DOC	COD	Total P	Phenols
	SM 5210B mg/L	SM 2540C mg/L	SM 4500B mg/L	SM 4500H mg/L	SM 5310C mg/L	SM 5220D mg/L	SM 4500-P F mg/L	SM 5530D mg/L
S1	1.1	332	1.21	0.06	13.3	40	0.086	<0.001
S2	1.0	340	0.98	0.09	12.2	40	0.091	0.001
S3	1.2	328	1.04	0.68	13	39	0.078	<0.001
S4	1.2	334	1.01	0.10	13	39	0.085	<0.001
S5	15.7	922	12.0	11.7	24.7	94	0.276	0.001
Blank	<0.5	<2	<0.03	<0.03	<0.2	<5	<0.002	<0.001
QC Standard (found)	5.4	248	1.50	1.55	9.6	40	0.142	0.030
QC Standard (expected)	6.0	250	1.40	1.50	10	40	0.140	0.030
Repeat S1	2.2	330	1.18	0.05	13.9	40	0.088	<0.001



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Surface Water Samples

Sample Id	Al (Dis.)	C-Hard.	Ag	Al	B	Ba
	ICP/MS	SM 2340B	ICP/MS	ICP/MS	ICP/MS	ICP/MS
	mg/L	mg CaCO3/L	mg/L	mg/L	mg/L	mg/L
S1	0.020	229.1	<0.0001	0.221	0.028	0.044
S2	0.009	221.4	<0.0001	0.352	0.027	0.043
S3	0.009	224.9	<0.0001	0.321	0.030	0.044
S4	0.012	233.7	<0.0001	0.389	0.026	0.045
S5	0.013	498.8	<0.0001	1.91	0.928	0.163
Blank	<0.005	1.5	<0.0001	<0.005	<0.005	<0.005
QC Standard (found)	1.02	17.4	0.0037	1.00	0.044	0.101
QC Standard (expected)	1.00	16.6	0.0030	1.00	0.050	0.100
Repeat S1	0.016	232.7	<0.0001	0.222	0.031	0.045



ANALYTICAL SERVICES

5-Aug-2004

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Ottawa, ON
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Page: 4
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Attn: Marie Gauthier
Project: 04-1120-712

Received: 21-Jul-2004 09:55

PO #:

Job: 2457063

Status: Final

Surface Water Samples

Sample Id	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L	Cu ICP/MS mg/L
S1	<0.001	61.4	<0.0001	0.0002	<0.005	0.0016
S2	<0.001	59.2	<0.0001	0.0003	<0.005	0.0019
S3	<0.001	60.0	<0.0001	0.0003	<0.005	0.0018
S4	<0.001	63.3	<0.0001	0.0003	<0.005	0.0022
S5	<0.001	134.	<0.0001	0.0024	0.005	0.0027
Blank	<0.001	<0.5	<0.0001	<0.0001	<0.005	<0.0005
QC Standard (found)	0.005	5.2	0.0510	0.0505	0.049	0.0518
QC Standard (expected)	0.005	5.0	0.0500	0.0500	0.050	0.0500
Repeat S1	<0.001	62.1	<0.0001	0.0002	<0.005	0.0021

5-Aug-2004

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Attn: Marie Gauthier
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PO #:

Received: 21-Jul-2004 09:55

Job: 2457063

Status: Final

Surface Water Samples

Sample Id	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L	Na ICP/MS mg/L
S1	0.22	1.7	18.3	0.036	0.001	16.7
S2	0.35	1.8	17.8	0.040	0.001	16.3
S3	0.33	1.9	18.2	0.034	0.001	16.7
S4	0.39	1.8	18.3	0.042	0.001	16.6
S5	3.35	45.7	39.7	0.921	<0.001	93.7
Blank	<0.03	<0.1	<0.05	<0.005	<0.001	<0.1
QC Standard (found)	0.99	0.9	1.07	0.050	0.052	4.8
QC Standard (expected)	1.00	1.0	1.00	0.050	0.050	5.0
Repeat S1	0.22	1.7	18.8	0.036	0.001	17.1

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5-Aug-2004

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Attn: Marie Gauthier
Project: 04-1120-712

PO #:

Received: 21-Jul-2004 09:55

Job: 2457063

Status: Final

Surface Water Samples

Sample Id	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L
S1	0.001	<0.0005	1.95	<0.001	0.419	0.010
S2	0.001	<0.0005	2.37	<0.001	0.409	0.017
S3	0.001	<0.0005	2.09	<0.001	0.412	0.016
S4	0.001	<0.0005	2.33	<0.001	0.416	0.019
S5	0.007	0.0017	10.9	<0.001	0.882	0.118
Blank	<0.001	<0.0005	<0.05	<0.001	<0.001	<0.005
QC Standard (found)	0.049	0.0531	0.98	0.105	0.050	0.051
QC Standard (expected)	0.050	0.0500	1.00	0.100	0.050	0.050
Repeat S1	0.001	<0.0005	1.97	<0.001	0.429	0.012



ANALYTICAL SERVICES

5-Aug-2004

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Attn: Marie Gauthier
Project: 04-1120-712

PO #:

Received: 21-Jul-2004 09:55

Job: 2457063

Status: Final

Surface Water Samples

Sample Id	Tl	V	Zn
	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L
S1	<0.00005	0.0028	0.015
S2	<0.00005	0.0030	<0.005
S3	<0.00005	0.0030	0.009
S4	<0.00005	0.0031	0.049
S5	<0.00005	0.0046	0.067
Blank	<0.00005	<0.0005	<0.005
QC Standard (found)	0.107	0.0506	0.051
QC Standard (expected)	0.100	0.0500	0.050
Repeat S1	<0.00005	0.0028	0.017



ANALYTICAL SERVICES

5-Aug-2004

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Page: 8
Copy: 1 of 2

Attn: Marie Gauthier
Project: 04-1120-712

PO #:

Received: 21-Jul-2004 09:55

Job: 2457063

Status: Final

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed:

.....
Ralph Siebert, B.Sc.
Section Supervisor, Metals



5735 McAdam Road
Mississauga
Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Toll Free: 1-800-263-9040

LABORATORY USE ONLY

Work Order:

Comments:

CHAIN OF CUSTODY RECORD

Client:

PASC Quote # :

Page 1 of 1

Client P.O. # :

Client Project # :

Sampled by:

Please specify Guideline (if applicable)

Contact:

Phone:

Fax:

Invoice to (if other than above):

TAT (Turnaround Time)

**PLEASE PROVIDE ADVANCE NOTICE
FOR RUSH PROJECTS**

Some exceptions apply. Please contact Lab

STD

5-7 Business Days

RUSH

Specify Date:

Time:

[illegible]

Samples Relinquished to PASC by:
(Client Signature)

Date:

Time

Method of Shipment:

Samples Received in lab by:

Date:

Time

Condition of samples
upon receipt at lab:





ANALYTICAL SERVICES

GOLDER ASSOCIATES LTD.
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3-Sep-2004

Page: 1
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Attn: Marie Gauthier
Project: 04-1120-71

PO #:

Received: 23-Aug-2004 09:12

Job: 2458351

Status: Final

Surface Water Samples

Sample Id	Alk 4.5 SM 2320B mg CaCO ₃ /L	Turb. SM 2130B NTU	Cl- SM 4110B mg/L	NO ₂ -N SM 4110B mg/L	NO ₃ -N SM 4110B mg/L	PO ₄ -3 SM 4110B mg/L	SO ₄ = SM 4110B mg/L	BOD (5) SM 5210B mg/L
S-1 SW	552	10.4	121.	<0.2	6.4	---	51.5	14.1
S-2 SW	197	9.7	36.3	<0.2	1.3	<1	35.8	0.7
S-3 SW	193	12.0	35.9	<0.2	1.4	<1	34.6	0.7
S-4 SW	195	19.5	37.1	<0.2	1.5	<1	37.6	0.6
S-5 SW	188	7.9	35.2	<0.2	1.4	<1	34.1	<0.5
Sample+Spike (found)	---	---	---	---	---	---	---	23.1
Sample+Spike (expected)	---	---	---	---	---	---	---	19.6
Blank	<1	<0.2	<0.5	<0.2	<0.2	<1	<0.5	<0.5
QC Standard (found)	254	18.5	2.0	1.1	1.0	5	4.8	5.6
QC Standard (expected)	250	18.0	2.0	1.0	1.0	5	5.0	6.0
Repeat S-1	550	10.4	124.	<0.2	6.9	<1	52.0	9.6



ANALYTICAL SERVICES

3-Sep-2004

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Attn: Marie Gauthier
Project: 04-1120-71

Received: 23-Aug-2004 09:12

PO #:

Job: 2458351

Status: Final

Surface Water Samples

Sample Id	TDS	TSS	C-Hard.	Al (Dis.)	Total P	NH3-N	DOC
	SM 2540C mg/L	SM 2540B mg/L	SM 2340B mg CaCO3/L	ICP/MS mg/L	SM 4500-P F mg/L	SM 4500H mg/L	SM 5310C mg/L
S-1	936	51	477.4	0.006	0.135	12.7	26.9
S-2	410	20	232.9	0.007	0.033	0.18	10.3
S-3	416	39	229.0	0.011	0.072	0.15	10.8
S-4	414	33	233.8	0.009	0.067	0.08	10.7
S-5	408	22	220.6	0.304	0.066	0.07	10.4
Sample+Spike (found)	---	---	nan	---	---	---	39.4
Sample+Spike (expected)	---	---	nan	---	---	---	40.3
Blank	<2	<1	1.5	<0.005	<0.002	<0.03	<0.2
QC Standard (found)	248	48	17.5	1.01	0.134	1.46	10.8
QC Standard (expected)	250	50	16.6	1.00	0.140	1.50	10
Repeat S-1	948	56	499.7	0.007	0.127	12.8	26.6

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Job: 2458351

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Surface Water Samples

Sample Id	COD	TKN	Phenols	Ag	Al	B
	SM 5220D mg/L	SM 4500B mg/L	SM 5530D mg/L	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L
S-1	90	16.3	0.001	<0.0001	0.855	0.866
S-2	35	1.04	<0.001	<0.0001	0.374	0.046
S-3	36	0.88	<0.001	<0.0001	1.18	0.043
S-4	38	0.88	<0.001	<0.0001	0.727	0.041
S-5	36	0.84	<0.001	<0.0001	0.399	0.040
Sample+Spike (found)	---	26.9	0.019	---	1.51	---
Sample+Spike (expected)	---	26.3	0.021	---	1.35	---
Blank	<5	<0.03	<0.001	<0.0001	<0.005	<0.005
QC Standard (found)	40	1.33	0.029	0.0030	0.981	0.053
QC Standard (expected)	40	1.40	0.030	0.0030	1.00	0.050
Repeat S-1	90	16.6	0.001	<0.0001	0.948	0.925

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Attn: Marie Gauthier
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Received: 23-Aug-2004 09:12
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Job: 2458351

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Surface Water Samples

Sample Id	Ba ICP/MS mg/L	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L
S-1	0.161	<0.001	132.	<0.0001	0.0016	<0.005
S-2	0.056	<0.001	62.8	<0.0001	0.0003	<0.005
S-3	0.061	<0.001	61.4	<0.0001	0.0008	<0.005
S-4	0.059	<0.001	63.5	<0.0001	0.0005	<0.005
S-5	0.052	<0.001	58.9	<0.0001	0.0003	<0.005
Sample+Spike (found)	0.695	0.537	---	0.516	0.500	0.507
Sample+Spike (expected)	0.661	0.500	---	0.500	0.501	0.500
Blank	<0.005	<0.001	<0.5	<0.0001	<0.0001	<0.005
QC Standard (found)	0.103	0.005	5.3	0.0497	0.0504	0.050
QC Standard (expected)	0.100	0.005	5.0	0.0500	0.0500	0.050
Repeat S-1	0.162	<0.001	136.	<0.0001	0.0016	<0.005

3-Sep-2004

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PO #:

Received: 23-Aug-2004 09:12

Job: 2458351

Status: Final

Surface Water Samples

Sample Id	Cu	Fe	K	Mg	Mn	Mo
	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L
S-1	0.0023	2.12	41.4	35.4	0.710	<0.001
S-2	0.0023	0.51	3.3	18.5	0.039	0.002
S-3	0.0032	1.40	3.5	18.3	0.065	0.002
S-4	0.0037	0.86	3.3	18.3	0.050	0.002
S-5	0.0025	0.50	3.1	17.8	0.038	0.002
Sample+Spike (found)	0.509	2.56	---	---	1.23	0.554
Sample+Spike (expected)	0.502	2.62	---	---	1.21	0.500
Blank	0.0007	<0.03	<0.1	<0.05	<0.005	<0.001
QC Standard (found)	0.0510	1.05	1.0	1.07	0.050	0.052
QC Standard (expected)	0.0500	1.00	1.0	1.00	0.050	0.050
Repeat S-1	0.0020	2.10	43.2	38.3	0.722	<0.001

3-Sep-2004

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Attn: Marie Gauthier
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Job: 2458351

Status: Final

Surface Water Samples

Sample Id	Na ICP/MS mg/L	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L
S-1	87.3	0.007	0.0009	8.81	<0.001	0.865
S-2	20.1	0.002	<0.0005	3.43	<0.001	0.521
S-3	19.4	0.003	0.0006	4.98	<0.001	0.498
S-4	19.5	0.002	0.0006	4.03	<0.001	0.500
S-5	19.2	0.002	<0.0005	3.29	<0.001	0.479
Sample+Spike (found)	---	0.491	0.520	---	---	---
Sample+Spike (expected)	---	0.507	0.500	---	---	---
Blank	0.1	<0.001	<0.0005	<0.05	<0.001	<0.001
QC Standard (found)	5.3	0.049	0.0505	0.99	0.105	0.049
QC Standard (expected)	5.0	0.050	0.0500	1.00	0.100	0.050
Repeat S-1	93.8	0.006	0.0008	9.33	<0.001	0.859



ANALYTICAL SERVICES

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3-Sep-2004

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Project: 04-1120-71

PO #:

Received: 23-Aug-2004 09:12

Job: 2458351

Status: Final

Surface Water Samples

Sample Id	Ti ICP/MS mg/L	Tl ICP/MS mg/L	V ICP/MS mg/L	Zn ICP/MS mg/L
S-1	0.061	<0.00005	0.0030	0.027
S-2	0.022	<0.00005	0.0035	<0.005
S-3	0.067	<0.00005	0.0052	0.017
S-4	0.041	<0.00005	0.0043	0.033
S-5	0.023	<0.00005	0.0037	0.006
Sample+Spike (found)	0.574	0.521	0.507	0.533
Sample+Spike (expected)	0.561	0.500	0.503	0.527
Blank	<0.005	<0.00005	<0.0005	<0.005
QC Standard (found)	0.050	0.103	0.0500	0.049
QC Standard (expected)	0.050	0.100	0.0500	0.050
Repeat S-1	0.063	<0.00005	0.0028	0.027



ANALYTICAL SERVICES

3-Sep-2004

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Page: 8
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Attn: Marie Gauthier
Project: 04-1120-71

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Received: 23-Aug-2004 09:12

Job: 2458351

Status: Final

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. PSC Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PSC Analytical for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed:

.....
Ralph Siebert, B.Sc.
Section Supervisor, Metals



5735 McAdam Road
Mississauga
Ontario L4Z 1N9

Tel: (905) 890-2366
Fax: (905) 890-8575
Toll Free: 1-800-263-9040

CHAIN OF CUSTODY RECORD

Client:

Goldenrod

PASC Quote #:

102004 BC (B)

Page 1 of 1

Contact:

102004 BC (B)

Client P.O. #:

04-1170-712

Phone:

603-241-9928

Client Project #:

7 Black

Sampled by:

Goldenrod

Invoice to (if other than above):

Goldenrod

Please specify Guideline (if applicable)

Invoice to (if other than above):

Goldenrod

Analysis Required:

102004 BC (B)

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Some exceptions apply. Please contact Lab

STD

5-7 Business Days



RUSH

Specify Date:

Time:

Sample #	Client Sample I.D.	Date Sampled	Time Sampled
1	S-1	Aug 20	AM
2	S-2		
3	S-3		
4	S-4		
5	S-5		
6			
7			
8			
9			
10			
11			
12			

Samples Relinquished to PASC by:
(Client Signature)

Date: Aug 20

Method of Shipment:

Courier

Samples Received in lab by:

Date: Aug 20

Condition of samples upon receipt at lab:

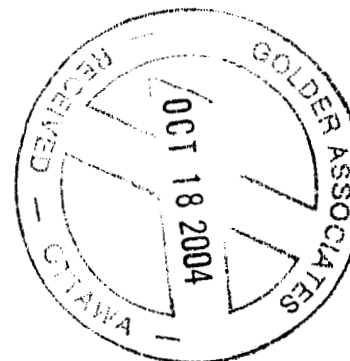
19

White: PSC Yellow: Mail Pink: Receiver Goldenrod: Client





ANALYTICAL SERVICES



GOLDER ASSOCIATES LTD.
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4-Oct-2004

Page: 1
Copy: 1 of 2

Attn: Marie Gauthier
Project: 041120712

PO #:

Received: 22-Sep-2004 09:57

Job: 2459617

Status: Final

Surface Water Samples

Sample Id	Alk 4.5 SM 2320B mg CaCO3/L	TDS SM 2540C mg/L	BOD (5) SM 5210B mg/L	Turb. SM 2130B NTU	Cl- SM 4110B mg/L	NO2-N SM 4110B mg/L	NO3-N SM 4110B mg/L	PO4-3 SM 4110B mg/L
S-1 SW3	182	288	2.0	8.9	24.2	<0.2	1.8	<1
S-2 SW10	185	310	1.6	8.4	23.1	<0.2	1.6	<1
S-3 SW9	184	314	1.3	11.3	22.7	<0.2	1.7	<1
S-4 SW7	179	304	1.4	6.8	22.6	<0.2	1.6	<1
S-5 SW6	555	1204	9.8	12.0	107.	2.8	7.8	<1
Blank	<1	<2	<0.5	<0.2	<0.5	<0.2	<0.2	<1
QC Standard (found)	253	244	6.2	18.5	2.0	1.0	1.0	5
QC Standard (expected)	250	250	6.0	18.0	2.0	1.0	1.0	5
Repeat S-1	182	294	4.1	8.9	23.4	<0.2	1.7	<1



ANALYTICAL SERVICES

4-Oct-2004

GOLDER ASSOCIATES LTD.
1796 Courtwood Crescent
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Page: 2
Copy: 1 of 2

Attn: Marie Gauthier
Project: 041120712

Received: 22-Sep-2004 09:57

PO #:

Job: 2459617

Status: Final

Surface Water Samples

Sample Id	SO4=	TSS	DOC	COD	NH3-N	TKN	Total P	Phenols
	SM 4110B mg/L	SM 2540B mg/L	SM 5310C mg/L	SM 5220D mg/L	SM 4500H mg/L	SM 4500B mg/L	SM 4500-P F mg/L	SM 5530D mg/L
S-1	34.3	15	14.2	38	0.09	1.07	0.098	<0.001
S-2	33.3	12	14.8	40	0.09	1.36	0.099	<0.001
S-3	32.7	12	13.4	40	0.10	1.30	0.102	<0.001
S-4	32.0	20	13.7	41	0.09	1.36	0.119	<0.001
S-5	282.	41	29.1	79	8.20	11.5	0.127	<0.001
Blank	<0.5	<1	<0.2	<5	<0.03	<0.03	<0.002	<0.001
QC Standard (found)	4.8	49	9.6	40	1.54	1.33	0.146	0.010
QC Standard (expected)	5.0	50	10	40	1.50	1.40	0.140	0.010
Repeat S-1	35.0	16	14.6	38	0.08	1.07	0.100	<0.001

4-Oct-2004

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Attn: Marie Gauthier
Project: 041120712

PO #:

Received: 22-Sep-2004 09:57

Job: 2459617

Status: Final

Surface Water Samples

Sample Id	C-Hard. SM 2340B	Al (Dis.) ICP/MS	Ag ICP/MS	Al ICP/MS	B ICP/MS	Ba ICP/MS
	mg CaCO ₃ /L	mg/L	mg/L	mg/L	mg/L	mg/L
S-1	212.3	0.007	<0.0001	0.518	0.033	0.053
S-2	219.8	0.017	<0.0001	0.446	0.030	0.054
S-3	225.0	0.014	<0.0001	0.578	0.031	0.056
S-4	220.3	0.112	<0.0001	0.435	0.029	0.053
S-5	732.5	0.027	<0.0001	0.726	1.28	0.193
Blank	1.5	<0.005	<0.0001	<0.005	<0.005	<0.005
QC Standard (found)	16.4	1.09	0.0026	0.932	0.043	0.095
QC Standard (expected)	16.6	1.00	0.0030	1.00	0.050	0.100
Repeat S-1	225.5	0.007	<0.0001	0.544	0.030	0.055

4-Oct-2004

GOLDER ASSOCIATES LTD.
1796 Courtwood Crescent
Ottawa, ON
K2C 2B5

Page: 4
Copy: 1 of 2

Attn: Marie Gauthier
Project: 041120712

PO #:

Received: 22-Sep-2004 09:57

Job: 2459617

Status: Final

Surface Water Samples

Sample Id	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L	Cu ICP/MS mg/L
S-1	<0.0005	60.9	<0.0001	0.0003	<0.005	0.0039
S-2	<0.0005	63.0	<0.0001	0.0003	<0.005	0.0036
S-3	<0.0005	64.2	<0.0001	0.0004	<0.005	0.0035
S-4	<0.0005	63.1	<0.0001	0.0003	<0.005	0.0029
S-5	<0.0005	221.	<0.0001	0.0013	<0.005	0.0014
Blank	<0.0005	<0.5	<0.0001	<0.0001	<0.005	<0.0005
QC Standard (found)	0.0048	5.0	0.0473	0.0474	0.047	0.0487
QC Standard (expected)	0.0050	5.0	0.0500	0.0500	0.050	0.0500
Repeat S-1	<0.0005	64.2	<0.0001	0.0004	<0.005	0.0039

4-Oct-2004

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Attn: Marie Gauthier
Project: 041120712

PO #:

Received: 22-Sep-2004 09:57

Job: 2459617

Status: Final

Surface Water Samples

Sample Id	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L	Na ICP/MS mg/L
S-1	0.56	3.4	14.6	0.052	0.002	12.5
S-2	0.49	3.4	15.1	0.048	0.002	13.0
S-3	0.64	3.5	15.7	0.059	0.002	13.2
S-4	0.47	3.3	15.2	0.047	0.002	12.7
S-5	0.98	42.5	43.4	0.521	<0.001	79.4
Blank	<0.03	<0.1	<0.05	<0.005	<0.001	<0.1
QC Standard (found)	0.95	0.9	0.93	0.047	0.049	4.6
QC Standard (expected)	1.00	1.0	1.00	0.050	0.050	5.0
Repeat S-1	0.59	3.5	15.8	0.056	0.002	13.2

4-Oct-2004

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Attn: Marie Gauthier
Project: 041120712

PO #:

Received: 22-Sep-2004 09:57

Job: 2459617

Status: Final

Surface Water Samples

Sample Id	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L
S-1	0.001	<0.0005	5.16	<0.001	0.383	0.030
S-2	<0.001	<0.0005	5.13	<0.001	0.395	0.026
S-3	0.001	0.0006	5.50	<0.001	0.406	0.035
S-4	<0.001	<0.0005	5.15	<0.001	0.394	0.025
S-5	0.005	0.0005	8.86	<0.001	1.14	0.045
Blank	<0.001	<0.0005	<0.05	<0.001	<0.001	<0.005
QC Standard (found)	0.048	0.0481	0.94	0.102	0.047	0.050
QC Standard (expected)	0.050	0.0500	1.00	0.100	0.050	0.050
Repeat S-1	<0.001	<0.0005	5.49	<0.001	0.397	0.032

4-Oct-2004

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Status: Final

Surface Water Samples

Sample Id	Tl	V	Zn
	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L
S-1	<0.00005	0.0022	0.009
S-2	<0.00005	0.0021	0.007
S-3	<0.00005	0.0024	0.007
S-4	<0.00005	0.0021	<0.005
S-5	<0.00005	0.0015	0.036
Blank	<0.00005	<0.0005	<0.005
QC Standard (found)	0.0960	0.0460	0.047
QC Standard (expected)	0.100	0.0500	0.050
Repeat S-1	0.00006	0.0024	0.009



ANALYTICAL SERVICES

4-Oct-2004

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Attn: Marie Gauthier
Project: 041120712

PO #:

Received: 22-Sep-2004 09:57

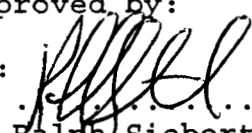
Job: 2459617

Status: Final

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. PSC Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PSC Analytical for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed:


.....
Ralph Siebert, B.Sc.
Section Supervisor, Metals

CHAIN OF CUSTODY RECORD

Client: Golden Assoc
1796 Centennial Cres
Orleans ON
 Contact: M. Gauthier
 Phone: 22458641 Fax: _____

PASC Quote #: 102004 BC (B)
 Client P.O. #: _____
 Client Project #: 041120712
 Sampled by: C. Albert

Page 1 of 1

Work Order: _____
 Comments: _____

Invoice to (if other than above): _____

TAT (Turnaround Time)

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Some exceptions apply. Please contact Lab

STD 5-7 Business Days ☒

RUSH Specify Date: _____

Time: _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	S-1	Sept 2nd/04		Sw	7	
2	S-2					
3	S-3					
4	S-4					
5	S-5					
6						
7						
8						
9						
10						
11						
12						

Samples Relinquished to PASC by: _____
 (Client Signature)

Samples Received in lab by: _____

Date: Sept 2nd/04 Time: _____

Date: Sept 2nd/04 Time: _____

Method of Shipment: _____

Condition of samples upon receipt at lab: _____

White: PSC Yellow: Mail Pink: Receiver Gold: Prod: Client



DEC 08 2004

24-Nov-2004

GOLDER ASSOCIATES LTD.
1796 Courtwood Crescent
Ottawa, ON
K2C 2B5

Page: 1
Copy: 1 of 2

Attn: Marie Gauthier
Project: 04-1120-712

Received: 1-Nov-2004 09:31

PO #:

Job: 2461456

Status: Final

Revised Final Report

Surface Water Samples

Sample Id	Al (Dis.) ICP/MS mg/L	Ag ICP/MS mg/L	Al ICP/MS mg/L	B ICP/MS mg/L	Ba ICP/MS mg/L	Be ICP/MS mg/L
S-5 SW7	0.005	<0.0001	0.382	0.056	0.074	<0.0005
S-6 (SW-1)	0.010	<0.0001	0.051	1.16	0.266	<0.0005
Blank	<0.005	<0.0001	<0.005	<0.005	<0.005	<0.0005
QC Standard (found)	1.09	0.0023	0.992	0.051	0.106	0.0052
QC Standard (expected)	1.00	0.0030	1.00	0.050	0.100	0.0050
Repeat S-5	<0.005	<0.0001	0.388	0.055	0.074	<0.0005

Sample Id	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L	Cu ICP/MS mg/L	Fe ICP/MS mg/L
S-5	76.9	<0.0001	0.0003	<0.005	0.0021	0.37
S-6	248.	<0.0001	0.0043	<0.005	0.0014	21.2
Blank	<0.5	<0.0001	<0.0001	<0.005	<0.0005	<0.03
QC Standard (found)	5.2	0.0509	0.0513	0.050	0.0535	1.03
QC Standard (expected)	5.0	0.0500	0.0500	0.050	0.0500	1.00
Repeat S-5	77.9	<0.0001	0.0003	<0.005	0.0019	0.37

24-Nov-2004

GOLDER ASSOCIATES LTD.
1796 Courtwood Crescent
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Page: 2
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Attn: Marie Gauthier
Project: 04-1120-712

Received: 1-Nov-2004 09:31

PO #:

Job: 2461456

Status: Final

Revised Final Report

Surface Water Samples

Sample Id	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L	Na ICP/MS mg/L	Ni ICP/MS mg/L
S-5	4.4	24.4	0.048	0.005	29.8	0.001
S-6	83.9	64.4	1.74	0.001	170.	0.016
Blank	<0.1	<0.05	<0.005	<0.001	<0.1	<0.001
QC Standard (found)	1.0	1.01	0.051	0.052	4.9	0.050
QC Standard (expected)	1.0	1.00	0.050	0.050	5.0	0.050
Repeat S-5	4.4	24.9	0.049	0.005	30.3	0.001

Sample Id	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L	Tl ICP/MS mg/L
S-5	<0.0005	2.86	<0.001	0.714	0.021	<0.00005
S-6	<0.0005	8.24	<0.001	1.47	<0.005	0.00016
Blank	<0.0005	<0.05	<0.001	<0.001	<0.005	<0.00005
QC Standard (found)	0.0534	0.99	0.106	0.050	0.051	0.106
QC Standard (expected)	0.0500	1.00	0.100	0.050	0.050	0.100
Repeat S-5	<0.0005	2.92	<0.001	0.713	0.021	<0.00005



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24-Nov-2004

GOLDER ASSOCIATES LTD.
1796 Courtwood Crescent
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Attn: Marie Gauthier
Project: 04-1120-712

PO #:

Received: 1-Nov-2004 09:31

Job: 2461456

Status: Final

Revised Final Report

Surface Water Samples

Sample Id	V ICP/MS mg/L	Zn ICP/MS mg/L
S-5	0.0027	<0.005
S-6	0.0012	0.028
Blank	<0.0005	<0.005
QC Standard (found)	0.0502	0.050
QC Standard (expected)	0.0500	0.050
Repeat S-5	0.0029	<0.005

24-Nov-2004

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Received: 1-Nov-2004 09:31

Job: 2461456Status: Final

Revision: Sample IDs changed from S-5A,S-5B to S-5, S-6 as per client request.

Note: Many silicon compounds are not soluble in acidic solutions. The values reported for Si represent acid soluble Si only.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. PSC Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PSC Analytical for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed:

.....
Malgorzata Dancziger
Project Manager

16-Nov-2004

GOLDER ASSOCIATES LTD.
1796 Courtwood Crescent
Ottawa, ON
K2C 2B5

Page: 1
Copy: 1 of 2

Attn: Marie Gauthier
Project: 04-1120-712

PO #:

Received: 1-Nov-2004 09:31

Job: 2461456

Status: Final

Surface Water Samples

Sample Id	Alk 4.5 SM 2320B mg CaCO ₃ /L	TDS SM 2540C mg/L	TSS SM 2540B mg/L	BOD (5) SM 5210B mg/L	Turb. SM 2130B NTU	Cl- SM 4110B mg/L	SO ₄ = SM 4110B mg/L	PO ₄ -3 SM 4110B mg/L
S-1 SW8	224	436	7	<0.5	5.1	48.7	67.6	<1
S-2 SW10	230	440	9	<0.5	5.1	49.8	69.0	<1
S-3 SW6	722	1222	36	7.3	18.1	148.	150.	<1
S-4 SW9	231	428	16	<0.5	25.0	49.0	68.2	<1
S-5 SW7	228	432	7	<0.5	6.8	49.1	69.0	<1
S-6 CSW-1	1180	1572	79	16.2	236.	256.	101.	<1
Blank	<1	<2	<1	<0.5	<0.2	<0.5	<0.5	<1
QC Standard (found)	252	248	48	6.1	18.4	2.0	5.1	5
QC Standard (expected)	250	250	50	6.0	18.0	2.0	5.0	5
Repeat S-1	223	440	7	<0.5	5.1	48.2	67.4	<1

16-Nov-2004

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1796 Courtwood Crescent
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Attn: Marie Gauthier
Project: 04-1120-712

PO #:

Received: 1-Nov-2004 09:31

Job: 2461456

Status: Final

Surface Water Samples

Sample Id	NO2-N	NO3-N	TKN	NH3-N	Total P	DOC	COD	Phenols
	SM 4110B mg/L	SM 4110B mg/L	SM 4500B mg/L	SM 4500H mg/L	SM 4500-P F mg/L	SM 5310C mg/L	SM 5220D mg/L	SM 5530D mg/L
S-1	<0.2	0.4	0.93	0.19	0.068	14.6	36	<0.001
S-2	<0.2	0.4	0.97	0.27	0.068	14.1	34	<0.001
S-3	1.3	6.8	26.0	18.7	0.086	11.9	90	<0.001
S-4	<0.2	0.3	0.81	0.16	0.077	14	34	<0.001
S-5	<0.2	0.4	0.76	0.12	0.063	13.1	31	<0.001
S-6	<0.2	<0.2	91.0	74.1	0.090	43.6	140	<0.001
Blank	<0.2	<0.2	<0.03	<0.03	<0.002	<0.2	<5	<0.001
QC Standard (found)	1.0	1.0	1.40	1.49	0.136	10.2	41	0.031
QC Standard (expected)	1.0	1.0	1.40	1.50	0.140	10	40	0.030
Repeat S-1	<0.2	0.4	0.94	0.19	0.070	14.8	34	<0.001

16-Nov-2004

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Attn: Marie Gauthier
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Job: 2461456

Status: Final

Surface Water Samples

Sample Id	C-Hard. SM 2340B	Al (Dis.) ICP/MS	Ag ICP/MS	Al ICP/MS	B ICP/MS	Ba ICP/MS
	mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L
S-1	309.7	<0.005	<0.0001	0.281	0.055	0.069
S-2	308.7	<0.005	<0.0001	0.328	0.060	0.073
S-3	666.1	0.014	<0.0001	0.717	1.17	0.202
S-4	306.4	0.012	<0.0001	0.545	0.056	0.070
S-5	nan	n/a	---	---	---	---
S-6	nan	n/a	---	---	---	---
Blank	1.5	<0.005	<0.0001	<0.005	<0.005	<0.005
QC Standard (found)	16.5	1.00	0.0023	0.995	0.049	0.100
QC Standard (expected)	16.6	1.00	0.0030	1.00	0.050	0.100
Repeat S-1	310.5	<0.005	<0.0001	0.279	0.055	0.070



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Attn: Marie Gauthier
Project: 04-1120-712

PO #:

Received: 1-Nov-2004 09:31

Job: 2461456

Status: Final

Surface Water Samples

Sample Id	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L	Cu ICP/MS mg/L
S-1	<0.0005	77.7	0.0001	0.0003	<0.005	0.0030
S-2	<0.0005	81.0	<0.0001	0.0003	<0.005	0.0041
S-3	<0.0005	212.	<0.0001	0.0016	<0.005	0.0017
S-4	<0.0005	75.8	<0.0001	0.0004	<0.005	0.0019
S-5	---	---	---	---	---	---
S-6	---	---	---	---	---	---
Blank	<0.0005	<0.5	<0.0001	<0.0001	<0.005	<0.0005
QC Standard (found)	0.0048	5.2	0.0496	0.0499	0.049	0.0494
QC Standard (expected)	0.0050	5.0	0.0500	0.0500	0.050	0.0500
Repeat S-1	<0.0005	77.8	<0.0001	0.0003	<0.005	0.0028

16-Nov-2004

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1796 Courtwood Crescent
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Attn: Marie Gauthier
Project: 04-1120-712

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Job: 2461456

Status: Final

Surface Water Samples

Sample Id	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L	Na ICP/MS mg/L
S-1	0.21	4.6	25.2	0.047	0.005	30.1
S-2	0.26	4.9	25.6	0.053	0.005	31.2
S-3	1.10	52.7	50.3	0.624	<0.001	111.
S-4	0.43	4.3	24.7	0.049	0.005	29.8
S-5	---	---	---	---	---	---
S-6	---	---	---	---	---	---
Blank	<0.03	<0.1	<0.05	<0.005	<0.001	<0.1
QC Standard (found)	0.97	0.9	1.02	0.050	0.051	4.9
QC Standard (expected)	1.00	1.0	1.00	0.050	0.050	5.0
Repeat S-1	0.22	4.6	25.0	0.047	0.005	29.9

16-Nov-2004

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Attn: Marie Gauthier
Project: 04-1120-712

PO #:

Received: 1-Nov-2004 09:31

Job: 2461456

Status: Final

Surface Water Samples

Sample Id	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L
S-1	<0.001	<0.0005	2.79	<0.001	0.698	0.014
S-2	<0.001	<0.0005	2.99	<0.001	0.722	0.017
S-3	0.005	<0.0005	9.05	<0.001	1.17	0.051
S-4	0.001	<0.0005	3.28	<0.001	0.688	0.028
S-5	---	---	---	---	---	---
S-6	---	---	---	---	---	---
Blank	<0.001	<0.0005	<0.05	<0.001	<0.001	<0.005
QC Standard (found)	0.049	0.0505	1.01	0.104	0.049	0.051
QC Standard (expected)	0.050	0.0500	1.00	0.100	0.050	0.050
Repeat S-1	0.001	<0.0005	2.77	<0.001	0.700	0.015



ANALYTICAL SERVICES

16-Nov-2004

GOLDER ASSOCIATES LTD.
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Ottawa, ON
K2C 2B5

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Attn: Marie Gauthier
Project: 04-1120-712

PO #:

Received: 1-Nov-2004 09:31

Job: 2461456

Status: Final

Surface Water Samples

Sample Id	Tl ICP/MS mg/L	V ICP/MS mg/L	Zn ICP/MS mg/L
S-1	<0.00005	0.0027	0.008
S-2	<0.00005	0.0027	<0.005
S-3	0.00005	0.0019	0.028
S-4	<0.00005	0.0030	<0.005
S-5	---	---	---
S-6	---	---	---
Blank	<0.00005	<0.0005	<0.005
QC Standard (found)	0.100	0.0495	0.049
QC Standard (expected)	0.100	0.0500	0.050
Repeat S-1	<0.00005	0.0026	0.008



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16-Nov-2004

Page: 8
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Attn: Marie Gauthier
Project: 04-1120-712

PO #:

Received: 1-Nov-2004 09:31

Job: 2461456

Status: Final

Note: Many silicon compounds are not soluble in acidic solutions. The values reported for Si represent acid soluble Si only.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. PSC Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PSC Analytical for a period of 30 days following reporting or as per specific contractual arrangements.

Job approved by:

Signed:

.....
Malgorzata Dancziger
Project Manager



ANALYTICAL SERVICES

5735 McAdam Road
Mississauga
Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Toll Free: 1-800-263-9040

LABORATORY USE ONLY

Work Order: 1461456

Comments: _____

CHAIN OF CUSTODY RECORD

Client: Golden Rods

PASC Quote #: 102004BC (B)

Page 1 of 1

Client P.O. #: _____

Client Project #: 04/12/2012

Contact: M. Gauthier

Sampled by: C. A. Hout

Bottle Order # _____

Phone: 2245864 Fax: _____

Please specify Guideline (if applicable) _____

Invoice to (if other than above): _____

Analysis Required:

TAT (Turnaround Time)

**PLEASE PROVIDE ADVANCE NOTICE
FOR RUSH PROJECTS**

Some exceptions apply. Please contact Lab

STD 5-7 Business Days ☒

RUSH Specify Date: _____

Time: _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled	Analysis Required:												Drinking Water Sample - Y/N	Sample Matrix	No. of Containers	Comments/Contamination/ Site History
1	S-1	04/23/12		/													N SW	7	
2	S-2			/															
3	S-3			/															
4	S-4			/															
5	S-5			/															
6	S-6			/															
7																			
8																			
9																			
10																			
11																			
12																			

Samples Relinquished to PASC by:
(Client Signature)

Date: 04/26/12

Time: _____

Method of
Shipment:

Samples Received in lab by:

Date: 04/26/12

Time: _____

Condition of samples
upon receipt at lab:

White: PSC Yellow: Mail Pink: Receiver Goldenrod: Client



7-Dec-2004

GOLDER ASSOCIATES LTD.
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Ottawa, ON
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Page: 1
Copy: 1 of 2

Attn: Marie Gouthier
Project: 0411200712

PO #:

Received: 25-Nov-2004 10:11

Job: 2462556

Status: Final

Surface Water Samples

Sample Id	Cl- SM 4110B mg/L	NO2-N SM 4110B mg/L	NO3-N SM 4110B mg/L	PO4-3 SM 4110B mg/L	SO4= SM 4110B mg/L	Alk 4.5 SM 2320B mg CaCO3/L	TSS SM 2540B mg/L	Turb. SM 2130B NTU
S-1 <i>S103</i>	53.7	<0.2	2.1	<1	56.7	231	6	4.8
S-2 <i>S1010</i>	54.1	<0.2	2.1	<1	57.3	229	5	3.9
S-3 <i>S106</i>	142.	6.1	6.4	<1	113.	665	48	12.9
S-4 <i>S107</i>	52.8	<0.2	2.3	<1	56.8	229	5	4.6
S-5 <i>S109</i>	53.5	<0.2	2.3	<1	58.1	228	9	5.5
S-6 <i>S101</i>	279.	<0.2	<0.2	<1	70.0	1180	83	175.
Blank	<0.5	<0.2	<0.2	<1	<0.5	<1	<1	<0.2
QC Standard (found)	2.0	1.0	1.0	5	4.8	255	48	18.4
QC Standard (expected)	2.0	1.0	1.0	5	5.0	250	50	18.0
Repeat S-1	52.9	<0.2	2.3	<1	56.6	231	6	4.6



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Surface Water Samples

Sample Id	BOD (5)	TDS	TKN	DOC	COD	NH3-N	Phenols	C-Hard.
	SM 5210B mg/L	SM 2540C mg/L	SM 4500B mg/L	SM 5310C mg/L	SM 5220D mg/L	SM 4500H mg/L	SM 5530D mg/L	SM 2340B mg CaCO3/L
S-1	0.8	404	0.78	11.6	30	0.14	<0.001	286.2
S-2	0.8	406	0.97	11.7	28	0.10	<0.001	304.8
S-3	9.8	1090	28.0	29.4	75	18.6	<0.001	691.7
S-4	<0.5	416	1.04	11.8	49	0.13	<0.001	299.1
S-5	<0.5	398	1.00	11	30	0.10	<0.001	284.7
S-6	13.6	1522	106.	58.3	154	81.0	<0.001	878.1
Blank	<0.5	<2	<0.03	<0.2	<5	<0.03	<0.001	1.5
QC Standard (found)	6.0	248	1.40	9	39	1.51	0.031	17.7
QC Standard (expected)	6.0	250	1.40	10	40	1.50	0.030	16.6
Repeat S-1	<0.5	412	0.84	11.4	28	0.10	<0.001	301.4

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Job: 2462556

Status: Final

Surface Water Samples

Sample Id	Total P SM 4500-P F mg/L	Al (Dis.) ICP/MS mg/L	Ag ICP/MS mg/L	Al ICP/MS mg/L	B ICP/MS mg/L	Ba ICP/MS mg/L
S-1	0.030	<0.005	<0.0001	0.209	0.038	0.056
S-2	0.026	0.006	<0.0001	0.232	0.041	0.060
S-3	0.089	<0.005	<0.0001	0.585	0.973	0.176
S-4	0.026	<0.005	<0.0001	0.189	0.039	0.060
S-5	0.035	0.008	<0.0001	0.289	0.035	0.057
S-6	0.930	0.010	<0.0001	0.211	1.09	0.375
Blank	<0.002	<0.005	<0.0001	<0.005	<0.005	<0.005
QC Standard (found)	0.141	1.12	0.0032	0.990	0.051	0.104
QC Standard (expected)	0.140	1.00	0.0030	1.00	0.050	0.100
Repeat S-1	0.027	<0.005	<0.0001	0.221	0.044	0.061



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Attn: Marie Gouthier
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Received: 25-Nov-2004 10:11

PO #:

Job: 2462556

Status: Final

Surface Water Samples

Sample Id	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L	Cu ICP/MS mg/L
S-1	<0.0005	78.7	<0.0001	0.0001	<0.005	0.0020
S-2	<0.0005	83.5	<0.0001	0.0001	<0.005	0.0018
S-3	<0.0005	199.	<0.0001	0.0012	<0.005	0.0019
S-4	<0.0005	82.3	<0.0001	0.0002	<0.005	0.0015
S-5	<0.0005	78.1	<0.0001	0.0002	<0.005	0.0018
S-6	<0.0005	242.	<0.0001	0.0041	<0.005	0.0020
Blank	<0.0005	<0.5	<0.0001	<0.0001	<0.005	<0.0005
QC Standard (found)	0.0049	5.4	0.0510	0.0503	0.051	0.0516
QC Standard (expected)	0.0050	5.0	0.0500	0.0500	0.050	0.0500
Repeat S-1	<0.0005	82.4	<0.0001	0.0002	<0.005	0.0019

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Attn: Marie Gouthier
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PO #:

Received: 25-Nov-2004 10:11

Job: 2462556

Status: Final

Surface Water Samples

Sample Id	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L	Na ICP/MS mg/L
S-1	0.25	3.4	21.7	0.025	0.001	24.7
S-2	0.25	3.6	23.4	0.026	0.001	26.2
S-3	1.01	50.7	47.0	0.438	<0.001	90.0
S-4	0.24	3.5	22.7	0.025	0.001	26.4
S-5	0.34	3.3	21.8	0.027	0.001	24.8
S-6	30.2	96.4	66.4	1.49	0.001	169.
Blank	<0.03	<0.1	<0.05	<0.005	<0.001	<0.1
QC Standard (found)	1.07	1.0	1.03	0.050	0.053	4.5
QC Standard (expected)	1.00	1.0	1.00	0.050	0.050	5.0
Repeat S-1	0.27	3.7	23.2	0.026	0.001	27.1

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Attn: Marie Gouthier
Project: 0411200712

PO #:

Received: 25-Nov-2004 10:11

Job: 2462556

Status: Final

Surface Water Samples

Sample Id	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L
S-1	0.001	<0.0005	2.92	<0.001	0.541	0.012
S-2	<0.001	<0.0005	3.12	<0.001	0.578	0.012
S-3	0.006	0.0007	8.09	<0.001	1.04	0.040
S-4	<0.001	<0.0005	3.02	<0.001	0.565	0.011
S-5	0.001	<0.0005	3.05	<0.001	0.546	0.016
S-6	0.016	<0.0005	8.74	<0.001	1.38	0.016
Blank	<0.001	<0.0005	<0.05	<0.001	<0.001	<0.005
QC Standard (found)	0.048	0.0543	0.99	0.103	0.051	0.052
QC Standard (expected)	0.050	0.0500	1.00	0.100	0.050	0.050
Repeat S-1	<0.001	<0.0005	3.14	<0.001	0.573	0.012



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Received: 25-Nov-2004 10:11

PO #:

Job: 2462556

Status: Final

Surface Water Samples

Sample Id	Tl	V	Zn
	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L
S-1	<0.00005	0.0010	<0.005
S-2	<0.00005	0.0012	<0.005
S-3	<0.00005	0.0016	0.026
S-4	<0.00005	0.0011	<0.005
S-5	<0.00005	0.0012	<0.005
S-6	0.00020	0.0019	0.036
Blank	<0.00005	<0.0005	<0.005
QC Standard (found)	0.105	0.0516	0.050
QC Standard (expected)	0.100	0.0500	0.050
Repeat S-1	<0.00005	0.0011	0.005



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Note: Many silicon compounds are not soluble in acidic solutions. The values reported for Si represent acid soluble Si only.

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Job approved by:

Signed:

.....
Ralph Siebert, B.Sc.
Section Supervisor, Metals



5735 McAdam Road
Mississauga
Ontario L4Z 1N9

Tel: (905) 890-8566
Fax: (905) 890-8575
Toll Free: 1-800-263-9040

LABORATORY USE ONLY

Work Order: _____

Comments: _____

CHAIN OF CUSTODY RECORD

Client: _____

Golden Assoc
1796 Courtwoodline

PASC Quote #: _____

102004 BC (R)

Page 1 of 1

2 Hara ON

Client P.O. #: _____

Client Project #: _____

0241120712

Contact: *M. Gaskin*

Sampled by: _____

C. Alberty

Bottle Order #: _____

Phone: _____

Fax: _____

Please specify Guideline (if applicable) _____

Invoice to (if other than above): _____

Analysis Required: _____

Drinking Water Sample - Y/N

TAT (Turnaround Time)

**PLEASE PROVIDE ADVANCE NOTICE
FOR RUSH PROJECTS**

Some exceptions apply. Please contact Lab

STD

5-7 Business Days



RUSH

Specify Date: _____

Time: _____

Sample #	Client Sample I.D.	Date Sampled	Time Sampled
1	<i>S-1</i>	<i>Nov 24/04</i>	
2	<i>S-2</i>		
3	<i>S-3</i>		
4	<i>S-4</i>		
5	<i>S-5</i>		
6	<i>S-6</i>		
7			
8			
9			
10			
11			
12			

Samples Relinquished to PASC by:
(Client Signature) _____

Samples Received in lab by: _____

Date: *Nov 24/04*

Time: _____

Date: *11/24/04*

Time: _____

Method of
Shipment: _____

Condition of samples
upon receipt at lab: _____

White: PSC

Yellow: Mail

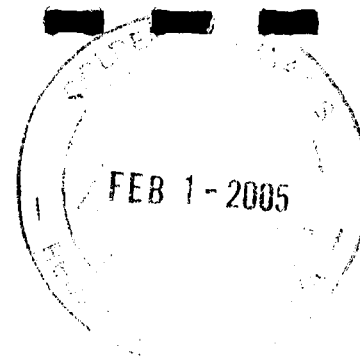
Pink: Receiver

Goldenrod: Client





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18-Jan-2005

Page: 1
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Attn: Marie Gouthier
Project: 04-1120-712

PO #:

Received: 30-Dec-2004 08:38

Job: 2463638

Status: Final

Surface Water Samples

Sample Id	BOD (5) SM 5210B mg/L	TSS SM 2540B mg/L	Turb. SM 2130B NTU	Cl- SM 4110B mg/L	NO2-N SM 4110B mg/L	NO3-N SM 4110B mg/L	PO4-3 SM 4110B mg/L	SO4= SM 4110B mg/L
S1 <i>SW</i>	2.0	44	3.2	86.2	0.4	2.4	<1	133.
S2 <i>SW</i>	4.3	46	79.0	176.	<0.2	<0.2	<1	254.
Blank	<0.5	<1	<0.2	<0.5	<0.2	<0.2	<1	<0.5
QC Standard (found)	5.0	49	18.4	2.0	1.0	1.0	5	4.9
QC Standard (expected)	6.0	50	18.0	2.0	1.0	1.0	5	5.0
Repeat S1	2.4	43	3.2	86.7	0.4	2.5	<1	133.

Sample Id	TDS SM 2540C mg/L	Total P SM 4500-P F mg/L	NH3-N SM 4500H mg/L	DOC SM 5310C mg/L	COD SM 5220D mg/L	Phenols SM 5530D mg/L	TKN SM 4500B mg/L
S1	868	0.090	16.6	24	70	0.001	16.8
S2	1208	0.123	42.9	36.2	96	0.001	39.5
Blank	<2	<0.002	<0.03	<0.2	<5	<0.001	<0.03
QC Standard (found)	248	0.146	1.50	10.6	41	0.029	1.32
QC Standard (expected)	250	0.140	1.50	10	40	0.030	1.40
Repeat S1	878	0.091	16.3	24.5	78	0.001	17.1

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Attn: Marie Gouthier
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Job: 2463638

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Surface Water Samples

Sample Id	C-Hard. SM 2340B mg CaCO3/L	Al (Dis.) ICP/MS mg/L	Ag ICP/MS mg/L	Al ICP/MS mg/L	B ICP/MS mg/L	Ba ICP/MS mg/L
S1	541.1	<0.005	<0.0001	0.567	0.602	0.121
S2	712.5	0.030	<0.0001	0.656	0.770	0.219
Blank	1.5	<0.005	<0.0001	<0.005	<0.005	<0.005
QC Standard (found)	16.8	1.01	0.0029	0.997	0.048	0.099
QC Standard (expected)	16.6	1.00	0.0030	1.00	0.050	0.100
Repeat S1	550.0	<0.005	<0.0001	0.548	0.644	0.126

Sample Id	Be ICP/MS mg/L	Ca ICP/MS mg/L	Cd ICP/MS mg/L	Co ICP/MS mg/L	Cr ICP/MS mg/L	Cu ICP/MS mg/L
S1	<0.0005	156.	<0.0001	0.0011	<0.005	0.0025
S2	<0.0005	203.	<0.0001	0.0028	<0.005	0.0020
Blank	<0.0005	<0.5	<0.0001	<0.0001	<0.005	<0.0005
QC Standard (found)	0.0048	5.1	0.0501	0.0497	0.050	0.0568
QC Standard (expected)	0.0050	5.0	0.0500	0.0500	0.050	0.0500
Repeat S1	<0.0005	159.	<0.0001	0.0010	<0.005	0.0023



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Status: Final

Surface Water Samples

Sample Id	Fe ICP/MS mg/L	K ICP/MS mg/L	Mg ICP/MS mg/L	Mn ICP/MS mg/L	Mo ICP/MS mg/L	Na ICP/MS mg/L
S1	0.94	34.8	36.2	0.400	<0.001	68.5
S2	12.3	53.1	49.9	1.32	0.001	95.6
Blank	<0.03	<0.1	<0.05	<0.005	<0.001	<0.1
QC Standard (found)	0.98	0.9	0.96	0.049	0.052	4.8
QC Standard (expected)	1.00	1.0	1.00	0.050	0.050	5.0
Repeat S1	0.93	35.0	36.9	0.402	<0.001	68.1

Sample Id	Ni ICP/MS mg/L	Pb ICP/MS mg/L	Si ICP/MS mg/L	Sn ICP/MS mg/L	Sr ICP/MS mg/L	Ti ICP/MS mg/L
S1	0.005	0.0008	6.78	<0.001	0.825	0.042
S2	0.008	<0.0005	7.94	<0.001	1.02	0.050
Blank	<0.001	<0.0005	<0.05	<0.001	<0.001	<0.005
QC Standard (found)	0.050	0.0527	1.00	0.107	0.051	0.052
QC Standard (expected)	0.050	0.0500	1.00	0.100	0.050	0.050
Repeat S1	0.005	0.0007	6.76	<0.001	0.820	0.040

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Attn: Marie Gouthier
Project: 04-1120-712

PO #:

Received: 30-Dec-2004 08:38

Job: 2463638

Status: Final

Surface Water Samples

Sample Id	Tl	V	Zn
	ICP/MS mg/L	ICP/MS mg/L	ICP/MS mg/L
S1	<0.00005	0.0016	0.048
S2	0.00006	0.0021	0.075
Blank	<0.00005	<0.0005	<0.005
QC Standard (found)	0.103	0.0490	0.050
QC Standard (expected)	0.100	0.0500	0.050
Repeat S1	<0.00005	0.0016	0.046



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Job approved by:

Signed:

.....
Malgorzata Dancziger
Project Manager



APPENDIX C

**RESULTS OF FIELD AND LABORATORY
CHEMICAL AND PHYSICAL ANALYSES**

LIST OF ABBREVIATIONS

The abbreviations commonly employed on the "Chemical and Physical Analyses Data Sheets", on the figures, in the tables and in the text of the report as related to the water quality monitoring programs are as follows:

ODWQS	Ontario Drinking Water Quality Standards (Ministry of the Environment, 2003)
PWQO	Provincial Water Quality Objective (Ministry of the Environment, 1994a) (Includes Interim PWQO also)

N	nitrogen
P	phosphorus
CaCO ₃	calcium carbonate

C	degrees Celsius
microS/cm	microsiemens per centimetre
NTU	Nephelometric Turbidity Unit
TCU	True Colour Unit
mL	millilitre
mg/L	milligrams per litre
ppm	parts per million

COND.	conductivity
DIS. OXYGEN	dissolved oxygen
TKN	total kjeldahl nitrogen
BOD	biochemical oxygen demand
COD	chemical oxygen demand
DOC	dissolved organic carbon
EC	<i>Escherichia coli</i>
TOC	total organic carbon
TS	total solids
TSS	total suspended solids
TDS	total dissolved solids
TC	total coliform
FC	faecal coliform
FS	faecal streptococcus
BKGD	background

f (Alk)	PWQO related to alkalinity of surface water
f (Hardness)	PWQO related to hardness of surface water
f (Temp)	PWQO related to temperature of surface water
f (pH, Temp)	PWQO related to pH and temperature of surface water
f (pH)	PWQO related to pH of surface water

NA	not available

*	See Ministry of Environment (1994a) for narrative guideline

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sheet: 1

Sample Source: P1

Date Sampled:

14-Nov-1990

13-May-1999

Parameter	ODWQS		
Alkalinity (CaCO ₃)	30-500	280	Destroyed
Ammonia (as N)		0.28	
Bicarbonate		342.00	
Calcium		147.0	
Carbonate		<1.00	
Chloride	250	15.0	
COD		221	
Conductivity (uS/cm)		1088	
Copper	1	<0.0500	
DOC	5	13.6	
Fecal Coliform (per 100mL)	0	4	
Fecal Streptococci (per 100mL)		<2	
Hardness (CaCO ₃)	80-100	507	
Iron	0.3	0.10	
Lead	0.01	<0.0500	
Magnesium		34.00	
Manganese	0.05	1.380	
Mercury	0.001	<0.0001	
Nickel		<0.050	
Nitrate (as N)	10	<0.10	
pH (pH units)	6.5-8.5	7.6	
Phosphorus (total)		0.250	
Potassium		6.0	
Sodium	200	30.0	
Sulphate	500	278.0	
TDS	500	648	
Total Coliform (per 100mL)	0	10	
Zinc	5	<0.050	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: P2

Sheet: 1

Date Sampled: 14-Nov-1990 13-May-1999 26-Nov-2003 26-May-2004 25-Oct-2004

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	140	Not found	850	382	1180
Aluminum	0.1			<0.010	<0.005	0.005
Ammonia (as N)		<0.10		0.12	0.14	0.46
Barium	1			0.220	0.079	0.300
Beryllium				<0.001	<0.001	<0.001
Bicarbonate		171.00				
BOD				4.0	2.2	1.9
Boron	5			0.530	0.245	0.462
Cadmium	0.005			<0.0001	<0.0001	<0.0001
Calcium		37.0		237.0	84.1	249.0
Carbonate		<1.00				
Chloride	250	1.0		133.0	89.9	152.0
Chromium	0.05			0.008	<0.005	<0.005
Cobalt				0.0047	0.0017	0.0045
COD		74		71	50	81
Conductivity (uS/cm)		391		1550	1270	610
Copper	1	<0.0500		0.0350	0.0182	0.0148
DOC	5	1.7		26.1	17.1	36.1
Fecal Coliform (per 100mL)	0	<2				
Fecal Streptococci (per 100mL)		<2				
Hardness (CaCO ₃)	80-100	142		847	350	944
Iron	0.3	0.47		0.03	<0.03	0.04
Lead	0.01	<0.0500		<0.0010	<0.0005	0.0014
Magnesium		12.00		62.00	34.00	77.60
Manganese	0.05	0.100		1.600	<0.005	1.540
Mercury	0.001	<0.1000				
Molybdenum				<0.005	0.003	<0.001
Nickel		<0.050		0.030	0.010	0.023
Nitrate (as N)	10	<0.10		4.70	4.60	<0.20
Nitrite (as N)	1			<0.10	<0.20	<0.20
pH (pH units)	6.5-8.5	8.3		6.9	7.3	7.2
Phenols				<0.001	<0.005	0.001
Phosphate (as P)				0.21	<1.00	<1.00
Phosphorus (dissolved reactive)				0.070	<0.003	<0.003
Phosphorus (total)		0.770		2.150	<0.050	<0.050
Potassium		2.0		10.0	7.9	18.9
Silicon				11.90	6.02	8.94
Silver				<0.0001	<0.0001	<0.0001
Sodium	200	5.0		137.0	85.1	126.0
Strontium				1.420	0.578	1.310
Sulphate	500	14.0		13.0	10.0	10.7
TDS	500	180		1210	732	1298
Temperature (C)	15			7.0	9.5	7.0
Thallium				<0.00100	<0.00005	<0.00005
Tin				<0.010	<0.001	<0.001
Titanium				<0.010	<0.005	<0.005
Total Coliform (per 100mL)	0	2				
Vanadium				0.0070	<0.0100	0.0028
Zinc	5	<0.050		<0.010	<0.005	0.009

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: P3

Sheet: 1

Date Sampled: 14-Nov-1990 13-May-1999

Parameter	ODWQS		
Alkalinity (CaCO ₃)	30-500	110	Destroyed
Ammonia (as N)		<0.10	
Bicarbonate		119.00	
Calcium		21.0	
Carbonate		7.20	
Chloride	250	1.0	
COD		223	
Conductivity (uS/cm)		262	
Copper	1	<0.0500	
DOC	5	1.1	
Fecal Coliform (per 100mL)	0	36	
Fecal Streptococci (per 100mL)		<2	
Hardness (CaCO ₃)	80-100	77	
Iron	0.3	1.51	
Lead	0.01	<0.0500	
Magnesium		6.00	
Manganese	0.05	<0.050	
Mercury	0.001	<0.0001	
Nickel		<0.050	
Nitrate (as N)	10	<0.10	
pH (pH units)	6.5-8.5	8.4	
Phosphorus (total)		<0.100	
Potassium		2.0	
Sodium	200	5.0	
Sulphate	500	15.0	
TDS	500	156	
Total Coliform (per 100mL)	0	40	
Zinc	5	<0.050	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: P4

Sheet: 1

Date Sampled: 14-Nov-1990 13-May-1999 18-Oct-1999 25-Jul-2000 30-Oct-2000

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	134	DRY	DRY	DRY	DRY
Ammonia (as N)		<0.10				
Bicarbonate		163.00				
Calcium		56.0				
Carbonate		<1.00				
Chloride	250	51.0				
COD		62				
Conductivity (uS/cm)		542				
Copper	1	<0.0500				
DOC	5	2.2				
Fecal Coliform (per 100mL)	0	<2				
Fecal Streptococci (per 100mL)		<2				
Hardness (CaCO ₃)	80-100	189				
Iron	0.3	0.69				
Lead	0.01	<0.0500				
Magnesium		12.00				
Manganese	0.05	0.110				
Mercury	0.001	<0.0001				
Nickel		<0.050				
Nitrate (as N)	10	<0.10				
pH (pH units)	6.5-8.5	<7.8				
Phosphorus (total)		<0.100				
Potassium		3.0				
Sodium	200	8.0				
Sulphate	500	17.0				
TDS	500	300				
Total Coliform (per 100mL)	0	4				
Zinc	5	<0.050				

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G99-5

Sheet: 1

Date Sampled: 13-May-1999 18-Oct-1999 25-Jul-2000 30-Oct-2000

Parameter	ODWQS				
Alkalinity (CaCO ₃)	30-500	334	DRY	313	DRY
Aluminum	0.1	<0.030		<0.050	
Ammonia (as N)		0.03		0.15	
Barium	1	0.050		0.050	
Beryllium		<0.010		<0.002	
BOD				<1.0	
Boron	5	0.490		0.500	
Cadmium	0.005	<0.0050		<0.0001	
Calcium		240.0		299.0	
Chloride	250	31.0		27.0	
Chromium	0.05	0.040		<0.010	
Cobalt		<0.0100		0.0007	
COD		24		23	
Conductivity (uS/cm)		1000		1200	
Copper	1	<0.0050		0.0040	
DOC	5	10.4		8.2	
Hardness (CaCO ₃)	80-100	764		850	
Iron	0.3	0.09		0.06	
Lead	0.01	<0.0020		<0.0010	
Magnesium		40.00		25.00	
Manganese	0.05	0.010		<0.010	
Molybdenum		<0.010		<0.010	
Nickel		<0.010		<0.010	
Nitrate (as N)	10	<0.10		0.10	
Nitrite (as N)	1	<0.10		<0.10	
pH (pH units)	6.5-8.5	7.6		7.4	
Phenols		<0.001		<0.001	
Phosphate (as P)		<0.03		<0.01	
Phosphorus (total)		0.570		0.770	
Potassium		20.0		23.0	
Silicon		2.60		3.34	
Silver		<0.0100		<0.0001	
Sodium	200	32.0		22.0	
Strontium		0.818		1.020	
Sulphate	500	403.0		592.0	
Sulphur		117		200	
TDS	500	1004		1340	
Temperature (C)	15	9.0		14.0	
Thallium		<0.20000		<0.00100	
Tin		<0.050		<0.010	
Titanium		<0.010		<0.010	
Vanadium		<0.0100		0.0020	
Zinc	5	0.020		<0.010	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G99-6

Sheet: 1

Date Sampled: 13-May-1999 18-Oct-1999 25-Jul-2000 30-Oct-2000 15-May-2003

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	421	509	465	470	412
Aluminum	0.1	<0.030	<0.030	0.110	<0.050	<0.010
Ammonia (as N)		0.19	0.16	0.35	0.23	0.14
Barium	1	0.080	NA	0.090	0.070	0.060
Beryllium		<0.010	<0.010	<0.002	<0.002	<0.001
BOD				3.0	<1.0	<1.0
Boron	5	1.170	NA	1.030	0.900	0.970
Cadmium	0.005	<0.0050	<0.0050	<0.0001	<0.0001	<0.0001
Calcium		302.0	319.0	247.0	312.0	320.0
Chloride	250	49.0	51.0	38.0	33.0	39.0
Chromium	0.05	<0.010	<0.010	<0.010	<0.010	0.007
Cobalt		<0.0100	<0.0100	0.0017	0.0013	0.0012
COD		43	41	29	29	20
Conductivity (uS/cm)		1400	1300	1750	1825	1910
Copper	1	<0.0050	<0.0100	0.0010	0.0010	0.0030
DOC	5	15.6	14.6	11.3	11.1	8.0
Hardness (CaCO ₃)	80-100	1128	1183	959	1130	1110
Iron	0.3	0.31	0.87	0.95	1.70	0.72
Lead	0.01	<0.0020	<0.0020	<0.0010	<0.0010	<0.0010
Magnesium		91.00	94.00	83.00	85.00	75.00
Manganese	0.05	1.310	1.420	2.000	2.070	1.430
Molybdenum		<0.010	<0.010	<0.010	<0.010	0.005
Nickel		<0.010	<0.010	<0.010	<0.010	<0.005
Nitrate (as N)	10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.0	6.6	7.1	6.8	6.8
Phenols		0.004	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.03	<0.03	<0.01	<0.03	0.24
Phosphorus (dissolved reactive)						0.080
Phosphorus (total)		2.000	1.310	1.110	0.010	1.660
Potassium		13.0	13.0	14.0	16.0	18.0
Silicon		9.00	10.20	11.50	11.00	9.70
Silver		<0.0100	0.0100	<0.0001	<0.0001	<0.0001
Sodium	200	88.0	86.0	69.0	64.0	63.0
Strontium		0.976	1.010	1.060	1.060	0.854
Sulphate	500	743.0	665.0	640.0	621.0	723.0
Sulphur		212	229	229	207	
TDS	500	1664	1672	1492	1680	1410
Temperature (C)	15	26.0	21.0	26.0	12.0	18.0
Thallium		<0.20000	<0.20000	<0.00100	<0.00100	<0.00100
Tin		<0.050	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
Vanadium		<0.0100	<0.0100	0.0050	<0.0010	0.0020
Zinc	5	0.020	0.330	0.010	0.050	0.006

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G99-7

Sheet: 1

Date Sampled: 13-May-1999 18-Oct-1999 25-Jul-2000 30-Oct-2000 22-Jun-2001

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	1187	1398	1130	1160	1400
Aluminum	0.1	<0.030	0.120	<0.050	<0.050	<0.050
Ammonia (as N)		0.18	0.14	4.61	0.20	0.27
Barium	1	0.200	NA	0.160	0.160	0.150
Beryllium		<0.100	<0.010	<0.002	<0.002	<0.002
BOD				9.0	8.0	14.0
Boron	5	0.410	NA	0.430	<0.010	0.410
Cadmium	0.005	<0.0050	<0.0050	<0.0001	<0.0001	<0.0001
Calcium		320.0	335.0	274.0	318.0	388.0
Chloride	250	250.0	204.0	178.0	168.0	193.0
Chromium	0.05	<0.010	<0.010	<0.010	<0.010	0.019
Cobalt		<0.0100	<0.0100	0.0083	0.0109	0.0129
COD		114	143	122	127	161
Conductivity (uS/cm)		1900	1650	1950	2550	2820
Copper	1	<0.0050	<0.0100	<0.0010	0.0010	<0.0010
DOC	5	47.8	53.0	50.2	44.1	50.5
Hardness (CaCO ₃)	80-100	1185	1264	998	1150	1380
Iron	0.3	0.58	3.04	5.54	12.20	13.70
Lead	0.01	<0.0020	<0.0020	<0.0010	<0.0010	<0.0010
Magnesium		94.00	104.00	76.00	87.00	100.00
Manganese	0.05	1.450	1.680	1.830	2.200	2.310
Molybdenum		<0.010	<0.010	<0.010	<0.010	<0.010
Nickel		<0.010	<0.010	0.020	0.020	0.030
Nitrate (as N)	10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.1	6.9	7.1	7.3	7.1
Phenols		0.001	<0.001	<0.001	0.001	0.002
Phosphate (as P)		<0.03	0.03	0.03	0.04	<0.03
Phosphorus (dissolved reactive)						
Phosphorus (total)		3.980	0.600	1.370	0.020	2.320
Potassium		7.0	7.0	10.0	9.0	13.0
Silicon		8.80	12.30	14.50	15.50	11.90
Silver		<0.0100	0.0100	<0.0001	<0.0001	<0.0001
Sodium	200	197.0	194.0	165.0	191.0	185.0
Strontium		0.819	1.070	1.110	1.120	1.170
Sulphate	500	16.0	8.0	<3.0	3.0	3.0
Sulphur		7	4	4	1	
TDS	500	1664	1784	1520	1720	1810
Temperature (C)	15	9.0	8.0	16.0	11.0	12.0
Thallium		<0.20000	<0.20000	<0.00100	<0.00100	<0.00100
Tin		<0.050		<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
Vanadium		<0.0100	<0.0100	0.0110	0.0080	0.0070
Zinc	5	0.020	0.190	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G99-7

Sheet: 2

Date Sampled: 15-Oct-2001 21-Jun-2002 31-Oct-2002 15-May-2003 06-Nov-2003

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	1550	1250	1000	584	1140
Aluminum	0.1	<0.050	<0.010	<0.010	<0.010	<0.010
Ammonia (as N)		0.44	0.67	0.06	0.50	0.05
Barium	1	0.150	0.180	0.250	0.130	0.240
Beryllium		<0.002	<0.001	<0.001	<0.001	<0.001
BOD		11.0	9.0	<1.0	5.0	<1.0
Boron	5	0.530	0.570	0.310	0.290	0.540
Cadmium	0.005	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Calcium		405.0	299.0	207.0	136.0	228.0
Chloride	250	196.0	162.0	156.0	61.0	136.0
Chromium	0.05	0.026	0.035	0.033	0.008	0.028
Cobalt		0.0142	0.0093	0.0049	0.0034	0.0052
COD		174	123	57	40	56
Conductivity (uS/cm)		2950	1700	1820	1980	1850
Copper	1	0.0010	0.0030	0.0310	0.0120	0.0020
DOC	5	58.7	50.7	23.0	15.3	22.5
Hardness (CaCO ₃)	80-100	1500	1100	970	500	940
Iron	0.3	45.80	6.95	0.36	<0.01	0.10
Lead	0.01	<0.0010	<0.0010	<0.0010	<0.0010	0.0010
Magnesium		118.00	86.00	110.00	39.00	90.00
Manganese	0.05	2.250	1.540	0.155	0.367	1.300
Molybdenum		<0.010	<0.005	<0.005	<0.005	<0.005
Nickel		<0.010	<0.005	0.009	<0.005	0.025
Nitrate (as N)	10	<0.10	<0.10	0.79	<0.10	<0.10
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.0	7.2	7.0	7.2	6.5
Phenols		0.002	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.03	0.21	0.20	0.11	0.39
Phosphorus (dissolved reactive)			0.070	0.070	0.040	0.130
Phosphorus (total)		0.330	0.710	0.330	0.280	0.390
Potassium		11.0	23.0	24.0	14.0	19.0
Silicon		33.40	3.55	4.20	4.90	9.40
Silver		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	200	162.0	182.0	168.0	96.0	153.0
Strontium		3.370	1.020	0.906	0.484	1.110
Sulphate	500	<1.0	22.0	50.0	28.0	19.0
Sulphur						
TDS	500	1990	1610	1380	787	1350
Temperature (C)	15	11.0	13.0	8.0	9.0	8.7
Thallium		<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
Vanadium		0.0070	0.0110	0.0110	0.0030	0.0080
Zinc	5	<0.010	<0.005	<0.005	<0.005	<0.010

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G99-7

Sheet: 3

Date Sampled: 26-May-2004

Parameter	ODWQS	
Alkalinity (CaCO ₃)	30-500	466
Aluminum	0.1	<0.005
Ammonia (as N)		0.19
Barium	1	0.112
Beryllium		<0.001
BOD		<0.5
Boron	5	0.220
Cadmium	0.005	<0.0001
Calcium		90.6
Chloride	250	50.1
Chromium	0.05	<0.005
Cobalt		0.0024
COD		30
Conductivity (uS/cm)		691
Copper	1	0.0014
DOC	5	9.9
Hardness (CaCO ₃)	80-100	345
Iron	0.3	<0.03
Lead	0.01	0.0008
Magnesium		28.70
Manganese	0.05	0.507
Molybdenum		0.001
Nickel		0.009
Nitrate (as N)	10	0.20
Nitrite (as N)	1	<0.20
pH (pH units)	6.5-8.5	7.5
Phenols		0.001
Phosphate (as P)		<1.00
Phosphorus (dissolved reactive)		<0.003
Phosphorus (total)		<0.050
Potassium		11.1
Silicon		5.23
Silver		<0.0001
Sodium	200	53.3
Strontium		0.432
Sulphate	500	2.6
Sulphur		
TDS	500	550
Temperature (C)	15	8.1
Thallium		<0.00005
Tin		<0.001
Titanium		<0.005
Vanadium		<0.0100
Zinc	5	0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G99-8

Sheet: 1

Date Sampled:

13-May-1999

18-Oct-1999

25-Jul-2000

30-Oct-2000

Parameter	ODWQS				
Alkalinity (CaCO ₃)	30-500	159	128	86	50
Aluminum	0.1	0.030	3.270	0.310	0.270
Ammonia (as N)		0.55	0.28	0.29	0.19
Barium	1	0.050	NA	0.030	0.030
Beryllium		<0.010	<0.010	<0.002	<0.002
BOD				<1.0	3.0
Boron	5	0.030	NA	<0.010	<0.010
Cadmium	0.005	<0.0050	<0.0050	<0.0001	<0.0001
Calcium		44.0	27.0	26.0	25.0
Chloride	250	16.0	14.0	22.0	27.0
Chromium	0.05	<0.010	<0.010	<0.010	<0.010
Cobalt		<0.0100	<0.0100	0.0016	0.0004
COD		62	68	44	60
Conductivity (uS/cm)		280	210	305	380
Copper	1	<0.0050	<0.0100	0.0020	0.0020
DOC	5	18.9	22.7	16.4	9.7
Hardness (CaCO ₃)	80-100	159	113	119	112
Iron	0.3	14.50	18.50	14.00	20.40
Lead	0.01	<0.0020	0.0030	<0.0010	<0.0010
Magnesium		12.00	11.00	13.00	12.00
Manganese	0.05	0.270	0.340	0.320	0.320
Molybdenum		<0.010	<0.010	<0.010	<0.010
Nickel		<0.010	<0.010	<0.010	<0.010
Nitrate (as N)	10	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.0	6.7	7.1	7.4
Phenols		<0.001	0.001	<0.001	<0.001
Phosphate (as P)		0.09	0.51	0.17	0.42
Phosphorus (total)		7.030	0.550	0.940	0.070
Potassium		2.0	2.0	2.0	3.0
Silicon		6.80	11.00	9.61	9.42
Silver		<0.0100	0.0100	<0.0001	<0.0001
Sodium	200	17.0	27.0	13.0	11.0
Strontium		0.077	0.090	0.080	0.093
Sulphate	500	26.0	18.0	23.0	41.0
Sulphur		12	6	9	14
TDS	500	232	276	184	244
Temperature (C)	15	8.5	5.0	13.0	10.0
Thallium		<0.20000	<0.20000	<0.00100	<0.00100
Tin		<0.050		<0.010	<0.010
Titanium		<0.010	<0.010	0.010	0.010
Vanadium		0.0300	<0.0100	0.0050	0.0050
Zinc	5	0.010	0.200	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sheet: 1

Sample Source: G00-3

Date Sampled:

25-Jul-2000

30-Oct-2000

Parameter	ODWQS		
Alkalinity (CaCO ₃)	30-500	DRY	178
Aluminum	0.1		1.520
Ammonia (as N)			0.37
Barium	1		0.070
Beryllium			<0.002
BOD			8.0
Boron	5		<0.010
Cadmium	0.005		<0.0001
Calcium			45.0
Chloride	250		1.0
Chromium	0.05		<0.010
Cobalt			0.0010
COD			31
Conductivity (uS/cm)			340
Copper	1		0.0010
DOC	5		11.5
Hardness (CaCO ₃)	80-100		154
Iron	0.3		6.40
Lead	0.01		0.0010
Magnesium			10.00
Manganese	0.05		0.260
Molybdenum			<0.010
Nickel			<0.010
Nitrate (as N)	10		<0.10
Nitrite (as N)	1		<0.10
pH (pH units)	6.5-8.5		7.5
Phenols			<0.001
Phosphate (as P)			0.23
Phosphorus (total)			0.290
Potassium			3.0
Silicon			13.60
Silver			<0.0001
Sodium	200		28.0
Strontium			0.127
Sulphate	500		22.0
Sulphur			7
TDS	500		248
Temperature (C)	15		11.0
Thallium			<0.00100
Tin			<0.010
Titanium			0.050
Vanadium			0.0080
Zinc	5		<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G00-4A

Sheet: 1

Date Sampled: 25-Jul-2000 30-Oct-2000 22-Jun-2001 15-Oct-2001 21-Jun-2002

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	DRY	162	147	227	181
Aluminum	0.1		3.290	5.040	<0.050	1.630
Ammonia (as N)			0.62	0.53	1.42	0.63
Barium	1		0.030	0.020	<0.010	0.020
Beryllium			<0.002	<0.002	<0.002	<0.001
BOD			6.0	13.0	7.0	8.0
Boron	5		<0.010	0.050	0.150	0.150
Cadmium	0.005		<0.0001	<0.0001	<0.0001	0.0001
Calcium			15.0	17.0	9.0	10.0
Chloride	250		1.0	19.0	1.0	1.0
Chromium	0.05		0.010	0.006	<0.001	0.014
Cobalt			0.0018	0.0011	<0.0002	0.0008
COD			34	11	13	45
Conductivity (uS/cm)			360	400	460	520
Copper	1		0.0020	0.0050	0.0030	0.0020
DOC	5		6.8	4.0	6.8	8.9
Hardness (CaCO ₃)	80-100		87	108	47	54
Iron	0.3		4.66	2.13	0.05	1.16
Lead	0.01		0.0010	0.0010	<0.0010	<0.0010
Magnesium			12.00	16.00	6.00	7.00
Manganese	0.05		0.130	0.040	0.020	0.021
Molybdenum			<0.010	<0.010	<0.010	0.009
Nickel			<0.010	<0.010	<0.010	<0.005
Nitrate (as N)	10		<0.10	1.16	<0.10	0.47
Nitrite (as N)	1		<0.10	0.16	<0.10	<0.10
pH (pH units)	6.5-8.5		7.4	7.2	7.3	7.7
Phenols			<0.001	<0.001	0.000	<0.001
Phosphate (as P)			0.16	0.17	0.26	0.33
Phosphorus (dissolved reactive)						0.110
Phosphorus (total)			0.280	0.060	6.820	8.610
Potassium			15.0	12.0	5.0	6.0
Silicon			8.68	13.90	4.16	10.30
Silver			<0.0001	<0.0001	<0.0001	<0.0001
Sodium	200		64.0	50.0	64.0	61.0
Strontium			0.090	0.053	0.056	0.069
Sulphate	500		18.0	20.0	11.0	12.0
Sulphur			6			
TDS	500		224	230	232	214
Temperature (C)	15		10.0	9.0	10.0	13.0
Thallium			<0.00100	<0.00100	<0.00100	<0.00100
Tin			<0.010	<0.010	<0.010	<0.010
Titanium			0.070	0.130	<0.010	0.090
Vanadium			0.0020	0.0080	0.0020	0.0070
Zinc	5		0.020	0.010	<0.010	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G00-4A

Sheet: 2

Date Sampled: 31-Oct-2002 15-May-2003 06-Nov-2003 26-May-2004 25-Oct-2004

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	227	185	176	163	178
Aluminum	0.1	0.060	0.050	0.150	0.058	0.137
Ammonia (as N)		0.69	0.49	1.03	0.41	0.93
Barium	1	<0.010	<0.010	<0.010	0.007	0.005
Beryllium		<0.001	<0.001	<0.001	<0.001	<0.001
BOD		5.0	5.0	9.0	2.3	7.4
Boron	5	0.100	0.130	0.150	0.126	0.134
Cadmium	0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		7.0	8.0	11.0	7.1	6.3
Chloride	250	1.0	1.0	2.0	0.5	0.6
Chromium	0.05	0.001	0.001	0.002	<0.005	<0.005
Cobalt		<0.0002	<0.0002	<0.0002	<0.0001	0.0001
COD		7	22	<5	24	44
Conductivity (uS/cm)		600	230	340	260	380
Copper	1	0.0010	0.0010	0.0180	0.0006	0.0012
DOC	5	4.5	5.2	3.4	3.7	5.0
Hardness (CaCO ₃)	80-100	38	41	48	40	35
Iron	0.3	0.04	0.04	0.11	<0.03	0.10
Lead	0.01	<0.0010	0.0010	0.0020	0.0006	0.0007
Magnesium		5.00	5.00	5.00	5.28	4.67
Manganese	0.05	0.022	0.017	0.020	0.015	0.018
Molybdenum		0.007	0.008	0.006	0.006	0.005
Nickel		<0.005	<0.005	<0.005	0.002	0.002
Nitrate (as N)	10	0.10	0.23	<0.10	0.30	0.30
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.20	<0.20
pH (pH units)	6.5-8.5	7.4	8.1	8.5	8.3	7.6
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		1.54	0.32	0.11	<1.00	<1.00
Phosphorus (dissolved reactive)		0.510	0.110	0.040	0.207	0.225
Phosphorus (total)		6.080	10.400	0.980	0.130	0.220
Potassium		5.0	5.0	8.0	3.9	3.8
Silicon		4.10	4.90	6.40	4.19	5.06
Silver		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	200	80.0	68.0	65.0	53.6	61.4
Strontium		0.065	0.070	0.053	0.062	0.055
Sulphate	500	12.0	18.0	27.0	6.6	5.9
Sulphur						
TDS	500	216	215	221	444	302
Temperature (C)	15	6.0	8.0	8.3	9.7	8.0
Thallium		<0.00100	<0.00100	<0.00100	<0.00005	<0.00005
Tin		<0.010	<0.010	<0.010	<0.001	<0.001
Titanium		<0.010	<0.010	<0.010	<0.005	0.009
Vanadium		0.0040	0.0030	0.0040	0.0043	0.0011
Zinc	5	<0.005	<0.005	0.010	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G00-4B

Sheet: 1

Date Sampled: 25-Jul-2000 30-Oct-2000 22-Jun-2001 15-Oct-2001 21-Jun-2002

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	113	121	200	124	119
Aluminum	0.1	1.440	1.220	2.310	<0.050	2.750
Ammonia (as N)		0.63	0.44	0.62	0.59	0.42
Barium	1	0.020	0.020	0.020	<0.010	0.040
Beryllium		<0.002	<0.002	<0.002	<0.002	<0.001
BOD		4.0	4.0	11.0	5.0	5.0
Boron	5	0.050	0.050	0.120	0.070	0.060
Cadmium	0.005	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Calcium		16.0	21.0	10.0	16.0	17.0
Chloride	250	2.0	1.0	2.0	1.0	1.0
Chromium	0.05	<0.010	<0.010	0.004	<0.001	0.004
Cobalt		0.0011	0.0007	0.0015	<0.0002	0.0030
COD		13	13	26	5	22
Conductivity (uS/cm)		300	280	280	310	600
Copper	1	0.0030	<0.0010	0.0050	<0.0010	0.0020
DOC	5	4.4	3.3	6.5	2.2	3.4
Hardness (CaCO ₃)	80-100	81	90	50	73	71
Iron	0.3	1.61	1.69	2.47	0.01	5.49
Lead	0.01	0.0010	<0.0010	0.0010	<0.0010	0.0030
Magnesium		10.00	9.00	8.00	8.00	7.00
Manganese	0.05	0.080	0.080	0.080	0.020	0.286
Molybdenum		0.030	<0.010	<0.010	0.010	<0.005
Nickel		<0.010	<0.010	<0.010	<0.010	<0.005
Nitrate (as N)	10	<0.10	<0.10	0.71	<0.10	<0.10
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	8.2	7.4	7.5	7.4	7.4
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.67	0.17	0.31	0.20	0.45
Phosphorus (dissolved reactive)						0.150
Phosphorus (total)		0.140	0.180	7.170	2.580	5.530
Potassium		10.0	6.0	6.0	3.0	4.0
Silicon		6.99	8.27	5.71	5.96	2.54
Silver		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	200	50.0	34.0	68.0	28.0	27.0
Strontium		0.087	0.109	0.073	0.082	0.144
Sulphate	500	23.0	21.0	16.0	9.0	10.0
Sulphur		10	7			
TDS	500	888	240	250	160	151
Temperature (C)	15	16.0	11.0	11.0	10.0	12.0
Thallium		<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		0.120	0.050	0.030	<0.010	0.060
Vanadium		0.0030	0.0010	0.0060	0.0020	0.0050
Zinc	5	<0.010	<0.010	0.010	<0.010	0.015

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G00-4B

Sheet: 2

Date Sampled: 31-Oct-2002 15-May-2003 06-Nov-2003 26-May-2004 25-Oct-2004

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	130	124	127	122	120
Aluminum	0.1	0.220	<0.010	0.020	0.132	0.051
Ammonia (as N)		0.46	0.41	0.41	0.55	0.26
Barium	1	<0.010	<0.010	<0.010	0.008	0.006
Beryllium		<0.001	<0.001	<0.001	<0.001	<0.001
BOD		6.0	<1.0	<1.0	<0.5	1.7
Boron	5	<0.050	0.080	0.060	0.035	0.045
Cadmium	0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		14.0	16.0	14.0	14.2	13.3
Chloride	250	1.0	1.0	2.0	1.0	1.2
Chromium	0.05	0.001	<0.001	0.002	<0.005	<0.005
Cobalt		0.0002	<0.0002	<0.0002	0.0001	<0.0001
COD		8	5	9	29	9
Conductivity (uS/cm)		680	280	255	186	490
Copper	1	<0.0010	<0.0010	<0.0010	<0.0005	0.0005
DOC	5	2.2	3.0	1.9	2.6	3.5
Hardness (CaCO ₃)	80-100	64	73	64	64	59
Iron	0.3	0.22	<0.01	<0.01	0.14	0.04
Lead	0.01	<0.0010	<0.0010	<0.0010	0.0008	0.0007
Magnesium		7.00	8.00	7.00	6.88	6.27
Manganese	0.05	0.034	0.023	0.020	0.027	0.028
Molybdenum		<0.005	0.006	<0.005	0.003	0.002
Nickel		<0.005	<0.005	<0.005	<0.001	0.001
Nitrate (as N)	10	<0.10	<0.10	<0.10	0.40	0.20
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.20	<0.20
pH (pH units)	6.5-8.5	7.1	8.2	7.9	8.4	7.8
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.47	0.30	0.30	<1.00	<1.00
Phosphorus (dissolved reactive)		0.160	0.100	0.100	0.103	0.179
Phosphorus (total)		4.770	0.170	0.330	0.203	0.170
Potassium		3.0	4.0	5.0	2.6	2.4
Silicon		6.20	6.70	10.20	5.93	7.35
Silver		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	200	38.0	29.0	30.0	27.6	29.3
Strontium		0.075	0.080	0.099	0.080	0.074
Sulphate	500	9.0	26.0	20.0	10.1	8.1
Sulphur						
TDS	500	161	161	166	190	184
Temperature (C)	15	7.0	8.0	9.9	7.4	7.0
Thallium		<0.00100	<0.00100	<0.00100	<0.00005	<0.00005
Tin		<0.010	<0.010	<0.010	<0.001	<0.001
Titanium		0.010	<0.010	<0.010	0.010	<0.005
Vanadium		0.0030	0.0020	0.0030	0.0027	<0.0005
Zinc	5	<0.005	<0.005	<0.010	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G00-4C

Sheet: 1

Date Sampled: 25-Jul-2000 30-Oct-2000

Parameter	ODWQS		
Alkalinity (CaCO ₃)	30-500	174	164
Aluminum	0.1	0.520	1.150
Ammonia (as N)		0.14	0.04
Barium	1	0.040	0.060
Beryllium		<0.002	<0.002
BOD		5.0	3.0
Boron	5	<0.010	<0.010
Cadmium	0.005	<0.0001	<0.0001
Calcium		40.0	42.0
Chloride	250	2.0	2.0
Chromium	0.05	<0.010	<0.010
Cobalt		0.0011	0.0011
COD		21	8
Conductivity (uS/cm)		310	320
Copper	1	0.0020	0.0050
DOC	5	5.1	3.2
Hardness (CaCO ₃)	80-100	154	159
Iron	0.3	0.54	1.74
Lead	0.01	<0.0010	<0.0010
Magnesium		13.00	13.00
Manganese	0.05	0.040	<0.010
Molybdenum		<0.010	<0.010
Nickel		<0.010	<0.010
Nitrate (as N)	10	<0.10	0.10
Nitrite (as N)	1	<0.10	<0.10
pH (pH units)	6.5-8.5	8.2	7.1
Phenols		<0.001	<0.001
Phosphate (as P)		0.02	0.11
Phosphorus (total)		2.260	0.260
Potassium		2.0	2.0
Silicon		11.70	12.20
Silver		<0.0001	<0.0001
Sodium	200	7.0	7.0
Strontium		0.099	0.102
Sulphate	500	12.0	15.0
Sulphur		4	5
TDS	500	236	232
Temperature (C)	15	17.0	12.0
Thallium		<0.00100	<0.00100
Tin		<0.010	<0.010
Titanium		0.030	0.040
Vanadium		0.0020	0.0010
Zinc	5	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-1A

Sheet: 1

Date Sampled: 21-Jun-2002 31-Oct-2002 28-Nov-2002 15-May-2003 06-Nov-2003

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	99	DRY	119	123	110
Aluminum	0.1	0.020		0.020	<0.010	0.010
Ammonia (as N)		0.42		0.12	0.22	0.13
Barium	1	<0.010		0.010	<0.010	<0.010
Beryllium		<0.001		<0.001	<0.001	<0.001
BOD		<1.0		<1.0	4.0	<1.0
Boron	5	0.110		0.080	<0.050	0.050
Cadmium	0.005	<0.0001		<0.0001	<0.0001	<0.0001
Calcium		14.0		18.0	23.0	15.0
Chloride	250	4.0		2.0	2.0	2.0
Chromium	0.05	<0.001		<0.001	<0.001	0.001
Cobalt		0.0003		<0.0002	<0.0002	<0.0002
COD		9		<5	<5	<5
Conductivity (uS/cm)		400		300	420	245
Copper	1	0.0020		0.0040	0.0020	0.0030
DOC	5	3.8		3.0	1.4	1.6
Hardness (CaCO ₃)	80-100	64		82	164	70
Iron	0.3	<0.01		<0.01	<0.01	<0.01
Lead	0.01	<0.0010		<0.0010	<0.0010	<0.0010
Magnesium		7.00		9.00	26.00	8.00
Manganese	0.05	0.015		0.018	0.021	<0.010
Molybdenum		0.012		0.010	0.009	<0.005
Nickel		<0.005		<0.005	<0.005	<0.005
Nitrate (as N)	10	0.17		1.63	0.16	0.34
Nitrite (as N)	1	<0.10		<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.7		8.2	7.5	7.3
Phenols		<0.001		<0.001	<0.001	<0.001
Phosphate (as P)		0.76		0.60	0.41	0.60
Phosphorus (dissolved reactive)		0.250		0.200	0.140	0.200
Phosphorus (total)		4.030		5.540	0.600	2.890
Potassium		7.0		5.0	17.0	7.0
Silicon		6.68		5.00	5.80	8.90
Silver		<0.0001		<0.0001	<0.0001	<0.0001
Sodium	200	27.0		35.0	43.0	37.0
Strontium		0.077		0.116	0.057	0.089
Sulphate	500	26.0		50.0	130.0	35.0
TDS	500	144		218	159	159
Temperature (C)	15	12.0		8.1	8.0	9.4
Thallium		<0.00100		<0.00100	<0.00100	<0.00100
Tin		<0.010		<0.010	<0.010	<0.010
Titanium		<0.010		<0.010	<0.010	<0.010
Vanadium		0.0040		0.0040	0.0040	0.0040
Zinc	5	<0.005		<0.005	<0.005	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-1A

Sheet: 2

Date Sampled: 26-May-2004 25-Oct-2004

Parameter	ODWQS		
Alkalinity (CaCO ₃)	30-500	99	99
Aluminum	0.1	0.019	0.007
Ammonia (as N)		0.23	0.19
Barium	1	0.008	0.007
Beryllium		<0.001	<0.001
BOD		<0.5	2.5
Boron	5	0.036	0.047
Cadmium	0.005	<0.0001	<0.0001
Calcium		12.0	12.7
Chloride	250	0.6	0.8
Chromium	0.05	<0.005	<0.005
Cobalt		0.0001	<0.0001
COD		12	57
Conductivity (uS/cm)		168	400
Copper	1	0.0010	0.0013
DOC	5	1.3	18.4
Hardness (CaCO ₃)	80-100	54	56
Iron	0.3	<0.03	0.03
Lead	0.01	0.0006	<0.0005
Magnesium		5.83	5.93
Manganese	0.05	0.027	0.031
Molybdenum		0.004	0.003
Nickel		<0.001	0.001
Nitrate (as N)	10	0.20	0.20
Nitrite (as N)	1	<0.20	<0.20
pH (pH units)	6.5-8.5	8.1	7.2
Phenols		0.001	<0.001
Phosphate (as P)		<1.00	<1.00
Phosphorus (dissolved reactive)		0.154	0.235
Phosphorus (total)		0.170	0.200
Potassium		2.6	2.9
Silicon		5.10	6.01
Silver		<0.0001	<0.0001
Sodium	200	23.3	24.1
Strontium		0.073	0.077
Sulphate	500	13.9	12.6
TDS	500	204	168
Temperature (C)	15	7.3	8.0
Thallium		<0.00005	<0.00005
Tin		<0.001	<0.001
Titanium		<0.005	<0.005
Vanadium		0.0042	0.0028
Zinc	5	<0.005	0.008

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-1B

Sheet: 1

Date Sampled: 21-Jun-2002 31-Oct-2002 28-Nov-2002 15-May-2003 06-Nov-2003

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	387	DRY	228	310	247
Aluminum	0.1	<0.010		<0.010	<0.010	<0.010
Ammonia (as N)		0.10		0.04	0.08	0.30
Barium	1	0.080		0.040	0.050	0.050
Beryllium		<0.001		<0.001	<0.001	<0.001
BOD		1.0		<1.0	<1.0	<1.0
Boron	5	0.040		<0.050	<0.050	<0.010
Cadmium	0.005	<0.0001		<0.0001	<0.0001	<0.0001
Calcium		112.0		68.0	87.0	75.0
Chloride	250	3.0		<1.0	1.0	<1.0
Chromium	0.05	0.003		0.001	0.002	0.006
Cobalt		0.0028		<0.0002	<0.0002	<0.0002
COD		8		9	<5	<5
Conductivity (uS/cm)		320		420	360	460
Copper	1	0.0030		0.0040	0.0030	0.0050
DOC	5	4.3		3.4	2.6	1.9
Hardness (CaCO ₃)	80-100	407		236	300	241
Iron	0.3	<0.01		<0.01	<0.01	<0.01
Lead	0.01	<0.0010		<0.0010	<0.0010	<0.0010
Magnesium		31.00		16.00	20.00	13.00
Manganese	0.05	0.314		<0.005	<0.005	<0.010
Molybdenum		0.005		<0.005	<0.005	<0.005
Nickel		<0.005		<0.005	<0.005	<0.005
Nitrate (as N)	10	0.13		<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.10		<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.9		7.8	7.6	7.0
Phenols		<0.001		<0.001	<0.001	<0.001
Phosphate (as P)		0.15		0.14	0.04	<0.03
Phosphorus (dissolved reactive)		0.050		0.050	0.010	<0.010
Phosphorus (total)		2.220		2.050	7.000	5.320
Potassium		6.0		3.0	4.0	4.0
Silicon		4.71		2.10	2.80	3.40
Silver		<0.0001		<0.0001	<0.0001	<0.0001
Sodium	200	6.0		6.0	13.0	15.0
Strontium		0.315		0.152	0.216	0.173
Sulphate	500	39.0		51.0	49.0	23.0
TDS	500	488		320	400	315
Temperature (C)	15	13.0		6.0	8.0	8.3
Thallium		<0.00100		<0.00100	<0.00100	<0.00100
Tin		<0.010		<0.010	<0.010	<0.010
Titanium		<0.010		<0.010	<0.010	<0.010
Vanadium		0.0010		<0.0010	0.0010	0.0020
Zinc	5	<0.005		<0.005	<0.005	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-1B

Sheet: 2

Date Sampled: 26-May-2004 25-Oct-2004

Parameter	ODWQS		
Alkalinity (CaCO ₃)	30-500	338	398
Aluminum	0.1	<0.005	0.006
Ammonia (as N)		<0.03	0.07
Barium	1	0.067	0.076
Beryllium		<0.001	<0.001
BOD		<0.5	<0.5
Boron	5	<0.005	0.011
Cadmium	0.005	<0.0001	<0.0001
Calcium		102.0	104.0
Chloride	250	0.6	<0.5
Chromium	0.05	<0.005	<0.005
Cobalt		<0.0001	<0.0001
COD		8	6
Conductivity (uS/cm)		542	440
Copper	1	0.0025	0.0029
DOC	5	2.2	3.4
Hardness (CaCO ₃)	80-100	385	390
Iron	0.3	<0.03	0.04
Lead	0.01	0.0007	0.0006
Magnesium		31.10	31.20
Manganese	0.05	0.008	<0.005
Molybdenum		<0.001	0.001
Nickel		0.001	0.002
Nitrate (as N)	10	<0.20	<0.20
Nitrite (as N)	1	<0.20	<0.20
pH (pH units)	6.5-8.5	7.2	7.1
Phenols		<0.001	<0.001
Phosphate (as P)		<1.00	<1.00
Phosphorus (dissolved reactive)		<0.003	<0.003
Phosphorus (total)		<0.050	<0.050
Potassium		5.1	5.7
Silicon		3.13	3.88
Silver		<0.0001	<0.0001
Sodium	200	6.1	13.3
Strontium		0.307	0.320
Sulphate	500	30.4	35.9
TDS	500	378	436
Temperature (C)	15	9.2	8.0
Thallium		<0.00005	<0.00005
Tin		<0.001	<0.001
Titanium		<0.005	<0.005
Vanadium		<0.0100	0.0006
Zinc	5	0.010	0.007

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-2

Sheet: 1

Date Sampled: 21-Jun-2002 31-Oct-2002 28-Nov-2002 15-May-2003 06-Nov-2003

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	423	DRY	333	358	325
Aluminum	0.1	<0.010		<0.010	<0.010	<0.010
Ammonia (as N)		0.24		<0.02	0.04	<0.02
Barium	1	0.060		0.060	0.040	0.040
Beryllium		<0.001		<0.001	<0.001	<0.001
BOD		1.0		<1.0	3.0	<1.0
Boron	5	0.110		<0.050	<0.050	0.020
Cadmium	0.005	<0.0001		0.0001	0.0001	<0.0001
Calcium		86.0		174.0	169.0	126.0
Chloride	250	9.0		<1.0	1.0	1.0
Chromium	0.05	0.003		0.002	0.003	0.007
Cobalt		0.0019		0.0003	0.0003	0.0016
COD		15		<5	<5	7
Conductivity (uS/cm)		450		1200	400	840
Copper	1	0.0040		0.0040	0.0050	0.0040
DOC	5	5.0		2.6	2.3	3.1
Hardness (CaCO ₃)	80-100	400		855	743	619
Iron	0.3	<0.01		<0.01	<0.01	0.10
Lead	0.01	<0.0010		<0.0010	<0.0010	<0.0010
Magnesium		45.00		102.00	78.00	74.00
Manganese	0.05	0.129		0.082	0.048	0.230
Molybdenum		0.018		0.007	0.007	<0.005
Nickel		<0.005		<0.005	<0.005	<0.005
Nitrate (as N)	10	0.11		<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.10		<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.7		7.5	7.5	6.6
Phenols		<0.001		<0.001	<0.001	<0.001
Phosphate (as P)		0.40		0.12	0.19	0.07
Phosphorus (dissolved reactive)		0.130		0.040	0.060	0.020
Phosphorus (total)		5.070		2.780	4.970	0.980
Potassium		10.0		12.0	10.0	12.0
Silicon		8.04		2.60	3.10	5.20
Silver		<0.0001		<0.0001	<0.0001	<0.0001
Sodium	200	117.0		21.0	20.0	18.0
Strontium		0.509		0.790	0.619	0.582
Sulphate	500	225.0		651.0	402.0	294.0
TDS	500	748		1130	861	676
Temperature (C)	15	12.0		6.0	9.0	8.8
Thallium		<0.00100		<0.00100	<0.00100	<0.00100
Tin		<0.010		<0.010	<0.010	<0.010
Titanium		<0.010		<0.010	<0.010	<0.010
Vanadium		0.0030		0.0020	0.0020	0.0030
Zinc	5	0.006		<0.005	<0.005	<0.010

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-2

Sheet: 2

Date Sampled: 26-May-2004

Parameter	ODWQS	
Alkalinity (CaCO ₃)	30-500	456
Aluminum	0.1	<0.005
Ammonia (as N)		<0.03
Barium	1	0.054
Beryllium		<0.001
BOD		1.4
Boron	5	0.029
Cadmium	0.005	<0.0001
Calcium		153.0
Chloride	250	0.5
Chromium	0.05	<0.005
Cobalt		0.0008
COD		10
Conductivity (uS/cm)		954
Copper	1	<0.0005
DOC	5	2.2
Hardness (CaCO ₃)	80-100	735
Iron	0.3	0.75
Lead	0.01	0.0007
Magnesium		85.50
Manganese	0.05	0.486
Molybdenum		0.004
Nickel		0.003
Nitrate (as N)	10	<0.20
Nitrite (as N)	1	<0.20
pH (pH units)	6.5-8.5	7.1
Phenols		<0.001
Phosphate (as P)		<1.00
Phosphorus (dissolved reactive)		<0.003
Phosphorus (total)		<0.050
Potassium		10.5
Silicon		4.58
Silver		<0.0001
Sodium	200	26.9
Strontium		0.803
Sulphate	500	315.0
TDS	500	846
Temperature (C)	15	9.3
Thallium		<0.00005
Tin		<0.001
Titanium		<0.005
Vanadium		<0.0100
Zinc	5	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-3

Sheet: 1

Date Sampled: 21-Jun-2002 31-Oct-2002 28-Nov-2002 15-May-2003 06-Nov-2003

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	545	DRY	254	402	375
Aluminum	0.1	<0.010		<0.010	<0.010	<0.010
Ammonia (as N)		0.22		0.09	0.08	0.05
Barium	1	0.080		0.030	0.050	0.040
Beryllium		<0.001		<0.001	<0.001	<0.001
BOD		4.0		-	4.0	<1.0
Boron	5	0.120		<0.050	<0.050	0.050
Cadmium	0.005	<0.0001		<0.0001	0.0002	<0.0001
Calcium		134.0		75.0	128.0	170.0
Chloride	250	75.0		64.0	43.0	43.0
Chromium	0.05	0.012		0.004	0.004	0.005
Cobalt		0.0045		0.0004	0.0013	0.0004
COD		20		17	10	18
Conductivity (uS/cm)		1000		800	1060	1100
Copper	1	0.0040		0.0110	0.0090	0.0100
DOC	5	13.3		7.2	5.5	6.1
Hardness (CaCO ₃)	80-100	553		307	480	672
Iron	0.3	0.05		<0.01	<0.01	<0.01
Lead	0.01	<0.0010		<0.0010	0.0010	<0.0010
Magnesium		53.00		29.00	39.00	60.00
Manganese	0.05	0.758		<0.005	0.344	<0.010
Molybdenum		0.011		0.006	<0.005	<0.005
Nickel		<0.005		<0.005	<0.005	0.006
Nitrate (as N)	10	<0.10		<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.10		<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.3		7.7	7.4	6.6
Phenols		<0.001		<0.001	<0.001	<0.001
Phosphate (as P)		0.19		<0.03	0.16	0.09
Phosphorus (dissolved reactive)		0.060		<0.010	0.050	0.030
Phosphorus (total)		1.190		7.810	5.410	1.900
Potassium		8.0		6.0	5.0	9.0
Silicon		6.92		1.50	3.00	4.20
Silver		<0.0001		<0.0001	<0.0001	<0.0001
Sodium	200	133.0		86.0	68.0	62.0
Strontium		0.624		0.253	0.354	0.476
Sulphate	500	190.0		166.0	147.0	319.0
TDS	500	956		631	702	910
Temperature (C)	15	12.0		5.6	9.0	7.2
Thallium		<0.00100		<0.00100	<0.00100	<0.00100
Tin		<0.010		<0.010	<0.010	<0.010
Titanium		<0.010		<0.010	<0.010	<0.010
Vanadium		0.0050		0.0020	0.0020	0.0020
Zinc	5	0.010		<0.005	0.007	<0.010

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-3

Sheet: 2

Date Sampled: 26-May-2004

Parameter	ODWQS	
Alkalinity (CaCO ₃)	30-500	714
Aluminum	0.1	<0.005
Ammonia (as N)		<0.03
Barium	1	0.033
Beryllium		<0.001
BOD		0.7
Boron	5	0.063
Cadmium	0.005	<0.0001
Calcium		343.0
Chloride	250	70.4
Chromium	0.05	<0.005
Cobalt		0.0026
COD		23
Conductivity (uS/cm)		1830
Copper	1	0.0022
DOC	5	7.4
Hardness (CaCO ₃)	80-100	1469
Iron	0.3	<0.03
Lead	0.01	0.0009
Magnesium		148.00
Manganese	0.05	0.537
Molybdenum		<0.001
Nickel		0.012
Nitrate (as N)	10	<0.20
Nitrite (as N)	1	<0.20
pH (pH units)	6.5-8.5	7.0
Phenols		0.001
Phosphate (as P)		<1.00
Phosphorus (dissolved reactive)		<0.003
Phosphorus (total)		<0.050
Potassium		9.7
Silicon		3.36
Silver		<0.0001
Sodium	200	87.8
Strontium		0.892
Sulphate	500	715.0
TDS	500	1702
Temperature (C)	15	8.9
Thallium		<0.00005
Tin		<0.001
Titanium		<0.005
Vanadium		<0.0100
Zinc	5	0.009

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-4A

Sheet: 1

Date Sampled: 21-Jun-2002 31-Oct-2002 28-Nov-2002 15-May-2003 06-Nov-2003

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	121	129	136	129	121
Aluminum	0.1	<0.010	<0.010	<0.010	<0.010	0.010
Ammonia (as N)		0.25	0.09	0.18	0.06	0.22
Barium	1	0.010	<0.010	<0.010	<0.010	<0.010
Beryllium		<0.001	<0.001	<0.001	<0.001	<0.001
BOD		1.0	<1.0	—	3.0	4.0
Boron	5	0.140	0.060	0.070	<0.050	0.070
Cadmium	0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		18.0	16.0	27.0	17.0	11.0
Chloride	250	11.0	3.0	2.0	1.0	3.0
Chromium	0.05	<0.001	0.001	0.002	0.001	0.002
Cobalt		0.0004	<0.0002	<0.0002	<0.0002	<0.0002
COD		21	<5	<5	<5	<5
Conductivity (uS/cm)		280	410	260	380	235
Copper	1	0.0020	0.0020	0.0030	<0.0010	<0.0010
DOC	5	4.0	2.1	2.0	1.5	1.4
Hardness (CaCO ₃)	80-100	74	85	174	75	52
Iron	0.3	0.09	<0.01	<0.01	<0.01	<0.01
Lead	0.01	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		7.00	11.00	26.00	8.00	6.00
Manganese	0.05	0.023	0.032	0.014	0.037	0.030
Molybdenum		0.018	0.012	0.009	0.007	<0.005
Nickel		<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)	10	0.24	0.38	0.33	0.17	0.21
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.8	7.6	8.1	7.5	7.4
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.71	0.85	0.76	0.78	0.68
Phosphorus (dissolved reactive)		0.240	0.280	0.250	0.260	0.230
Phosphorus (total)		4.980	4.060	14.400	8.200	3.930
Potassium		8.0	6.0	35.0	5.0	4.0
Silicon		6.90	5.60	5.20	6.30	10.30
Silver		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	200	39.0	48.0	48.0	34.0	31.0
Strontium		0.098	0.090	0.082	0.084	0.076
Sulphate	500	33.0	36.0	26.0	37.0	10.0
TDS	500	209	205	187	183	162
Temperature (C)	15	11.0	7.0	9.0	7.0	9.9
Thallium		<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
Vanadium		0.0030	0.0030	0.0040	0.0010	<0.0010
Zinc	5	<0.005	<0.005	<0.005	<0.005	<0.010

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-4A

Sheet: 2

Date Sampled: 26-May-2004

Parameter	ODWQS	
Alkalinity (CaCO ₃)	30-500	189
Aluminum	0.1	0.021
Ammonia (as N)		0.22
Barium	1	0.030
Beryllium		<0.001
BOD		1.0
Boron	5	0.046
Cadmium	0.005	<0.0001
Calcium		30.8
Chloride	250	0.7
Chromium	0.05	<0.005
Cobalt		0.0003
COD		12
Conductivity (uS/cm)		272
Copper	1	<0.0005
DOC	5	1.6
Hardness (CaCO ₃)	80-100	130
Iron	0.3	<0.03
Lead	0.01	0.0007
Magnesium		12.80
Manganese	0.05	0.070
Molybdenum		0.002
Nickel		0.002
Nitrate (as N)	10	0.20
Nitrite (as N)	1	<0.20
pH (pH units)	6.5-8.5	7.7
Phenols		<0.001
Phosphate (as P)		<1.00
Phosphorus (dissolved reactive)		0.060
Phosphorus (total)		0.110
Potassium		3.1
Silicon		6.50
Silver		<0.0001
Sodium	200	32.8
Strontium		0.142
Sulphate	500	16.9
TDS	500	228
Temperature (C)	15	7.9
Thallium		<0.00005
Tin		<0.001
Titanium		<0.005
Vanadium		0.0012
Zinc	5	0.007

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-4B

Sheet: 1

Date Sampled: 21-Jun-2002 31-Oct-2002 28-Nov-2002 15-May-2003 06-Nov-2003

Parameter	ODWQS					
Alkalinity (CaCO ₃)	30-500	540	417	345	531	482
Aluminum	0.1	<0.010	<0.010	1.040	<0.010	<0.010
Ammonia (as N)		0.20	0.05	0.03	0.06	0.03
Barium	1	0.080	0.050	0.050	0.060	0.090
Beryllium		<0.001	<0.001	<0.001	<0.001	<0.001
BOD		5.0	<1.0	<1.0	3.0	<1.0
Boron	5	0.120	<0.050	<0.050	<0.050	0.020
Cadmium	0.005	<0.0001	0.0001	0.0001	0.0001	<0.0001
Calcium		108.0	94.0	71.0	128.0	115.0
Chloride	250	12.0	1.0	<1.0	<1.0	1.0
Chromium	0.05	0.005	0.006	0.005	0.005	0.011
Cobalt		0.0023	0.0003	0.0009	0.0011	0.0002
COD		34	<5	7	9	<5
Conductivity (uS/cm)		800	830	230	710	650
Copper	1	0.0030	0.0090	0.0100	0.0020	0.0040
DOC	5	7.8	3.6	3.9	3.3	2.7
Hardness (CaCO ₃)	80-100	451	412	280	530	464
Iron	0.3	0.01	<0.01	0.86	0.04	<0.01
Lead	0.01	<0.0010	<0.0010	0.0020	0.0010	<0.0010
Magnesium		44.00	43.00	25.00	51.00	43.00
Manganese	0.05	0.254	0.009	0.039	0.347	0.050
Molybdenum		0.012	0.007	<0.005	<0.005	<0.005
Nickel		<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)	10	0.40	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.5	7.4	7.5	7.6	6.7
Phenols		<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.17	0.16	0.16	0.30	0.07
Phosphorus (dissolved reactive)		0.060	0.050	0.050	0.100	0.020
Phosphorus (total)		5.690	1.970	1.340	0.920	2.380
Potassium		11.0	8.0	3.0	7.0	7.0
Silicon		9.33	3.20	4.90	6.30	6.00
Silver		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium	200	53.0	36.0	26.0	23.0	26.0
Strontium		0.619	0.404	0.264	0.417	0.393
Sulphate	500	50.0	66.0	23.0	35.0	12.0
TDS	500	642	534	413	599	547
Temperature (C)	15	13.0	7.0	5.9	8.0	8.2
Thallium		<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	0.040	<0.010	<0.010
Vanadium		0.0040	0.0040	0.0040	0.0030	0.0040
Zinc	5	0.006	<0.005	0.009	0.006	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: G02-4B

Sheet: 2

Date Sampled: 26-May-2004

Parameter	ODWQS	
Alkalinity (CaCO ₃)	30-500	536
Aluminum	0.1	0.006
Ammonia (as N)		<0.03
Barium	1	0.087
Beryllium		<0.001
BOD		<0.5
Boron	5	0.020
Cadmium	0.005	<0.0001
Calcium		122.0
Chloride	250	0.5
Chromium	0.05	<0.005
Cobalt		0.0016
COD		17
Conductivity (uS/cm)		730
Copper	1	<0.0005
DOC	5	7.4
Hardness (CaCO ₃)	80-100	508
Iron	0.3	0.35
Lead	0.01	0.0009
Magnesium		49.20
Manganese	0.05	0.544
Molybdenum		<0.001
Nickel		0.003
Nitrate (as N)	10	<0.20
Nitrite (as N)	1	<0.20
pH (pH units)	6.5-8.5	7.0
Phenols		0.001
Phosphate (as P)		<1.00
Phosphorus (dissolved reactive)		<0.003
Phosphorus (total)		<0.050
Potassium		6.1
Silicon		5.84
Silver		<0.0001
Sodium	200	18.1
Strontium		0.525
Sulphate	500	12.2
TDS	500	508
Temperature (C)	15	10.5
Thallium		<0.00005
Tin		<0.001
Titanium		<0.005
Vanadium		<0.0100
Zinc	5	0.016

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW1

Sheet: 1

Date Sampled: 22-Jun-2001 31-Jul-2001 25-Aug-2001 22-Sep-2001 15-Oct-2001

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	207	185	DRY	DRY	988
Aluminum	f (pH)	0.720	<0.050			<0.050
Ammonia (as N)		1.55	0.19			0.11
Barium		0.110	0.050			0.180
Beryllium	f (Hardness)	<0.002	<0.002			<0.002
BOD		19.0	2.0			7.0
Boron	0.2	0.270	0.060			0.430
Cadmium	0.0002	<0.0001	<0.0001			<0.0001
Calcium		101.0	48.0			208.0
Chloride		92.0	51.0			166.0
Chromium		0.003	0.003			0.013
Cobalt	0.0009	0.0013	0.0003			0.0062
COD		90	27			114
Conductivity (uS/cm)		440	461			490
Copper	0.005	0.0050	0.0020			0.0040
Dissolved Oxygen	f (Temp)	2.5	5.0			-
DOC		26.3	7.7			40.8
Hardness (CaCO ₃)		388	223			792
Iron	0.3	1.45	0.28			1.21
Lead	f (Alk)	<0.0010	<0.0010			<0.0010
Magnesium		33.00	25.00			66.00
Manganese		0.120	0.080			1.300
Molybdenum	0.04	<0.010	<0.010			<0.010
Nickel	0.025	0.010	<0.010			<0.010
Nitrate (as N)		6.42	0.19			<0.10
Nitrite (as N)		0.47	<0.10			<0.10
pH (pH units)	6.5-8.5	7.2	8.3			7.7
Phenols	0.001	<0.001	<0.001			<0.001
Phosphate (as P)		0.20	0.20			<0.03
Phosphorus (total)	0.03	0.310	0.080			0.080
Potassium		23.0	3.0			11.0
Silicon		4.10	1.70			6.88
Silver	0.0001	<0.0001	<0.0001			<0.0001
Sodium		81.0	32.0			167.0
Strontium		0.349	0.605			0.691
Sulphate		218.0	52.0			22.0
TDS		780	404			1210
Temperature (C)		24.0	20.6			16.0
Thallium	0.0003	<0.00100	<0.00100			<0.00100
Tin		<0.010	<0.010			<0.010
Titanium		0.040	0.010			<0.010
TKN		5.49	1.02			2.35
TSS		42	15			82
Turbidity (NTU)		23.0	14.0			17.0
Unionized Ammonia	0.02	<0.020	0.020			<0.020
Vanadium	0.006	0.0030	0.0050			0.0050
Zinc	0.03	0.010	<0.010			<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW1

Sheet: 2

Date Sampled: 03-Dec-2001 24-Dec-2001 11-Jan-2002 09-Apr-2002 17-May-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	523	FROZEN	FROZEN	215	313
Aluminum	f (pH)	<0.050			<0.050	<0.050
Ammonia (as N)		1.42			0.11	0.05
Barium		0.150			0.060	0.060
Beryllium	f (Hardness)	<0.002			<0.002	<0.002
BOD		5.0			6.0	3.0
Boron	0.2	0.150			0.100	0.090
Cadmium	0.0002	<0.0001			<0.0001	<0.0001
Calcium		139.0			50.0	74.0
Chloride		92.0			28.0	29.0
Chromium		0.003			0.001	0.007
Cobalt	0.0009	0.0020			0.0006	0.0011
COD		66			23	27
Conductivity (uS/cm)		520			670	675
Copper	0.005	0.0050			0.0020	0.0020
Dissolved Oxygen	f (Temp)	2.7			8.2	6.6
DOC		23.6			8.7	9.8
Hardness (CaCO ₃)		504			187	279
Iron	0.3	0.23			0.31	0.63
Lead	f (Alk)	<0.0010			<0.0010	<0.0010
Magnesium		38.00			15.00	23.00
Manganese		0.120			0.080	0.090
Molybdenum	0.04	<0.010			<0.010	<0.010
Nickel	0.025	<0.010			<0.010	<0.020
Nitrate (as N)		6.05			1.70	<0.10
Nitrite (as N)		<0.10			<0.10	<0.10
pH (pH units)	6.5-8.5	7.4			7.0	7.2
Phenols	0.001	<0.001			<0.001	<0.001
Phosphate (as P)		0.04			<0.03	<0.03
Phosphorus (total)	0.03	0.100			0.060	0.030
Potassium		18.0			4.0	6.0
Silicon		4.07			2.73	2.59
Silver	0.0001	<0.0001			<0.0001	<0.0001
Sodium		96.0			41.0	41.0
Strontium		0.378			0.170	0.218
Sulphate		46.0			19.0	20.0
TDS		771			328	447
Temperature (C)		4.0			7.0	10.0
Thallium	0.0003	<0.00100			<0.00100	<0.00100
Tin		<0.010			<0.010	<0.010
Titanium		<0.010			<0.010	0.010
TKN		3.11			1.02	1.02
TSS		52			33	15
Turbidity (NTU)		7.8			5.4	6.8
Unionized Ammonia	0.02	<0.020			<0.020	<0.020
Vanadium	0.006	0.0020			<0.0010	0.0030
Zinc	0.03	<0.010			<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW1

Sheet: 3

Date Sampled: 30-Oct-2002 25-Apr-2003 26-Nov-2003 29-Apr-2004 25-Oct-2004

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	DRY	216	315	DRY	DRY
Aluminum	f (pH)		<0.010	<0.010		
Ammonia (as N)			0.31	0.03		
Barium			0.060	0.070		
Beryllium	f (Hardness)		<0.001	<0.001		
BOD			5.0	<1.0		
Boron	0.2		0.060	0.090		
Cadmium	0.0002		<0.0001	<0.0001		
Calcium			60.0	93.0		
Chloride			30.0	17.0		
Chromium			<0.001	0.002		
Cobalt	0.0009		0.0005	0.0004		
COD			45	22		
Conductivity (uS/cm)			290	450		
Copper	0.005		0.0020	0.0020		
Dissolved Oxygen	f (Temp)		3.1	3.0		
DOC			13.2	7.1		
Hardness (CaCO ₃)			216	323		
Iron	0.3		0.25	0.07		
Lead	f (Alk)		<0.0010	<0.0010		
Magnesium			16.00	22.00		
Manganese			0.070	0.020		
Molybdenum	0.04		<0.005	<0.005		
Nickel	0.025		<0.005	<0.005		
Nitrate (as N)			0.16	<0.10		
Nitrite (as N)			<0.10	<0.10		
pH (pH units)	6.5-8.5		7.3	7.3		
Phenols	0.001		<0.001	<0.001		
Phosphate (as P)			0.24	0.10		
Phosphorus (total)	0.03		0.170	0.070		
Potassium			8.0	6.0		
Silicon			4.20	8.20		
Silver	0.0001		<0.0001	<0.0001		
Sodium			25.0	24.0		
Strontium			0.191	0.279		
Sulphate			25.0	31.0		
TDS			360	436		
Temperature (C)			6.0	2.0		
Thallium	0.0003		<0.00100	<0.00100		
Tin			<0.010	<0.010		
Titanium			<0.010	<0.010		
TKN			1.98	0.86		
TSS			12	4		
Turbidity (NTU)			3.9	0.8		
Unionized Ammonia	0.02		<0.020	<0.020		
Vanadium	0.006		<0.0010	<0.0010		
Zinc	0.03		<0.005	<0.010		

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW2

Sheet: 1

Date Sampled: 13-May-1999 18-Oct-1999 06-Dec-1999 30-Dec-1999 31-Jan-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	603	723	610	675	603
Aluminum	f (pH)	0.100	0.120	<0.030	0.230	0.170
Ammonia (as N)		2.27	2.01	2.07	2.68	1.77
Barium		0.120	0.200	0.160	0.170	0.120
Beryllium	f (Hardness)	<0.010	<0.010	<0.002	<0.002	<0.002
BOD				2.0	3.0	2.0
Boron	0.2	0.440	0.510	0.460	0.620	0.510
Cadmium	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Calcium		222.0	251.0	225.0	201.0	226.0
Chloride		49.0	90.0	64.0	81.0	61.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	0.0008	0.0012	0.0011	0.0010	0.0011
COD		48	60	55	55	51
Colour (TCU)				11	8	9
Conductivity (uS/cm)		910	1050	1100	1430	1350
Copper	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Oxygen	f (Temp)	6.8	1.1	7.8		
DOC		17.8	19.3	20.1	20.8	19.7
Hardness (CaCO ₃)		699	783	723	659	734
Hydrogen Sulphide	0.002			0.01	<0.01	0.13
Iron	0.3	28.40	71.40	48.30	60.00	30.50
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Magnesium		35.00	38.00	39.00	38.00	41.00
Manganese		4.180	4.940	3.600	5.400	3.390
Mercury	0.0002			<0.0002	<0.0002	<0.0002
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		<0.10	<0.10	0.11	<0.10	0.14
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.2	6.9	7.0	7.1	7.5
Phenols	0.001	<0.001	<0.001	<0.001	0.002	0.001
Phosphate (as P)		<0.03	<0.03			
Phosphorus (total)	0.03	0.030	0.020	0.030	0.060	0.190
Potassium		19.0	22.0	23.0	19.0	21.0
Silicon		5.40	7.90	6.30	8.00	5.90
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		38.0	45.0	44.0	38.0	48.0
Strontium		0.829	1.020	0.878	1.040	0.804
Sulphate		81.0	91.0	104.0	122.0	87.0
Sulphur		25	24	36	44	31
TDS		804	948	848	980	828
Temperature (C)		12.0	4.0	9.5	5.0	3.0
Thallium	0.0003	<0.00500	<0.00500	<0.00500	<0.00500	<0.00200
Tin		<0.050		<0.050	<0.050	<0.050
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
TKN				2.65	3.19	2.62
TSS				196	688	120
Turbidity (NTU)				>100	>100	>100
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0110	<0.0070	<0.0070	<0.0070	<0.0070
Zinc	0.03	0.220	0.050	0.090	0.100	0.050

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW2

Sheet: 2

Date Sampled: 29-Feb-2000 30-Mar-2000 28-Apr-2000 27-May-2000 28-Jun-2000

Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	430	529	585	629	637
Aluminum	f (pH)	0.050	<0.030	<0.050	0.060	0.060
Ammonia (as N)		0.93	1.10	1.50	1.87	2.23
Barium		0.140	0.160	0.170	0.160	0.160
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		1.0	2.0	1.0	51.0	<1.0
Boron	0.2	0.500	0.470	0.520	0.520	0.510
Cadmium	0.0002	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001
Calcium		192.0	202.0	285.0	311.0	275.0
Chloride		47.0	47.0	83.0	82.0	75.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	0.0027	0.0012	0.0033	0.0054	0.0024
COD		49	45	55	51	49
Colour (TCU)		10	8	8	8	10
Conductivity (uS/cm)		950	1000	1200	1550	1700
Copper	0.005	<0.0050	<0.0050	0.0060	<0.0050	0.0020
Dissolved Oxygen	f (Temp)		N/A	6.2	6.5	13.8
DOC		16.1	18.6	18.5	19.4	18.1
Hardness (CaCO3)		599	633	881	950	852
Hydrogen Sulphide	0.002	0.05	<0.01	0.03	0.05	<0.01
Iron	0.3	23.30	54.10	31.50	32.60	50.60
Lead	f (Alk)	<0.0020	<0.0020	0.0020	<0.0020	0.0020
Magnesium		29.00	31.00	41.00	42.00	40.00
Manganese		2.310	3.070	4.090	5.980	6.510
Mercury	0.0002	<0.0002	<0.0002	<0.0001	0.0004	<0.0001
Molybdenum	0.04	<0.010	<0.010	0.010	<0.010	<0.010
Nickel	0.025	0.020	<0.010	<0.010	0.020	<0.010
Nitrate (as N)		0.11	0.12	0.16	0.17	<0.10
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.4	6.9	6.9	7.0	6.6
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)						
Phosphorus (total)	0.03	0.080	0.200	0.040	0.030	0.060
Potassium		20.0	19.0	27.0	26.0	25.0
Silicon		5.20	6.80	5.67	7.16	7.20
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		38.0	33.0	55.0	52.0	45.0
Strontium		0.734	0.731	0.964	1.090	0.999
Sulphate		170.0	98.0	281.0	334.0	165.0
Sulphur		50	36	89	93	65
TDS		784	660	1230	1170	1172
Temperature (C)		4.0	3.0	10.0	9.0	12.0
Thallium	0.0003	<0.00500	<0.00500	<0.00100	<0.00020	<0.00200
Tin		<0.050	<0.050	<0.010	<0.050	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
TKN		1.76	1.71	2.12	1.87	4.51
TSS		109	410	121	213	135
Turbidity (NTU)		>100	>100	230.0	>100	>100
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0100	<0.0100	<0.0020	<0.0050	<0.0010
Zinc	0.03	0.740	0.280	1.190	1.570	0.680

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW2

Sheet: 3

Date Sampled: 25-Jul-2000 28-Aug-2000 01-Nov-2000

Parameter	PWQO			
Alkalinity (CaCO ₃)	75% Bkgd	674	694	708
Aluminum	f (pH)	0.530	0.110	0.090
Ammonia (as N)		15.90	2.55	2.58
Barium		0.500	0.130	0.520
Beryllium	f (Hardness)	<0.002	<0.002	<0.002
BOD		2.0	2.0	6.0
Boron	0.2	0.510	0.480	0.570
Cadmium	0.0002	<0.0001	<0.0001	<0.0001
Calcium		259.0	224.0	249.0
Chloride		76.0	88.0	83.0
Chromium		0.030	<0.010	<0.010
Cobalt	0.0009	0.0022	0.0013	0.0010
COD		75	54	72
Colour (TCU)		9	22	
Conductivity (uS/cm)		1780	1750	270
Copper	0.005	<0.0010	0.0010	<0.0010
Dissolved Oxygen	f (Temp)	1.4	5.4	1.1
DOC		26.8	17.9	30.5
Hardness (CaCO ₃)		812	721	787
Hydrogen Sulphide	0.002	0.29	<0.01	
Iron	0.3	104.00	42.80	108.00
Lead	f (Alk)	<0.0010	<0.0010	<0.0010
Magnesium		40.00	39.00	40.00
Manganese		7.640	6.300	5.970
Mercury	0.0002	<0.0001	<0.0001	
Molybdenum	0.04	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010
Nitrate (as N)		<0.10	<0.10	<0.10
Nitrite (as N)		<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	6.9	7.1	6.8
Phenols	0.001	<0.001	<0.001	<0.001
Phosphate (as P)				<0.03
Phosphorus (total)	0.03	1.470	0.020	0.360
Potassium		24.0	24.0	25.0
Silicon		9.83	7.85	9.97
Silver	0.0001	<0.0001	<0.0001	<0.0001
Sodium		47.0	45.0	50.0
Strontium		1.270	1.010	1.170
Sulphate		146.0	94.0	50.0
Sulphur		51	32	17
TDS		1120	1036	1030
Temperature (C)		14.4	13.0	13.0
Thallium	0.0003	<0.00200	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	<0.010
TKN		17.20	3.39	4.64
TSS		674	128	1670
Turbidity (NTU)		>100.0	>100.0	44.0
Unionized Ammonia	0.02	0.033	<0.020	<0.020
Vanadium	0.006	0.0060	0.0060	0.0040
Zinc	0.03	1.120	0.050	0.160

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW3

Sheet: 1

Date Sampled: 13-May-1999 18-Oct-1999 06-Dec-1999 30-Dec-1999 31-Jan-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	477	496	413	571	530
Aluminum	f (pH)	0.750	0.040	<0.030	<0.030	0.090
Aluminum (Total)						
Ammonia (as N)		0.18	0.07	0.09	1.34	0.72
Barium		0.060	0.070	0.070	0.340	0.090
Beryllium	f (Hardness)	<0.010	<0.010	<0.002	<0.002	<0.002
BOD				3.0	9.0	1.0
Boron	0.2	0.400	0.360	0.290	0.480	0.340
Cadmium	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Calcium		176.0	157.0	138.0	170.0	197.0
Chloride		45.0	63.0	48.0	76.0	70.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	0.0006	<0.0004	0.0007	0.0010	0.0017
COD		29	39	27	38	34
Colour (TCU)				14	10	9
Conductivity (uS/cm)		710	745	710	1220	1100
Copper	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Oxygen	f (Temp)	8.6	11.8	13.1	4.1	
DOC		14.4	15.0	12.1	18.9	14.0
Hardness (CaCO ₃)		592	548	489	598	690
Hydrogen Sulphide	0.002			0.12	0.01	0.04
Iron	0.3	0.02	1.08	1.96	11.20	1.62
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	<0.0020	0.0040
Magnesium		37.00	38.00	35.00	42.00	48.00
Manganese		0.920	0.420	0.560	5.140	1.280
Mercury	0.0002			<0.0002	<0.0002	<0.0002
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		0.39	0.15	0.37	0.85	0.26
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.9	7.9	7.6	7.9	8.0
Phenols	0.001	<0.001	<0.001	<0.001	0.005	<0.001
Phosphate (as P)		0.03	0.15			
Phosphorus (total)	0.03	0.360	0.320	0.430	3.740	0.380
Potassium		15.0	15.0	14.0	14.0	14.0
Silicon		4.40	5.80	5.20	9.20	4.70
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		39.0	41.0	35.0	37.0	45.0
Strontium		0.643	0.635	0.542	0.965	0.651
Sulphate		93.0	47.0	64.0	117.0	112.0
Sulphur		29	15	22	40	37
TDS		672	676	580	876	820
Temperature (C)		14.0	1.0	4.0	0.0	0.0
Thallium	0.0003	<0.00500	<0.00500	<0.00500	<0.00500	<0.00200
Tin		<0.050		<0.050	<0.050	<0.050
Titanium		<0.010	<0.010	<0.010	0.020	<0.010
TKN				1.30	10.90	1.62
TSS				692	5770	401
Turbidity (NTU)				>100	>100	76.0
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0070	<0.0070	<0.0070	<0.0070	<0.0070
Zinc	0.03	0.020	<0.010	0.050	0.380	0.030

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW3

Sheet: 2

Date Sampled: 29-Feb-2000 30-Mar-2000 28-Apr-2000 27-May-2000 28-Jun-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	FROZEN	FROZEN	437	426	466
Aluminum	f (pH)			<0.050	<0.050	<0.050
Aluminum (Total)						
Ammonia (as N)				0.25	0.07	0.15
Barium				0.070	0.060	0.060
Beryllium	f (Hardness)			<0.002	<0.002	<0.002
BOD				2.0	33.0	<1.0
Boron	0.2			0.460	0.440	0.450
Cadmium	0.0002			<0.0001	<0.0002	<0.0001
Calcium				200.0	219.0	184.0
Chloride				67.0	66.0	69.0
Chromium				<0.010	<0.010	<0.010
Cobalt	0.0009			0.0005	0.0012	0.0003
COD				33	33	35
Colour (TCU)				10	11	12
Conductivity (uS/cm)				1050	1150	1200
Copper	0.005			<0.0010	0.0090	<0.0010
Dissolved Oxygen	f (Temp)			10.3	9.2	8.2
DOC				12.7	14.2	13.6
Hardness (CaCO ₃)				656	712	460
Hydrogen Sulphide	0.002			<0.01	0.01	<0.01
Iron	0.3			0.42	0.12	0.22
Lead	f (Alk)			<0.0010	<0.0020	<0.0010
Magnesium				38.00	40.00	37.00
Manganese				0.210	0.430	0.350
Mercury	0.0002			<0.0001	<0.0001	<0.0001
Molybdenum	0.04			0.020	<0.010	<0.010
Nickel	0.025			<0.010	<0.010	<0.010
Nitrate (as N)				0.55	0.49	0.20
Nitrite (as N)				<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5			7.7	7.9	7.4
Phenols	0.001			<0.001	<0.001	<0.001
Phosphate (as P)						
Phosphorus (total)	0.03			0.040	0.020	0.060
Potassium				19.0	18.0	17.0
Silicon				4.53	5.30	5.27
Silver	0.0001			<0.0001	<0.0001	<0.0001
Sodium				47.0	46.0	42.0
Strontium				0.739	0.801	0.749
Sulphate				218.0	227.0	156.0
Sulphur				68	72	56
TDS				896	900	948
Temperature (C)				10.5	11.5	16.0
Thallium	0.0003			<0.00100	<0.00020	<0.00200
Tin				<0.010	<0.050	<0.010
Titanium				<0.010	<0.010	<0.010
TKN				0.72	0.07	0.68
TSS				31	8	44
Turbidity (NTU)				1.6	1.9	3.5
Unionized Ammonia	0.02			<0.020	<0.020	<0.020
Vanadium	0.006			<0.0020	<0.0050	<0.0010
Zinc	0.03			0.020	0.030	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW3

Sheet: 3

Date Sampled: 25-Jul-2000 28-Aug-2000 01-Nov-2000 21-Jun-2002 31-Oct-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	468	451	DRY	466	DRY
Aluminum	f (pH)	<0.050	<0.050		<0.010	
Aluminum (Total)						
Ammonia (as N)		11.50	0.13		12.90	
Barium		0.070	0.070		0.150	
Beryllium	f (Hardness)	<0.002	<0.002		<0.001	
BOD		46.0	2.0		6.0	
Boron	0.2	0.450	0.420		0.190	
Cadmium	0.0002	<0.0001	<0.0001		<0.0001	
Calcium		163.0	144.0		97.0	
Chloride		77.0	76.0		60.0	
Chromium		<0.010	<0.010		0.008	
Cobalt	0.0009	0.0008	0.0009		0.0034	
COD		91	34		59	
Colour (TCU)		15	12			
Conductivity (uS/cm)		2030	1190		350	
Copper	0.005	0.0010	0.0020		0.0060	
Dissolved Oxygen	f (Temp)	1.1	4.4		6.9	
DOC		42.3	14.3		26.6	
Hardness (CaCO ₃)		576	512		349	
Hydrogen Sulphide	0.002	1.10	0.01			
Iron	0.3	0.66	0.06		1.08	
Lead	f (Alk)	<0.0010	<0.0010		<0.0010	
Magnesium		41.00	37.00		26.00	
Manganese		1.490	1.450		0.083	
Mercury	0.0002	<0.0001	<0.0001			
Molybdenum	0.04	<0.010	<0.010		<0.005	
Nickel	0.025	<0.010	<0.010		<0.005	
Nitrate (as N)		0.13	<0.10		1.03	
Nitrite (as N)		<0.10	<0.10		<0.10	
pH (pH units)	6.5-8.5	6.7	7.8		7.7	
Phenols	0.001	<0.001	<0.001		<0.001	
Phosphate (as P)					0.20	
Phosphorus (total)	0.03	3.630	0.050		0.100	
Potassium		19.0	13.0		30.0	
Silicon		6.13	6.16		9.11	
Silver	0.0001	<0.0001	<0.0001		<0.0001	
Sodium		49.0	41.0		60.0	
Strontium		0.740	0.596		0.430	
Sulphate		133.0	95.0		28.0	
Sulphur		44	32			
TDS		832	800		657	
Temperature (C)		15.0	16.6		14.0	
Thallium	0.0003	<0.00200	<0.00100		<0.00100	
Tin		<0.010	<0.010		<0.010	
Titanium		<0.010	<0.010		0.010	
TKN		12.30	0.65		15.80	
TSS		35240	13		38	
Turbidity (NTU)		>100	14.0		13.4	
Unionized Ammonia	0.02	<0.020	<0.020		0.100	
Vanadium	0.006	0.0030	0.0050		0.0040	
Zinc	0.03	0.010	<0.010		<0.005	

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW3

Sheet: 4

Date Sampled:	25-Apr-2003	27-Oct-2003	29-Apr-2004	25-Oct-2004
Parameter	PWQO			
Alkalinity (CaCO ₃)	75% Bkgd	399	386	383
Aluminum	f (pH)	<0.010	<0.010	0.009
Aluminum (Total)				1.180
Ammonia (as N)		7.98	7.39	7.62
Barium		0.140	0.140	0.127
Beryllium	f (Hardness)	<0.001	<0.001	<0.001
BOD		2.0	<1.0	4.5
Boron	0.2	0.170	0.170	0.159
Cadmium	0.0002	<0.0001	<0.0001	<0.0001
Calcium		91.0	93.0	92.3
Chloride		53.0	42.0	37.3
Chromium		0.002	0.003	<0.005
Cobalt	0.0009	0.0027	0.0018	0.0020
COD		42	42	44
Colour (TCU)				
Conductivity (uS/cm)		490	610	580
Copper	0.005	0.0040	0.0040	0.0047
Dissolved Oxygen	f (Temp)	3.6	5.2	10.4
DOC		17.5	15.4	16.8
Hardness (CaCO ₃)		343	319	329
Hydrogen Sulphide	0.002			
Iron	0.3	1.56	0.81	1.62
Lead	f (Alk)	<0.0010	<0.0010	0.0008
Magnesium		28.00	21.00	23.90
Manganese		0.239	0.105	0.105
Mercury	0.0002			
Molybdenum	0.04	<0.005	<0.005	<0.001
Nickel	0.025	<0.005	0.005	0.005
Nitrate (as N)		1.02	1.17	2.50
Nitrite (as N)		<0.10	<0.10	0.90
pH (pH units)	6.5-8.5	7.6	7.1	8.4
Phenols	0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.31	0.10	<1.00
Phosphorus (total)	0.03	0.210	0.110	0.070
Potassium		24.0	25.0	17.1
Silicon		5.70	6.40	7.10
Silver	0.0001	<0.0001	<0.0001	<0.0001
Sodium		49.0	46.0	35.1
Strontium		0.338	0.333	0.357
Sulphate		40.0	19.0	22.1
Sulphur				
TDS		606	571	486
Temperature (C)		3.0	3.0	15.8
Thallium	0.0003	<0.00100	<0.00100	<0.00005
Tin		<0.010	<0.010	<0.001
Titanium		0.020	0.020	0.073
TKN		11.00	9.98	8.42
TSS		54	39	39
Turbidity (NTU)		35.9	19.9	37.0
Unionized Ammonia	0.02	0.030	<0.020	0.520
Vanadium	0.006	0.0020	0.0020	0.0036
Zinc	0.03	<0.005	<0.010	0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW4

Sheet: 1

Date Sampled:

13-May-1999

18-Oct-1999

Parameter	PWQO		
Alkalinity (CaCO ₃)	75% Bkgd	770	761
Aluminum	f (pH)	<0.030	0.030
Ammonia (as N)		67.70	33.20
Barium		0.190	0.220
Beryllium	f (Hardness)	<0.010	<0.010
Boron	0.2	1.180	1.340
Cadmium	0.0002	<0.0002	<0.0002
Calcium		213.0	187.0
Chloride		154.0	153.0
Chromium		<0.010	<0.010
Cobalt	0.0009	<0.0004	0.0014
COD		90	91
Conductivity (uS/cm)		1100	1200
Copper	0.005	<0.0050	<0.0050
Dissolved Oxygen	f (Temp)	4.9	2.8
DOC		39.4	33.1
Hardness (CaCO ₃)		717	656
Iron	0.3	0.43	2.41
Lead	f (Alk)	<0.0020	<0.0020
Magnesium		45.00	46.00
Manganese		0.710	0.560
Molybdenum	0.04	<0.010	<0.010
Nickel	0.025	<0.010	<0.010
Nitrate (as N)		0.41	0.31
Nitrite (as N)		0.14	<0.10
pH (pH units)	6.5-8.5	7.4	7.6
Phenols	0.001	<0.001	<0.001
Phosphate (as P)		<0.03	0.03
Phosphorus (total)	0.03	0.060	0.080
Potassium		75.0	67.0
Silicon		5.90	6.90
Silver	0.0001	0.0002	<0.0001
Sodium		113.0	112.0
Strontium		0.946	0.947
Sulphate		134.0	93.0
Sulphur		42	29
TDS		1204	1100
Temperature (C)		13.5	7.0
Thallium	0.0003	<0.00500	<0.00500
Tin		<0.050	
Titanium		<0.010	<0.010
Unionized Ammonia	0.02	0.412	0.153
Vanadium	0.006	<0.0070	<0.0070
Zinc	0.03	0.040	0.030

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sheet: 1

Sample Source: SW5

Date Sampled:

13-May-1999

18-Oct-1999

27-Nov-1999

04-Dec-1999

06-Dec-1999

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	710	735			462
Aluminum	f (pH)	0.050	<0.030			0.080
Ammonia (as N)		44.50	27.30	14.48	17.00	17.00
Barium		0.190	0.280			0.140
Beryllium	f (Hardness)	<0.010	<0.010			<0.002
BOD				15.0	20.0	19.0
Boron	0.2	1.170	1.320			0.810
Cadmium	0.0002	<0.0002	<0.0002			<0.0002
Calcium		206.0	184.0			137.0
Chloride		145.0	166.0			80.0
Chromium		<0.010	<0.010			<0.010
Cobalt	0.0009	<0.0004	0.0049			0.0012
COD		90	88	58	50	46
Colour (TCU)						19
Conductivity (uS/cm)		1050	1150	810		1000
Copper	0.005	<0.0050	<0.0050			<0.0050
Dissolved Oxygen	f (Temp)	6.1	7.9	8.1		8.8
DOC		41.2	33.0			19.9
Hardness (CaCO ₃)		695	653			487
Hydrogen Sulphide	0.002			0.01	0.01	0.02
Iron	0.3	0.04	9.25			1.60
Lead	f (Alk)	<0.0020	0.0020			<0.0020
Magnesium		44.00	47.00			35.00
Manganese		0.700	0.830			0.300
Mercury	0.0002					<0.0002
Molybdenum	0.04	<0.010	<0.010			<0.010
Nickel	0.025	<0.010	<0.010			<0.010
Nitrate (as N)		4.63	2.15			20.60
Nitrite (as N)		0.20	<0.10			<0.10
pH (pH units)	6.5-8.5	7.8	8.0	7.6		7.5
Phenols	0.001	<0.001	<0.001			<0.001
Phosphate (as P)		<0.03	0.06			0.060
Phosphorus (total)	0.03	0.070	0.490			42.0
Potassium		72.0	66.0			5.30
Silicon		5.60	8.00			0.0001
Silver	0.0001	0.0002	<0.0001			60.0
Sodium		108.0	111.0			0.615
Strontium		0.928	0.947			123.0
Sulphate		128.0	89.0			43
Sulphur		43	28			764
TDS		1156	1110			7.0
Temperature (C)		14.0	5.0	10.0		<0.00500
Thallium	0.0003	<0.00500	<0.00500			<0.050
Tin		<0.050	<0.010			<0.010
Titanium		<0.010				17.80
TKN						70
TSS				29.0	15.0	30.0
Turbidity (NTU)				0.106		0.080
Unionized Ammonia	0.02	0.699	0.328			<0.0070
Vanadium	0.006	<0.0070	<0.0070			0.060
Zinc	0.03	0.030	0.170			

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW5

Sheet: 2

Date Sampled: 11-Dec-1999 19-Dec-1999 30-Dec-1999 30-Dec-1999(2) 10-Jan-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd				755	
Aluminum	f (pH)				<0.030	
Ammonia (as N)		22.50	30.40	36.10	34.56	32.30
Barium					0.210	
Beryllium	f (Hardness)				<0.002	
BOD		17.0	54.0	78.0	27.0	20.0
Boron	0.2				1.570	
Cadmium	0.0002				<0.0002	
Calcium					165.0	
Chloride					168.0	
Chromium					<0.010	
Cobalt	0.0009				0.0012	
COD			71	89	77	75
Colour (TCU)					28	
Conductivity (uS/cm)					1800	
Copper	0.005				<0.0050	
Dissolved Oxygen	f (Temp)			11.2	7.2	12.0
DOC					31.2	
Hardness (CaCO ₃)					602	
Hydrogen Sulphide	0.002	<0.01	0.01	0.02	<0.01	0.02
Iron	0.3				2.47	
Lead	f (Alk)				<0.0020	
Magnesium					46.00	
Manganese					0.770	
Mercury	0.0002				<0.0002	
Molybdenum	0.04				<0.010	
Nickel	0.025				<0.010	
Nitrate (as N)					3.06	
Nitrite (as N)					<0.10	
pH (pH units)	6.5-8.5				7.9	
Phenols	0.001				0.012	
Phosphate (as P)						
Phosphorus (total)	0.03				0.240	
Potassium					52.0	
Silicon					7.80	
Silver	0.0001				<0.0001	
Sodium					86.0	
Strontium					0.964	
Sulphate					121.0	
Sulphur					44	
TDS					1116	
Temperature (C)		2.0	2.0	2.0	2.0	4.0
Thallium	0.0003				<0.00500	
Tin					<0.050	
Titanium					<0.010	
TKN					34.60	
TSS					143	
Turbidity (NTU)		10.0	>100	>100	44.0	17.0
Unionized Ammonia	0.02				0.265	
Vanadium	0.006				<0.0070	
Zinc	0.03				0.050	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW5

Sheet: 3

Date Sampled:

15-Jan-2000

29-Jan-2000

31-Jan-2000

05-Feb-2000

13-Feb-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd			827		
Aluminum	f (pH)			0.050		
Ammonia (as N)		30.30	38.90	37.80	40.20	44.20
Barium				0.200		
Beryllium	f (Hardness)			<0.002		
BOD		5.0	5.0	3.0	6.0	10.0
Boron	0.2			1.550		
Cadmium	0.0002			<0.0002		
Calcium				233.0		
Chloride				182.0		
Chromium				<0.010		
Cobalt	0.0009			0.0015		
COD		68	102	93	92	88
Colour (TCU)				28		
Conductivity (uS/cm)		1150		2000	2000	1890
Copper	0.005			<0.0050		
Dissolved Oxygen	f (Temp)	8.2	7.8		8.0	8.5
DOC				37.4		
Hardness (CaCO ₃)				805		
Hydrogen Sulphide	0.002	<0.01	0.01	<0.01	<0.01	0.02
Iron	0.3			0.47		
Lead	f (Alk)			<0.0020		
Magnesium				54.00		
Manganese				0.730		
Mercury	0.0002			<0.0002		
Molybdenum	0.04			<0.010		
Nickel	0.025			<0.010		
Nitrate (as N)				0.64		
Nitrite (as N)				<0.10		
pH (pH units)	6.5-8.5	7.8	7.8	7.9	6.4	7.9
Phenols	0.001			<0.001		
Phosphate (as P)						
Phosphorus (total)	0.03			0.030		
Potassium				70.0		
Silicon				6.00		
Silver	0.0001			<0.0001		
Sodium				129.0		
Strontium				1.080		
Sulphate				157.0		
Sulphur				49		
TDS				1248		915
Temperature (C)		1.5	3.0	2.0	3.5	3.5
Thallium	0.0003			<0.00200		
Tin				<0.050		
Titanium				<0.010		
TKN				37.80		
TSS				<2		
Turbidity (NTU)		14.0	6.5	4.9	10.0	45.0
Unionized Ammonia	0.02	0.180	0.260	0.290	<0.020	0.380
Vanadium	0.006			<0.0070		
Zinc	0.03			0.030		

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW5

Sheet: 4

Date Sampled: 20-Feb-2000 26-Feb-2000 29-Feb-2000 03-Mar-2000 11-Mar-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd			380		
Aluminum	f (pH)			0.030		
Ammonia (as N)		43.90	33.30	14.90	19.50	15.70
Barium				0.160		
Beryllium	f (Hardness)			<0.002		
BOD		10.0	8.0	4.0	1.0	2.0
Boron	0.2			1.490		
Cadmium	0.0002			<0.0002		
Calcium				202.0		
Chloride				64.0		
Chromium				<0.010		
Cobalt	0.0009			0.0012		
COD		86	68	83	68	62
Colour (TCU)				34		
Conductivity (uS/cm)		1890	1530	2500	1494	1188
Copper	0.005			<0.0050		
Dissolved Oxygen	f (Temp)	7.6	8.5	8.8	8.0	12.0
DOC				28.4		
Hardness (CaCO ₃)				637		
Hydrogen Sulphide	0.002	<0.01	<0.01	0.01	<0.01	0.01
Iron	0.3			1.24		
Lead	f (Alk)			<0.0020		
Magnesium				32.00		
Manganese				0.400		
Mercury	0.0002			<0.0002		
Molybdenum	0.04			<0.010		
Nickel	0.025			<0.010		
Nitrate (as N)				4.25		
Nitrite (as N)				0.15		
pH (pH units)	6.5-8.5	7.9	8.0	7.6	7.8	8.0
Phenols	0.001			<0.001		
Phosphate (as P)						
Phosphorus (total)	0.03			0.090		
Potassium				48.0		
Silicon				5.60		
Silver	0.0001			<0.0001		
Sodium				69.0		
Strontium				0.889		
Sulphate				373.0		
Sulphur				111		
TDS		900	730	1008	708	576
Temperature (C)		5.0	8.0	4.5	7.0	5.5
Thallium	0.0003			<0.00500		
Tin				<0.050		
Titanium				<0.010		
TKN				15.70		
TSS				23		
Turbidity (NTU)		16.0		18.0	3.7	12.0
Unionized Ammonia	0.02	0.430	0.520	0.070	0.180	0.200
Vanadium	0.006			<0.0100		
Zinc	0.03			0.210		

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW5

Sheet: 5

Date Sampled: 17-Mar-2000 26-Mar-2000 30-Mar-2000 03-Apr-2000 10-Apr-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd			179		
Aluminum	f (pH)			0.080		
Ammonia (as N)		17.50	8.12	4.00	5.91	5.59
Barium				0.060		
Beryllium	f (Hardness)			<0.002		
BOD		3.0	2.0	4.0	2.0	2.0
Boron	0.2			0.470		
Cadmium	0.0002			<0.0002		
Calcium				91.0		
Chloride				28.0		
Chromium				<0.010		
Cobalt	0.0009			0.0011		
COD		63	34	40	45	47
Colour (TCU)				61		
Conductivity (uS/cm)		1100	788	550	740	700
Copper	0.005			<0.0050		
Dissolved Oxygen	f (Temp)	9.5	10.8	7.6	9.8	12.5
DOC				17.1		
Hardness (CaCO ₃)				285		
Hydrogen Sulphide	0.002	<0.01	0.03	0.03	0.02	0.02
Iron	0.3			1.13		
Lead	f (Alk)			<0.0020		
Magnesium				14.00		
Manganese				0.150		
Mercury	0.0002			<0.0002		
Molybdenum	0.04			<0.010		
Nickel	0.025			<0.010		
Nitrate (as N)				1.05		
Nitrite (as N)				<0.10		
pH (pH units)	6.5-8.5	7.8	7.8	7.7	7.6	7.8
Phenols	0.001			<0.001		
Phosphate (as P)						
Phosphorus (total)	0.03			0.120		
Potassium				17.0		
Silicon				3.80		
Silver	0.0001			<0.0001		
Sodium				25.0		
Strontium				0.378		
Sulphate				128.0		
Sulphur				46		
TDS		580	385	400	390	316
Temperature (C)		5.0	5.5	2.0	5.0	5.0
Thallium	0.0003			<0.00500		
Tin				<0.050		
Titanium				0.010		
TKN				4.95		
TSS				16		
Turbidity (NTU)		4.6	20.0	31.0	11.0	14.9
Unionized Ammonia	0.02	0.140	0.070	<0.020	0.029	0.044
Vanadium	0.006			<0.0100		
Zinc	0.03			0.270		

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW5

Sheet: 6

Date Sampled:

16-Apr-2000

28-Apr-2000

29-Apr-2000

13-May-2000

23-May-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd		348			
Aluminum	f (pH)		<0.050			
Ammonia (as N)		5.70	9.13			
Barium			0.110	18.90	0.68	18.80
Beryllium	f (Hardness)		<0.002			
BOD		3.0	4.0	6.0	3.0	5.0
Boron	0.2		0.760			
Cadmium	0.0002		<0.0001			
Calcium			150.0			
Chloride			74.0			
Chromium			<0.010			
Cobalt	0.0009		0.0005			
COD		44	45	81	58	59
Colour (TCU)			27			
Conductivity (uS/cm)		885	860		1163	1454
Copper	0.005		<0.0010			
Dissolved Oxygen	f (Temp)	9.0	3.6	8.5	9.5	8.6
DOC			19.4			
Hardness (CaCO ₃)			478			
Hydrogen Sulphide	0.002	0.02	<0.01	<0.01	0.01	<0.01
Iron	0.3		0.23			
Lead	f (Alk)		<0.0010			
Magnesium			25.00			
Manganese			0.150			
Mercury	0.0002		<0.0001			
Molybdenum	0.04		<0.010			
Nickel	0.025		<0.010			
Nitrate (as N)			3.28			
Nitrite (as N)			0.40			
pH (pH units)	6.5-8.5	7.7	7.2	7.8	7.8	7.8
Phenols	0.001		<0.001			
Phosphate (as P)						
Phosphorus (total)	0.03		0.010			
Potassium			31.0			
Silicon			3.96			
Silver	0.0001		<0.0001			
Sodium			56.0			
Strontium			0.634			
Sulphate			171.0			
Sulphur			55			
TDS		430	732	742	565	713
Temperature (C)		8.5	10.0	14.0	14.0	13.0
Thallium	0.0003		<0.00100			
Tin			<0.010			
Titanium			<0.010			
TKN			10.40			
TSS			7			
Turbidity (NTU)		9.9	4.6	4.5	5.6	4.3
Unionized Ammonia	0.02	0.047	0.027	0.297	<0.020	0.274
Vanadium	0.006		<0.0020			
Zinc	0.03		0.120			

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW5

Sheet: 7

Date Sampled:

27-May-2000

28-May-2000

10-Jun-2000

27-Jun-2000

28-Jun-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	331				450
Aluminum	f (pH)	<0.050				<0.050
Ammonia (as N)		7.80		34.16		12.80
Barium		0.110				0.140
Beryllium	f (Hardness)	<0.002				<0.002
BOD		51.0		2.0	4.0	17.0
Boron	0.2	0.670				0.880
Cadmium	0.0002	<0.0002				<0.0001
Calcium		146.0				168.0
Chloride		51.0				51.0
Chromium		<0.010				<0.010
Cobalt	0.0009	0.0015				0.0009
COD		51		95		56
Colour (TCU)		37				35
Conductivity (uS/cm)		950	1438		1650	1300
Copper	0.005	<0.0100				0.0010
Dissolved Oxygen	f (Temp)	4.8	9.5	6.0	9.8	3.1
DOC		21.1				21.6
Hardness (CaCO ₃)		456				527
Hydrogen Sulphide	0.002	0.01		<0.01	<0.01	<0.01
Iron	0.3	0.59				0.37
Lead	f (Alk)	<0.0020				<0.0010
Magnesium		22.00				26.00
Manganese		0.430				0.670
Mercury	0.0002	<0.0001				<0.0001
Molybdenum	0.04	<0.010				<0.010
Nickel	0.025	<0.010				<0.010
Nitrate (as N)		2.54				2.19
Nitrite (as N)		0.22				<0.10
pH (pH units)	6.5-8.5	7.4	7.6	7.9	7.8	7.0
Phenols	0.001	<0.001				<0.001
Phosphate (as P)						0.020
Phosphorus (total)	0.03	0.080				38.0
Potassium		27.0				5.83
Silicon		5.08				<0.0001
Silver	0.0001	0.0001				50.0
Sodium		42.0				0.748
Strontium		0.635				146.0
Sulphate		169.0				52
Sulphur		54				816
TDS		664	695	1059	856	20.0
Temperature (C)		15.0	14.0	15.5	17.5	<0.00200
Thallium	0.0003	<0.00020				<0.010
Tin		<0.050				<0.010
Titanium		<0.010				15.50
TKN		7.98				7
TSS		3				3.8
Turbidity (NTU)		8.5		11.0	11.1	0.050
Unionized Ammonia	0.02	0.053		0.752		<0.0010
Vanadium	0.006	<0.0050				0.080
Zinc	0.03	0.170				

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW5

Sheet: 8

Date Sampled:

09-Jul-2000

17-Jul-2000

24-Jul-2000

25-Jul-2000

02-Aug-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd				833	
Aluminum	f (pH)				<0.050	
Ammonia (as N)		34.90	38.60	0.02	41.80	47.30
Barium					0.200	
Beryllium	f (Hardness)				<0.002	
BOD		10.0	6.0	19.0	4.0	7.0
Boron	0.2				1.300	
Cadmium	0.0002				<0.0001	
Calcium					183.0	
Chloride					467.0	
Chromium					<0.010	
Cobalt	0.0009				0.0020	
COD		88	109	19	91	141
Colour (TCU)					41	
Conductivity (uS/cm)		1650		922	2220	
Copper	0.005				0.0010	
Dissolved Oxygen	f (Temp)	6.2	5.0	5.6	3.9	7.0
DOC					35.0	
Hardness (CaCO ₃)					676	
Hydrogen Sulphide	0.002	<0.01	<0.01	0.01	<0.01	0.10
Iron	0.3				0.95	
Lead	f (Alk)				<0.0010	
Magnesium					53.00	
Manganese					0.640	
Mercury	0.0002				<0.0001	
Molybdenum	0.04				<0.010	
Nickel	0.025				<0.010	
Nitrate (as N)					0.28	
Nitrite (as N)					0.25	
pH (pH units)	6.5-8.5	7.8	7.0	7.7	7.6	7.4
Phenols	0.001				<0.001	
Phosphate (as P)						
Phosphorus (total)	0.03				0.060	
Potassium					78.0	
Silicon					7.84	
Silver	0.0001				<0.0001	
Sodium					118.0	
Strontium					1.140	
Sulphate					113.0	
Sulphur					41	
TDS		980	1077	1126	1228	1120
Temperature (C)		17.0	18.0	17.5	26.0	19.0
Thallium	0.0003				<0.00200	
Tin					<0.010	
Titanium					<0.010	
TKN					48.60	
TSS					100	
Turbidity (NTU)		33.5	26.4	89.0	9.0	>100.0
Unionized Ammonia	0.02	0.685	0.131	<0.020	0.946	0.683
Vanadium	0.006				0.0040	
Zinc	0.03				0.020	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sheet: 9

Sample Source: SW5

Date Sampled:

09-Aug-2000

28-Aug-2000

29-Aug-2000

04-Sep-2000

13-Sep-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd					
Aluminum	f (pH)					
Ammonia (as N)		24.20		46.60	1.01	48.00
Barium						
Beryllium	f (Hardness)					
BOD		5.0		10.0	5.0	4.0
Boron	0.2					
Cadmium	0.0002					
Calcium						
Chloride						
Chromium						
Cobalt	0.0009			95	106	95
COD		73				
Colour (TCU)						
Conductivity (uS/cm)						
Copper	0.005			5.5	7.0	7.5
Dissolved Oxygen	f (Temp)	7.0				
DOC						
Hardness (CaCO ₃)						
Hydrogen Sulphide	0.002	<0.01		<0.01	<0.01	<0.01
Iron	0.3					
Lead	f (Alk)					
Magnesium						
Manganese						
Mercury	0.0002					
Molybdenum	0.04					
Nickel	0.025					
Nitrate (as N)						
Nitrite (as N)				7.9	7.9	7.9
pH (pH units)	6.5-8.5	7.4				
Phenols	0.001					
Phosphate (as P)						
Phosphorus (total)	0.03	0.030				
Potassium						
Silicon						
Silver	0.0001					
Sodium						
Strontium						
Sulphate						
Sulphur					1080	975
TDS		858		16.5	15.0	16.5
Temperature (C)		18.5				
Thallium	0.0003					
Tin						
Titanium						
TKN						
TSS						
Turbidity (NTU)		40.0		11.0	20.0	12.0
Unionized Ammonia	0.02	0.530		1.105	0.034	1.138
Vanadium	0.006					
Zinc	0.03					

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW5

Date Sampled:

Sheet: 10

Parameter	PWQO	24-Sep-2000	15-Oct-2000	01-Nov-2000	16-Nov-2000	20-Mar-2003
Alkalinity (CaCO3)	75% Bkgd			775		751
Aluminum	f (pH)			<0.050		<0.010
Ammonia (as N)		22.90		36.10		42.00
Barium				0.190		0.170
Beryllium	f (Hardness)			<0.002		<0.001
BOD		18.0		4.0		38.0
Boron	0.2			1.060		0.930
Cadmium	0.0002			<0.0001		<0.0001
Calcium				178.0		171.0
Chloride				149.0		174.0
Chromium				<0.010		0.024
Cobalt	0.0009			0.0010		0.0010
COD		89		103		77
Colour (TCU)						
Conductivity (uS/cm)						
Copper	0.005			280		1240
Dissolved Oxygen	f (Temp)	6.5	7.0	<0.0010		0.0050
DOC				2.9	9.0	2.1
Hardness (CaCO3)				34.4		32.6
Hydrogen Sulphide				659		604
Iron	0.002	<0.01				
Lead	0.3			0.74		3.79
Magnesium	f (Alk)			<0.0010		<0.0010
Manganese				52.00		43.00
Mercury				0.450		0.487
Molybdenum	0.0002					
Nickel	0.04			<0.010		<0.005
Nitrate (as N)	0.025			<0.010		<0.005
Nitrite (as N)				0.42		0.91
pH (pH units)	6.5-8.5	7.9	7.6	<0.10		<0.10
Phenols	0.001			7.6	7.6	6.9
Phosphate (as P)				<0.001		<0.001
Phosphorus (total)	0.03			<0.03		0.38
Potassium				0.110		0.240
Silicon				75.0		75.0
Silver				7.67		6.70
Sodium	0.0001			<0.0001		<0.0001
Strontium				111.0		120.0
Sulphate				0.976		0.760
Sulphur				48.0		85.0
TDS				16		
Temperature (C)		915	930	1080		1290
Thallium		14.0	10.0	9.0	5.7	3.0
Tin	0.0003			<0.00100		<0.00100
Titanium				<0.010		<0.010
TKN				<0.010		<0.010
TSS				41.30		44.50
Turbidity (NTU)				91		28
Unionized Ammonia		15.0		8.3		20.1
Vanadium	0.02	0.360		0.257		0.035
Zinc	0.006			0.0050		0.0080
	0.03			<0.010		0.013

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sheet: 1

Sample Source: SW6

Date Sampled:

13-May-1999

18-Oct-1999

06-Dec-1999

30-Dec-1999

31-Jan-2000

Parameter	PWQO	13-May-1999	18-Oct-1999	06-Dec-1999	30-Dec-1999	31-Jan-2000
Alkalinity (CaCO ₃)	75% Bkgd	688	715	444	748	794
Aluminum	f (pH)	0.480	0.040	<0.030	<0.030	0.030
Aluminum (Total)		48.60	26.80	13.00	34.56	35.50
Ammonia (as N)		<0.010	0.270	0.140	0.190	0.170
Barium		<0.010	<0.010	<0.002	<0.002	<0.002
Beryllium	f (Hardness)			45.0	73.0	2.0
BOD				0.750	1.570	1.490
Boron	0.2	<0.010	1.290	<0.0002	<0.0002	<0.0002
Cadmium	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Calcium		205.0	170.0	130.0	159.0	224.0
Chloride		147.0	152.0	84.0	165.0	186.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	0.0008	0.0076	0.0013	0.0011	0.0017
COD		86	91	48	85	88
Colour (TCU)				21	28	27
Conductivity (uS/cm)				915	1790	2200
Copper	0.005	1050	1150	<0.0050	<0.0050	<0.0050
Dissolved Oxygen	f (Temp)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
DOC		8.8	9.1	10.3	6.4	37.7
Hardness (CaCO ₃)		34.1	32.4	19.8	32.6	786
Hydrogen Sulphide		693	614	465	587	786
Iron				0.05	<0.01	<0.01
Lead	0.002		7.09	2.40	0.15	0.08
Magnesium	0.3	0.04	0.0030	<0.0020	<0.0020	<0.0020
Manganese	f (Alk)	<0.0020	0.0030	0.0030	0.0030	0.0030
Mercury		44.00	46.00	34.00	46.00	55.00
Molybdenum		0.040	0.950	0.350	0.670	0.450
Nickel				<0.0002	<0.0002	<0.0002
Nitrate (as N)	0.0002		<0.010	<0.010	<0.010	<0.010
Nitrite (as N)	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
pH (pH units)	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Phenols		6.89	3.07	3.09	4.06	0.65
Phosphate (as P)		0.22	<0.10	<0.10	<0.10	<0.10
Phosphorus (total)	6.5-8.5	7.8	8.1	7.5	8.0	7.9
Potassium	0.001	<0.001	<0.001	<0.001	0.002	<0.001
Silicon		<0.03	0.09	0.350	0.960	0.020
Silver	0.03	0.110	0.680	39.0	51.0	69.0
Sodium		70.0	64.0	5.40	7.40	5.80
Strontium		6.80	7.80	5.40	7.40	5.80
Sulphate		6.80	7.80	5.40	7.40	5.80
Sulphur	0.0001	0.0002	<0.0001	0.0001	<0.0001	<0.0001
TDS		108.0	109.0	59.0	86.0	141.0
Temperature (C)		0.113	0.943	0.591	0.949	1.210
Thallium		131.0	88.0	111.0	122.0	156.0
Tin		42	28	40	44	52
Titanium		1132	1060	736	1088	1276
TKN		10.0	5.0	6.5	2.0	0.0
TSS		10.0	5.0	6.5	2.0	0.0
Turbidity (NTU)	0.0003	<0.00500	<0.00500	<0.00500	<0.00500	<0.00200
Unionized Ammonia		<0.050	<0.010	<0.010	<0.010	<0.010
Vanadium		<0.010	<0.010	<0.010	<0.010	<0.010
Zinc		<0.010	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW6

Date Sampled:

Sheet: 2

Parameter	PWQO	29-Feb-2000	30-Mar-2000	28-Apr-2000	27-May-2000	28-Jun-2000
Alkalinity (CaCO ₃)	75% Bkgd	Same as SW10	Same as SW10	345	330	447
Aluminum	f (pH)			<0.050	0.090	<0.050
Aluminum (Total)						
Ammonia (as N)						
Barium				8.87	6.96	12.50
Beryllium				0.110	0.110	0.140
BOD	f (Hardness)			<0.002	<0.002	<0.002
Boron	0.2			5.0	51.0	16.0
Cadmium	0.0002			0.740	0.670	0.880
Calcium				<0.0001	<0.0002	<0.0001
Chloride				149.0	143.0	167.0
Chromium				69.0	51.0	73.0
Cobalt	0.0009			<0.010	<0.010	<0.010
COD				0.0006	0.0010	0.0010
Colour (TCU)				52	51	51
Conductivity (uS/cm)				28	36	30
Copper	0.005			915	900	1300
Dissolved Oxygen	f (Temp)			<0.0010	<0.0100	0.0020
DOC				7.8	6.9	7.4
Hardness (CaCO ₃)				19.8	20.8	21.7
Hydrogen Sulphide	0.002			475	448	529
Iron	0.3			<0.01	0.01	<0.01
Lead	f (Alk)			0.49	1.17	0.77
Magnesium				<0.0010	<0.0020	<0.0010
Manganese				25.00	22.00	27.00
Mercury	0.0002			0.190	0.460	0.690
Molybdenum	0.04			0.0002	<0.0001	<0.0001
Nickel	0.025			<0.010	<0.010	<0.010
Nitrate (as N)				<0.010	<0.010	<0.010
Nitrite (as N)				2.98	2.43	3.01
pH (pH units)	6.5-8.5			0.41	0.20	<0.10
Phenols	0.001			7.4	7.5	7.1
Phosphate (as P)				<0.001	<0.001	<0.001
Phosphorus (total)	0.03					
Potassium				0.040	0.030	0.080
Silicon				30.0	27.0	38.0
Silver	0.0001			4.09	5.49	6.02
Sodium				<0.0001	0.0001	<0.0001
Strontium				55.0	42.0	51.0
Sulphate				0.622	0.641	0.778
Sulphur				178.0	166.0	151.0
TDS				54	54	52
Temperature (C)				756	668	820
Thallium				8.0	15.0	20.0
Tin	0.0003			<0.00100	<0.00020	<0.00200
Titanium				<0.010	<0.050	<0.010
TKN				0.010	0.030	0.010
TSS				8.63	6.96	14.60
Turbidity (NTU)				96	71	54
Unionized Ammonia	0.02			12.0	19.4	9.3
Vanadium	0.006			0.035	0.060	0.062
Zinc	0.03			<0.0020	<0.0050	<0.0010
				0.110	0.170	0.080

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sheet: 3

Sample Source: SW6

Date Sampled:

25-Jul-2000

28-Aug-2000

01-Nov-2000

22-Jun-2001

31-Jul-2001

Parameter	PWQO	25-Jul-2000	28-Aug-2000	01-Nov-2000	22-Jun-2001	31-Jul-2001
Alkalinity (CaCO ₃)	75% Bkgd	769	620	753	614	599
Aluminum	f (pH)	<0.050	<0.050	<0.050	<0.050	<0.050
Aluminum (Total)		20.30	30.30	35.60	21.10	23.80
Ammonia (as N)		0.190	0.170	0.190	0.160	0.020
Barium		<0.002	<0.002	<0.002	<0.002	<0.002
Beryllium	f (Hardness)	21.0	24.0	21.0	68.0	78.0
BOD		1.290	1.160	1.050	1.090	1.020
Boron	0.2	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cadmium	0.0002	197.0	128.0	177.0	166.0	117.0
Calcium		452.0	153.0	148.0	155.0	163.0
Chloride		<0.010	<0.010	<0.010	0.006	0.017
Chromium		0.0025	0.0020	0.0020	0.0014	0.0023
Cobalt	0.0009	86	78	97	90	105
COD		37	32			
Colour (TCU)		2050	1810	265	1730	1710
Conductivity (uS/cm)		0.0020	0.0020	0.0020	0.0020	0.0050
Copper	0.005	3.0	3.4	2.8	4.5	6.5
Dissolved Oxygen	f (Temp)	34.9	31.7	30.4	29.4	48.3
DOC		690	501	652	588	486
Hardness (CaCO ₃)		<0.01	0.01			
Hydrogen Sulphide	0.002	0.07	0.14	1.41	1.15	2.26
Iron	0.3	<0.0010	<0.0010	<0.0010	0.0010	0.0020
Lead	f (Alk)	48.00	44.00	51.00	42.00	47.00
Magnesium		0.620	0.270	0.500	0.370	0.520
Manganese		<0.0001	<0.0001			
Mercury	0.0002	<0.010	<0.010	<0.010	<0.010	<0.010
Molybdenum	0.04	<0.010	<0.010	<0.010		
Nickel	0.025	3.12	6.90	3.00	11.10	9.39
Nitrate (as N)		0.72	0.82	<0.10	<0.10	2.13
Nitrite (as N)		7.5	7.7	7.4	7.8	8.1
pH (pH units)	6.5-8.5	0.004	<0.001	<0.001	<0.001	<0.001
Phenols	0.001			<0.03	<0.03	0.07
Phosphate (as P)		0.030	0.110	0.170	0.180	0.300
Phosphorus (total)	0.03	76.0	69.0	72.0	70.0	75.0
Potassium		7.63	7.86	7.96	8.35	8.15
Silicon		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver	0.0001	112.0	108.0	107.0	102.0	115.0
Sodium		1.150	0.936	0.996	0.923	0.909
Strontium		117.0	88.0	50.0	74.0	46.0
Sulphate		42	29	17		
Sulphur		1160	1052	1140	1020	1040
TDS		23.0	20.1	10.0	20.0	20.0
Temperature (C)		<0.00200	<0.00100	<0.00100	<0.00100	<0.00100
Thallium	0.0003	<0.010	<0.010	<0.010	<0.010	<0.010
Tin		<0.010	<0.010	0.010	0.010	0.020
Titanium		21.90	30.30	38.80	30.10	24.20
TKN		32	57	150	270	120
TSS		4.3	44.0	42.0	75.0	65.0
Turbidity (NTU)		0.311	0.594	0.165	0.800	0.900
Unionized Ammonia	0.02	0.0050	0.0060	0.0070	0.0030	0.0070
Vanadium	0.006	0.030	0.010	0.030	0.030	0.040
Zinc	0.03					

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW6

Sheet: 4

Date Sampled: 25-Aug-2001 22-Sep-2001 15-Oct-2001 03-Dec-2001 24-Dec-2001

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	475	650	602	593	FROZEN
Aluminum	f (pH)	<0.050	<0.050	<0.050	<0.050	
Aluminum (Total)						
Ammonia (as N)		21.20	27.60	22.80	22.30	
Barium		0.220	0.210	0.160	0.120	
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	
BOD		<1.0	<1.0	42.0	49.0	
Boron	0.2	1.340	1.310	1.150	0.610	
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	
Calcium		102.0	122.0	133.0	171.0	
Chloride		202.0	212.0	163.0	120.0	
Chromium		0.005	0.004	0.005	0.003	
Cobalt	0.0009	0.0016	0.0017	0.0015	0.0010	
COD		112	87	74	86	
Colour (TCU)						
Conductivity (uS/cm)		950	1000	1040	1030	
Copper	0.005	0.0030	0.0030	0.0020	0.0020	
Dissolved Oxygen	f (Temp)	4.2	3.9	3.9	4.0	
DOC		30.3	32.0	29.3	26.7	
Hardness (CaCO ₃)		457	535	518	596	
Hydrogen Sulphide	0.002					
Iron	0.3	1.78	1.35	0.86	0.94	
Lead	f (Alk)	0.0010	0.0020	<0.0010	<0.0010	
Magnesium		49.00	56.00	45.00	41.00	
Manganese		0.370	0.370	0.280	0.480	
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	
Nitrate (as N)		20.90	<0.10	7.39	1.71	
Nitrite (as N)		1.31	<0.10	0.26	<0.10	
pH (pH units)	6.5-8.5	8.0	7.6	7.5	8.1	
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	
Phosphate (as P)		0.04	0.08	<0.03	0.03	
Phosphorus (total)	0.03	0.220	0.210	0.140	0.100	
Potassium		92.0	84.0	61.0	47.0	
Silicon		9.93	9.53	7.24	4.61	
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Sodium		133.0	116.0	99.0	85.0	
Strontium		0.914	0.898	0.741	0.609	
Sulphate		35.0	39.0	82.0	114.0	
Sulphur						
TDS		1030	1100	992	968	
Temperature (C)		21.0	20.0	18.0	4.0	
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	
Tin		<0.010	<0.010	<0.010	<0.010	
Titanium		0.020	<0.010	<0.010	<0.010	
TKN		24.60	34.90	23.30	23.40	
TSS		312	244	97	86	
Turbidity (NTU)		>100	83.0	27.0	31.0	
Unionized Ammonia	0.02	0.870	0.330	0.250	0.250	
Vanadium	0.006	0.0030	0.0030	0.0030	0.0010	
Zinc	0.03	0.030	0.030	0.020	0.030	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW6

Sheet: 5

Date Sampled:

11-Jan-2002

09-Apr-2002

17-May-2002

21-Jun-2002

30-Jul-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	717	260	423	556	805
Aluminum	f (pH)	<0.050	<0.050	<0.050	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)		28.80	7.76	17.50	17.80	42.00
Barium		0.130	0.080	0.110	0.220	0.470
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.001	<0.001
BOD		18.0	5.0	20.0	19.0	39.0
Boron	0.2	0.680	0.590	0.620	1.030	1.310
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0003
Calcium		197.0	110.0	146.0	177.0	169.0
Chloride		167.0	43.0	75.0	10.0	256.0
Chromium		0.001	0.002	0.003	0.018	0.005
Cobalt	0.0009	0.0014	0.0008	0.0014	0.0045	0.0041
COD		92	40	60	66	120
Colour (TCU)						
Conductivity (uS/cm)		1970	1780	1975	1580	1720
Copper	0.005	0.0020	0.0030	0.0020	0.0030	0.0060
Dissolved Oxygen	f (Temp)	8.3	10.1	8.1	5.2	3.8
DOC		29.6	15.8	19.8	28.5	45.8
Hardness (CaCO ₃)		698	361	488	574	653
Hydrogen Sulphide	0.002					
Iron	0.3	0.65	1.20	1.10	5.97	4.45
Lead	f (Alk)	<0.0010	0.0010	<0.0010	<0.0010	0.0020
Magnesium		50.00	21.00	30.00	32.00	56.00
Manganese		0.330	0.330	0.450	1.640	1.850
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.005	<0.005
Nickel	0.025	<0.010	<0.010	<0.010	<0.005	<0.005
Nitrate (as N)		2.89	1.08	1.22	0.11	6.84
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	1.03
pH (pH units)	6.5-8.5	7.2	7.2	6.9	7.0	7.0
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.03	<0.03	0.05	0.07	0.45
Phosphorus (total)	0.03	0.150	0.070	0.030	0.160	2.070
Potassium		66.0	20.0	36.0	44.0	98.0
Silicon		4.98	4.69	5.20	9.14	10.60
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		97.0	43.0	63.0	72.0	152.0
Strontium		1.480	0.514	0.597	0.881	2.040
Sulphate		96.0	177.0	139.0	201.0	63.0
Sulphur						
TDS		1240	621	825	943	1470
Temperature (C)		2.0	5.0	10.0	17.0	22.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	0.020	<0.010	<0.010	0.020
TKN		38.50	9.72	20.80	20.90	60.00
TSS		1390	18	9	63	1390
Turbidity (NTU)		55.0	10.9	6.9	31.8	>100
Unionized Ammonia	0.02	0.280	<0.020	<0.020	0.060	0.200
Vanadium	0.006	0.0020	0.0010	0.0010	0.0060	0.0040
Zinc	0.03	<0.010	0.220	0.090	0.048	0.247

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW6

Sheet: 6

Date Sampled: 21-Aug-2002 23-Sep-2002 31-Oct-2002 28-Nov-2002 30-Dec-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	799	699	713	692	783
Aluminum	f (pH)	<0.010	<0.010	<0.010	<0.010	0.540
Aluminum (Total)						
Ammonia (as N)		40.00	32.00	30.00	27.10	40.00
Barium		0.480	0.210	0.170	0.180	0.200
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		67.0	39.0	18.0	15.0	7.0
Boron	0.2	1.290	1.320	0.970	0.990	1.100
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Calcium		147.0	140.0	156.0	184.0	194.0
Chloride		245.0	229.0	191.0	170.0	216.0
Chromium		0.026	0.011	0.022	0.013	0.020
Cobalt	0.0009	0.0021	0.0016	0.0017	0.0023	0.0023
COD		124	106	84	77	112
Colour (TCU)						
Conductivity (uS/cm)		1880	2050	850	1570	1440
Copper	0.005	0.0030	0.0030	0.0030	0.0040	0.0040
Dissolved Oxygen	f (Temp)	1.8	2.0	2.1	9.5	2.1
DOC		50.2	39.4	32.0	27.2	38.1
Hardness (CaCO ₃)		610	584	600	674	703
Hydrogen Sulphide	0.002					
Iron	0.3	5.11	1.00	0.49	1.31	0.55
Lead	f (Alk)	<0.0010	0.0010	<0.0010	0.0020	0.0010
Magnesium		59.00	57.00	51.00	52.00	53.00
Manganese		0.895	0.358	0.243	0.435	0.496
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	0.025	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		2.92	10.50	4.75	3.76	1.67
Nitrite (as N)		0.23	0.51	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	6.8	6.6	7.0	7.9	7.6
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.46	0.13	0.25	0.21	0.33
Phosphorus (total)	0.03	3.610	0.500	0.200	0.170	0.190
Potassium		110.0	102.0	69.0	60.0	66.0
Silicon		9.10	9.50	5.70	6.50	8.40
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		176.0	171.0	138.0	133.0	140.0
Strontium		1.510	0.895	0.802	0.843	0.959
Sulphate		37.0	22.0	71.0	90.0	66.0
Sulphur						
TDS		1420	1400	1270	1260	1400
Temperature (C)		24.0	19.0	3.0	1.2	2.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	0.010	<0.010	<0.010	0.020
TKN		54.80	37.70	27.10	32.90	44.30
TSS		780	2710	72	129	147
Turbidity (NTU)		>100	>100	12.9		52.4
Unionized Ammonia	0.02	0.210	0.050	0.030	0.190	0.150
Vanadium	0.006	0.0090	0.0040	0.0070	0.0060	0.0080
Zinc	0.03	0.080	<0.005	<0.005	0.022	0.020

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW6

Sheet: 7

Date Sampled: 31-Jan-2003 19-Feb-2003 20-Mar-2003 25-Apr-2003 15-May-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	FROZEN	966	FROZEN	315	404
Aluminum	f (pH)		<0.010		<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)			50.00		9.00	9.23
Barium			0.180		0.100	0.110
Beryllium	f (Hardness)		<0.001		<0.001	<0.001
BOD			3.0		8.0	7.0
Boron	0.2		1.010		0.540	0.680
Cadmium	0.0002		<0.0001		<0.0001	<0.0001
Calcium			193.0		131.0	163.0
Chloride			255.0		57.0	73.0
Chromium			0.014		<0.001	0.003
Cobalt	0.0009		0.0017		0.0008	0.0008
COD			105		44	53
Colour (TCU)						
Conductivity (uS/cm)			890		1310	930
Copper	0.005		0.0010		0.0030	0.0020
Dissolved Oxygen	f (Temp)		2.4		2.2	4.0
DOC			41.2		17.4	19.5
Hardness (CaCO ₃)			733		430	539
Hydrogen Sulphide	0.002					
Iron	0.3		0.27		0.55	0.17
Lead	f (Alk)		<0.0010		<0.0010	<0.0010
Magnesium			61.00		25.00	32.00
Manganese			0.827		0.286	0.347
Mercury	0.0002					
Molybdenum	0.04		<0.005		<0.005	<0.005
Nickel	0.025		<0.005		<0.005	<0.005
Nitrate (as N)			0.45		2.49	3.04
Nitrite (as N)			0.12		<0.10	0.68
pH (pH units)	6.5-8.5		6.8		6.7	7.5
Phenols	0.001		<0.001		<0.001	<0.001
Phosphate (as P)			0.31		0.26	0.16
Phosphorus (total)	0.03		0.120		0.140	0.060
Potassium			77.0		24.0	37.0
Silicon			7.80		3.90	5.00
Silver	0.0001		<0.0001		<0.0001	<0.0001
Sodium			160.0		47.0	63.0
Strontium			0.922		0.598	0.676
Sulphate			46.0		167.0	169.0
Sulphur						
TDS			1630		696	839
Temperature (C)			0.0		7.0	14.0
Thallium	0.0003		<0.00100		<0.00100	<0.00100
Tin			<0.010		<0.010	<0.010
Titanium			<0.010		<0.010	<0.010
TKN			58.40		11.70	14.30
TSS			21		220	7
Turbidity (NTU)			17.1		14.7	2.3
Unionized Ammonia	0.02		0.026		<0.020	0.073
Vanadium	0.006		0.0050		<0.0010	<0.0010
Zinc	0.03		<0.005		0.101	0.069

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW6

Sheet: 8

Date Sampled: 13-Jun-2003 17-Jul-2003 24-Aug-2003 23-Sep-2003 27-Oct-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	701	762	808	772	457
Aluminum	f (pH)	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)		27.00	36.00	37.00	32.00	14.20
Barium		0.160	0.200	0.220	0.240	0.160
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		22.0	69.0	66.0	21.0	6.0
Boron	0.2	1.030	1.300	1.330	1.410	0.930
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		215.0	159.0	155.0	143.0	142.0
Chloride		169.0	227.0	215.0	232.0	79.0
Chromium		0.012	0.014	0.025	0.015	0.003
Cobalt	0.0009	0.0020	0.0027	0.0018	0.0017	0.0010
COD		82	107	106	90	50
Colour (TCU)						
Conductivity (uS/cm)		985	1040	1060	1210	1080
Copper	0.005	0.0020	0.0040	0.0010	0.0010	0.0020
Dissolved Oxygen	f (Temp)	4.1	3.2	2.9	2.2	3.9
DOC		31.5	38.4	36.6	38.9	18.9
Hardness (CaCO ₃)		714	624	597	579	478
Hydrogen Sulphide	0.002					
Iron	0.3	1.17	2.13	1.45	0.52	0.42
Lead	f (Alk)	<0.0010	0.0030	<0.0010	<0.0010	<0.0010
Magnesium		43.00	55.00	51.00	54.00	30.00
Manganese		0.720	0.876	0.977	0.547	0.373
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	0.025	<0.005	<0.005	<0.005	0.007	0.006
Nitrate (as N)		3.01	7.66	3.42	9.02	1.66
Nitrite (as N)		<0.10	<0.10	1.23	1.14	0.19
pH (pH units)	6.5-8.5	7.6	7.5	7.3	7.1	6.9
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.24	0.53	0.21	0.20	0.12
Phosphorus (total)	0.03	0.130	0.640	0.180	0.110	0.080
Potassium		65.0	90.0	100.0	94.0	42.0
Silicon		5.50	8.50	8.90	8.60	5.50
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		122.0	172.0	186.0	192.0	77.0
Strontium		0.884	0.873	0.880	1.040	0.801
Sulphate		136.0	54.0	37.0	53.0	130.0
Sulphur						
TDS		1290	1420	1450	1450	858
Temperature (C)		14.0	15.0	21.0	15.0	5.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
TKN		32.50	44.90	43.30	39.80	21.60
TSS		60	705	158	22	33
Turbidity (NTU)		12.1	61.1	38.2	8.9	10.4
Unionized Ammonia	0.02	0.269	0.308	0.310	0.110	<0.020
Vanadium	0.006	0.0040	0.0070	0.0080	0.0050	<0.0010
Zinc	0.03	0.033	0.032	<0.005	0.020	0.060

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW6

Sheet: 9

Date Sampled: 26-Nov-2003 23-Dec-2003 29-Jan-2004 20-Feb-2004 26-Mar-2004

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	695	715	FROZEN	FROZEN	305
Aluminum	f (pH)	<0.010	<0.010			0.012
Aluminum (Total)						1.250
Ammonia (as N)		19.70	27.00			8.70
Barium		0.200	0.170			0.093
Beryllium	f (Hardness)	<0.001	<0.001			<0.001
BOD		<1.0	4.0			0.9
Boron	0.2	1.120	1.020			0.544
Cadmium	0.0002	<0.0001	<0.0001			0.0002
Calcium		197.0	195.0			120.0
Chloride		128.0	134.0			43.7
Chromium		0.003	0.012			<0.005
Cobalt	0.0009	0.0014	0.0014			0.0008
COD		83	69			40
Colour (TCU)						
Conductivity (uS/cm)		1110	2000			910
Copper	0.005	0.0020	0.0020			0.0033
Dissolved Oxygen	f (Temp)	3.8	3.1			13.8
DOC		26.0	26.5			14.6
Hardness (CaCO ₃)		685	672			405
Hydrogen Sulphide	0.002					
Iron	0.3	0.41	0.36			1.90
Lead	f (Alk)	<0.0010	<0.0010			0.0011
Magnesium		47.00	45.00			23.10
Manganese		0.630	0.670			0.298
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005			<0.001
Nickel	0.025	0.008	0.010			0.005
Nitrate (as N)		2.91	1.98			2.30
Nitrite (as N)		<0.10	<0.10			<0.20
pH (pH units)	6.5-8.5	6.7	6.8			6.8
Phenols	0.001	<0.001	<0.001			<0.005
Phosphate (as P)		0.13	0.14			<1.00
Phosphorus (total)	0.03	0.050	0.100			0.078
Potassium		58.0	61.0			23.1
Silicon		8.30	8.50			6.29
Silver	0.0001	<0.0001	<0.0001			<0.0001
Sodium		115.0	115.0			35.4
Strontium		1.050	0.946			0.597
Sulphate		156.0	126.0			158.0
Sulphur						
TDS		1220	1220			616
Temperature (C)		4.0	1.2			5.9
Thallium	0.0003	<0.00100	<0.00100			<0.00005
Tin		<0.010	<0.010			<0.001
Titanium		<0.010	<0.010			0.074
TKN		20.40	35.90			8.52
TSS		34	25			34
Turbidity (NTU)		10.3	9.3			37.0
Unionized Ammonia	0.02	<0.020	<0.020			<0.020
Vanadium	0.006	0.0010	0.0040			0.0025
Zinc	0.03	0.040	0.050			0.136

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW6

Sheet: 10

Date Sampled: 29-Apr-2004 26-May-2004 29-Jun-2004 20-Jul-2004 20-Aug-2004

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	358	480	546	536	552
Aluminum	f (pH)	0.006	0.006	0.007	0.013	0.006
Aluminum (Total)		0.120	0.421	2.320	1.910	0.855
Ammonia (as N)		5.83	10.30	13.40	11.70	12.70
Barium		0.108	0.134	0.189	0.163	0.161
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		11.3	11.0	4.5	15.7	14.1
Boron	0.2	0.587	0.727	0.938	0.928	0.866
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		136.0	172.0	148.0	134.0	132.0
Chloride		58.8	89.9	134.0	128.0	121.0
Chromium		<0.005	<0.005	0.006	0.005	<0.005
Cobalt	0.0009	0.0004	0.0011	0.0030	0.0024	0.0016
COD		48	75	113	94	90
Colour (TCU)						
Conductivity (uS/cm)		720	1370	1190	1240	1330
Copper	0.005	0.0022	0.0012	0.0037	0.0027	0.0023
Dissolved Oxygen	f (Temp)	6.0	4.5	5.4	5.3	4.6
DOC		16.8	20.8	30.7	24.7	26.9
Hardness (CaCO ₃)		459	586	536	499	477
Hydrogen Sulphide	0.002					
Iron	0.3	0.22	0.86	4.69	3.35	2.12
Lead	f (Alk)	<0.0005	<0.0005	0.0025	0.0017	0.0009
Magnesium		28.80	37.80	40.10	39.70	35.40
Manganese		0.425	0.501	1.070	0.921	0.710
Mercury	0.0002					
Molybdenum	0.04	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	0.025	0.003	0.004	0.009	0.007	0.007
Nitrate (as N)		9.90	11.80	12.40	6.20	6.40
Nitrite (as N)		<0.20	<0.20	<0.20	<0.50	<0.20
pH (pH units)	6.5-8.5	7.8	7.7	7.5	7.7	7.7
Phenols	0.001	<0.001	0.001	<0.001	0.001	0.001
Phosphate (as P)		<1.00	<1.00	<1.00	<1.00	nm
Phosphorus (total)	0.03	0.040	0.132	0.250	0.276	0.135
Potassium		23.9	36.4	45.5	45.7	41.4
Silicon		4.85	6.06	11.10	10.90	8.81
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		43.7	68.8	96.0	93.7	87.3
Strontium		0.723	0.927	0.965	0.882	0.865
Sulphate		181.0	124.0	68.1	75.9	51.5
Sulphur						
TDS		722	876	932	922	936
Temperature (C)		17.5	15.8	17.9	24.0	17.7
Thallium	0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium		0.007	0.026	0.153	0.118	0.061
TKN		6.46	10.70	17.10	12.00	16.30
TSS		8	45	52	134	51
Turbidity (NTU)		4.9	5.5	20.0	42.0	10.4
Unionized Ammonia	0.02	0.120	0.132	0.142	0.302	0.209
Vanadium	0.006	<0.0005	0.0010	0.0059	0.0046	0.0030
Zinc	0.03	0.076	0.045	0.086	0.067	0.027

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW6

Sheet: 11

Date Sampled: 20-Sep-2004 25-Oct-2004 24-Nov-2004 23-Dec-2004

Parameter	PWQO				
Alkalinity (CaCO ₃)	75% Bkgd	555	722	665	not measured
Aluminum	f (pH)	0.027	0.014	<0.005	<0.005
Aluminum (Total)		0.726	0.717	0.585	0.567
Ammonia (as N)		8.20	18.70	18.60	16.60
Barium		0.193	0.202	0.176	0.121
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001
BOD		9.8	7.3	9.8	2.0
Boron	0.2	1.280	1.170	0.973	0.602
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		221.0	212.0	199.0	156.0
Chloride		107.0	148.0	142.0	86.2
Chromium		<0.005	<0.005	<0.005	<0.005
Cobalt	0.0009	0.0013	0.0016	0.0012	0.0011
COD		79	90	75	70
Conductivity (uS/cm)		1445	1400	1510	945
Copper	0.005	0.0014	0.0017	0.0019	0.0025
Dissolved Oxygen	f (Temp)	4.4	6.9	7.1	8.0
DOC		29.1	11.9	29.4	24.0
Hardness (CaCO ₃)		733	666	692	541
Iron	0.3	0.98	1.10	1.01	0.94
Lead	f (Alk)	0.0005	<0.0005	0.0007	0.0008
Magnesium		43.40	50.30	47.00	36.20
Manganese		0.521	0.624	0.438	0.400
Molybdenum	0.04	<0.001	<0.001	<0.001	<0.001
Nickel	0.025	0.005	0.005	0.006	0.005
Nitrate (as N)		7.80	6.80	6.40	2.40
Nitrite (as N)		2.80	1.30	6.10	0.40
pH (pH units)	6.5-8.5	7.5	6.9	6.9	7.0
Phenols	0.001	<0.001	<0.001	<0.001	0.001
Phosphate (as P)		<1.00	<1.00	<1.00	<1.00
Phosphorus (total)	0.03	0.127	0.086	0.089	0.090
Potassium		42.5	52.7	50.7	34.8
Silicon		8.86	9.05	8.09	6.78
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		79.4	111.0	90.0	68.5
Strontium		1.140	1.170	1.040	0.825
Sulphate		282.0	150.0	113.0	133.0
TDS		1204	1222	1090	868
Temperature (C)		18.0	6.0	3.0	1.0
Thallium	0.0003	<0.00005	0.00005	<0.00005	<0.00005
Tin		<0.001	<0.001	<0.001	<0.001
Titanium		0.045	0.051	0.040	0.042
TKN		11.50	26.00	28.00	16.80
TSS		41	36	48	44
Turbidity (NTU)		12.0	18.1	12.9	3.2
Unionized Ammonia	0.02	0.088	0.020	<0.020	<0.020
Vanadium	0.006	0.0015	0.0019	0.0016	0.0016
Zinc	0.03	0.036	0.028	0.026	0.048

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW7

Sheet: 1

Date Sampled: 13-May-1999 18-Oct-1999 06-Dec-1999 30-Dec-1999 31-Jan-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	220	208	217	231	169
Aluminum	f (pH)	0.680	0.090	0.090	<0.030	0.050
Aluminum (Total)						
Ammonia (as N)		0.23	0.04	0.15	0.19	0.21
Barium		0.050	0.070	0.060	0.070	0.050
Beryllium	f (Hardness)	<0.010	<0.010	<0.002	<0.002	<0.002
BOD				4.0	1.0	1.0
Boron	0.2	0.020	0.030	0.020	0.060	<0.010
Cadmium	0.0002	<0.0032	<0.0002	<0.0002	<0.0002	<0.0002
Calcium		73.0	78.0	86.0	82.0	66.0
Chloride		35.0	57.0	41.0	49.0	23.0
Chromium		<0.010	<0.010	<0.010	<0.010	0.140
Cobalt	0.0009	<0.0004	<0.0004	<0.0004	0.0004	<0.0004
COD		24	23	21	17	29
Colour (TCU)				31	26	31
Conductivity (uS/cm)		370	460	465	651	490
Copper	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Oxygen	f (Temp)	9.8	12.0	14.5	7.1	
DOC		11.6	8.0	10.2	9.8	10.0
Hardness (CaCO ₃)		273	293	318	312	239
Hydrogen Sulphide	0.002			0.02	<0.01	0.03
Iron	0.3	<0.01	0.49	0.31	0.29	0.49
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Magnesium		22.00	24.00	25.00	26.00	18.00
Manganese		<0.010	0.020	<0.010	<0.010	0.030
Mercury	0.0002			<0.0002	<0.0002	<0.0002
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		0.20	1.93	3.44	4.18	2.35
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	8.4	8.2	7.5	7.9	8.0
Phenols	0.001	<0.001	<0.001	<0.001	0.001	<0.001
Phosphate (as P)		<0.03	<0.03			
Phosphorus (total)	0.03	0.200	0.070	0.060	0.040	0.080
Potassium		3.0	4.0	4.0	2.0	4.0
Silicon		0.40	2.10	4.00	4.30	4.20
Silver	0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Sodium		23.0	34.0	25.0	21.0	14.0
Strontium		0.503	0.702	0.512	0.650	0.385
Sulphate		45.0	70.0	68.0	75.0	42.0
Sulphur		14	22	23	25	14
TDS		356	384	412	408	320
Temperature (C)		15.0	6.5	2.0	0.0	0.0
Thallium	0.0003	<0.00500	<0.00500	<0.00500	<0.00500	<0.00200
Tin		<0.050		<0.050	<0.050	<0.050
Titanium		<0.010	<0.010	<0.010	<0.010	0.020
TKN				1.01	1.07	1.08
TSS				10	6	6
Turbidity (NTU)				19.0	9.2	22.0
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0070	<0.0070	<0.0070	<0.0070	<0.0070
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW7

Sheet: 2

Date Sampled: 29-Feb-2000 30-Mar-2000 28-Apr-2000 27-May-2000 28-Jun-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	46	145	192	225	217
Aluminum	f (pH)	0.290	0.160	<0.050	<0.050	<0.050
Aluminum (Total)						
Ammonia (as N)		0.51	0.14	0.09	0.11	0.12
Barium		0.030	0.060	0.050	0.060	0.060
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		5.0	6.0	2.0	26.0	<1.0
Boron	0.2	0.020	0.020	0.030	0.030	0.040
Cadmium	0.0002	<0.0002	0.0002	<0.0001	<0.0002	<0.0001
Calcium		16.0	53.0	68.0	73.0	67.0
Chloride		12.0	17.0	19.0	20.0	21.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	0.0006	<0.0004	<0.0004	0.0004	0.0003
COD		29	24	24	26	30
Colour (TCU)		37	32	30	33	38
Conductivity (uS/cm)		500	360	400	520	660
Copper	0.005	<0.0050	0.0110	0.0250	0.0060	0.0020
Dissolved Oxygen	f (Temp)	14.5	12.2	12.7	9.1	7.9
DOC		10.2	11.0	9.6	10.6	11.3
Hardness (CaCO ₃)		56	190	244	261	168
Hydrogen Sulphide	0.002	0.08	0.05	0.03	0.04	<0.01
Iron	0.3	0.89	1.62	0.77	0.61	0.63
Lead	f (Alk)	<0.0020	<0.0020	<0.0010	<0.0020	<0.0010
Magnesium		4.00	14.00	18.00	19.00	19.00
Manganese		0.060	0.100	0.060	0.040	0.040
Mercury	0.0002	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001
Molybdenum	0.04	<0.010	<0.010	0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		0.99	3.71	2.77	3.77	3.94
Nitrite (as N)		<0.10	0.13	<0.10	<0.10	0.20
pH (pH units)	6.5-8.5	7.8	7.8	8.0	8.0	7.4
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)						
Phosphorus (total)	0.03	0.300	0.360	0.130	0.070	0.070
Potassium		5.0	5.0	3.0	3.0	3.0
Silicon		2.40	4.10	1.79	3.55	4.20
Silver	0.0001	<0.0001	<0.0001	<0.0001	0.0003	0.0002
Sodium		9.0	12.0	16.0	16.0	16.0
Strontium		0.088	0.271	0.360	0.445	0.429
Sulphate		8.0	21.0	31.0	29.0	26.0
Sulphur		<3	9	12	10	11
TDS		104	228	308	336	384
Temperature (C)		1.0	2.0	10.0	14.0	23.0
Thallium	0.0003	<0.00500	<0.00500	<0.00100	<0.00020	<0.00200
Tin		<0.050	<0.050	<0.010	<0.050	<0.010
Titanium		0.030	0.010	0.030	0.020	0.020
TKN		1.62	1.66	0.95	1.15	0.91
TSS		66	470	24	37	30
Turbidity (NTU)		61.0	>100	17.6	22.8	16.4
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0100	<0.0100	<0.0020	<0.0050	0.0010
Zinc	0.03	<0.010	0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW7

Sheet: 3

Date Sampled: 25-Jul-2000 28-Aug-2000 01-Nov-2000 22-Jun-2001 31-Jul-2001

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	227	206	221	217	185
Aluminum	f (pH)	0.150	<0.050	<0.050	<0.050	<0.050
Aluminum (Total)						
Ammonia (as N)		0.50	0.15	0.11	0.10	0.20
Barium		0.040	0.050	0.060	0.050	0.050
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		4.0	12.0	2.0	<1.0	2.0
Boron	0.2	0.030	0.040	0.030	0.050	0.060
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		58.0	58.0	70.0	71.0	49.0
Chloride		25.0	38.0	47.0	39.0	50.0
Chromium		<0.010	<0.010	<0.010	0.001	0.003
Cobalt	0.0009	0.0009	0.0007	0.0005	<0.0002	0.0003
COD		36	29	22	26	27
Colour (TCU)		39	23			
Conductivity (uS/cm)		300	531	310	510	478
Copper	0.005	0.0020	0.0020	0.0020	0.0020	0.0020
Dissolved Oxygen	f (Temp)	6.4	3.6	6.9	4.9	5.3
DOC		14.7	11.4	11.9	7.3	8.2
Hardness (CaCO ₃)		227	227	274	276	225
Hydrogen Sulphide	0.002	0.13	0.01			
Iron	0.3	0.12	0.04	0.19	0.21	0.23
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		20.00	20.00	24.00	24.00	25.00
Manganese		0.020	0.010	0.020	0.030	0.070
Mercury	0.0002	<0.0001	<0.0001			
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		0.11	<0.10	<0.10	2.90	0.18
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	6.9	8.8	6.9	8.0	8.3
Phenols	0.001	0.002	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)				<0.03	0.06	0.19
Phosphorus (total)	0.03	0.230	0.240	0.040	0.060	0.080
Potassium		2.0	3.0	4.0	3.0	3.0
Silicon		1.68	2.29	1.93	1.56	1.59
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		26.0	24.0	24.0	25.0	33.0
Strontium		0.420	0.473	0.548	0.618	0.619
Sulphate		22.0	38.0	50.0	48.0	53.0
Sulphur		9	14	17		
TDS		344	352	412	396	388
Temperature (C)		24.0	23.6	10.0	22.0	24.7
Thallium	0.0003	<0.00200	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	0.010
TKN		0.84	2.33	0.96	1.16	0.98
TSS		73	22	45	7	2
Turbidity (NTU)		60.0	17.0	6.3	5.7	10.0
Unionized Ammonia	0.02	<0.020	0.037	<0.020	<0.020	0.030
Vanadium	0.006	0.0030	0.0050	0.0030	0.0030	0.0050
Zinc	0.03	0.010	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW7

Sheet: 4

Date Sampled: 25-Aug-2001 22-Sep-2001 15-Oct-2001 03-Dec-2001 24-Dec-2001

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	181	166	169	200	FROZEN
Aluminum	f (pH)	<0.050	<0.050	<0.050	<0.050	
Aluminum (Total)						
Ammonia (as N)		<0.02	0.09	0.14	0.39	
Barium		0.050	0.050	0.050	0.050	
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	
BOD		2.0	3.0	<1.0	3.0	
Boron	0.2	0.080	0.060	0.070	<0.050	
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	
Calcium		44.0	41.0	50.0	90.0	
Chloride		61.0	55.0	59.0	66.0	
Chromium		<0.001	<0.001	0.002	0.001	
Cobalt	0.0009	<0.0002	0.0004	0.0006	0.0002	
COD		29	22	5	23	
Colour (TCU)						
Conductivity (uS/cm)		420	405	400	400	
Copper	0.005	0.0020	0.0020	0.0020	0.0020	
Dissolved Oxygen	f (Temp)	6.2	5.1	—	5.7	
DOC		7.5	7.7	7.5	6.2	
Hardness (CaCO ₃)		213	210	232	340	
Hydrogen Sulphide	0.002					
Iron	0.3	0.29	0.55	0.55	0.28	
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	
Magnesium		25.00	26.00	26.00	28.00	
Manganese		0.050	0.050	0.040	0.020	
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	
Nitrate (as N)		<0.10	<0.10	0.21	4.48	
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	8.1	7.9	7.7	7.7	
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	
Phosphate (as P)		0.25	0.15	0.08	0.05	
Phosphorus (total)	0.03	0.130	0.130	0.080	0.030	
Potassium		4.0	3.0	4.0	4.0	
Silicon		2.28	1.35	1.79	2.46	
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Sodium		43.0	39.0	38.0	35.0	
Strontium		0.584	0.586	0.564	0.470	
Sulphate		60.0	51.0	57.0	107.0	
Sulphur						
TDS		376	340	404	470	
Temperature (C)		20.0	18.0	15.0	3.0	
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	
Tin		<0.010	<0.010	<0.010	<0.010	
Titanium		0.010	0.020	0.020	0.020	
TKN		0.73	0.69	0.74	0.93	
TSS		14	14	9	8	
Turbidity (NTU)		16.0	14.0	9.1	15.0	
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	
Vanadium	0.006	0.0040	0.0040	0.0040	0.0020	
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW7

Sheet: 5

Date Sampled: 11-Jan-2002 09-Apr-2002 17-May-2002 21-Jun-2002 30-Jul-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	101	166	186	194	206
Aluminum	f (pH)	<0.050	<0.050	<0.050	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)		0.49	0.11	0.23	0.12	0.10
Barium		0.010	0.040	0.040	0.060	0.070
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.001	<0.001
BOD		2.0	3.0	2.0	2.0	1.0
Boron	0.2	<0.050	<0.050	<0.050	<0.020	<0.020
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		41.0	56.0	64.0	63.0	66.0
Chloride		34.0	28.0	31.0	22.0	29.0
Chromium		<0.001	0.001	0.003	0.001	<0.001
Cobalt	0.0009	<0.0002	0.0007	0.0005	0.0014	0.0004
COD		16	23	26	29	29
Colour (TCU)						
Conductivity (uS/cm)		314	500	420	680	400
Copper	0.005	0.0020	0.0050	0.0030	0.0030	0.0020
Dissolved Oxygen	f (Temp)	12.5	12.4	10.9	9.0	6.4
DOC		5.9	7.0	8.3	13.0	11.0
Hardness (CaCO ₃)		156	218	242	223	260
Hydrogen Sulphide	0.002					
Iron	0.3	0.05	0.03	0.36	0.43	0.25
Lead	f (Alk)	<0.0010	0.0030	<0.0010	<0.0010	<0.0010
Magnesium		13.00	19.00	20.00	16.00	23.00
Manganese		<0.010	0.010	0.030	0.104	0.046
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.005	<0.005
Nickel	0.025	<0.010	<0.010	<0.010	<0.005	<0.005
Nitrate (as N)		4.66	3.93	4.54	<0.10	2.64
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	0.16
pH (pH units)	6.5-8.5	7.4	7.4	7.1	7.2	7.4
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.03	0.04	<0.03	0.14	0.26
Phosphorus (total)	0.03	0.030	0.400	0.070	0.130	0.100
Potassium		2.0	2.0	2.0	2.0	3.0
Silicon		1.24	2.01	3.39	5.06	2.22
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		20.0	24.0	19.0	16.0	20.0
Strontium		0.413	0.361	0.358	0.395	0.758
Sulphate		57.0	47.0	41.0	32.0	45.0
Sulphur						
TDS		293	320	356	322	380
Temperature (C)		0.2	4.0	8.0	16.0	21.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	0.020	0.020	0.010
TKN		1.00	1.26	1.43	1.20	1.33
TSS		4	120	17	29	25
Turbidity (NTU)		4.3	18.1	8.2	7.5	10.8
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0010	0.0030	0.0030	0.0020	0.0030
Zinc	0.03	<0.010	<0.010	<0.010	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW7

Sheet: 6

Date Sampled: 21-Aug-2002 23-Sep-2002 31-Oct-2002 28-Nov-2002 30-Dec-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	186	173	193	197	236
Aluminum	f (pH)	<0.010	<0.010	<0.010	<0.010	0.230
Aluminum (Total)						
Ammonia (as N)		0.05	0.03	0.10	0.12	0.08
Barium		0.040	0.060	0.050	0.070	0.070
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<1.0	3.0	<1.0	<1.0	1.0
Boron	0.2	<0.050	0.050	<0.050	<0.050	0.080
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		52.0	47.0	58.0	80.0	91.0
Chloride		40.0	46.0	59.0	56.0	66.0
Chromium		0.002	0.002	0.001	0.004	0.005
Cobalt	0.0009	0.0004	0.0008	0.0003	0.0005	0.0002
COD		33	30	18	15	27
Colour (TCU)						
Conductivity (uS/cm)		380	380	550	570	370
Copper	0.005	0.0030	0.0030	0.0020	0.0030	0.0020
Dissolved Oxygen	f (Temp)	5.3	5.1	5.6	10.1	7.0
DOC		10.9	9.1	8.8	7.2	9.1
Hardness (CaCO ₃)		229	220	256	278	334
Hydrogen Sulphide	0.002					
Iron	0.3	0.08	0.73	0.04	0.29	0.15
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		24.00	25.00	27.00	19.00	26.00
Manganese		0.033	0.068	0.034	0.066	0.017
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	0.025	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		0.25	<0.10	0.42	6.92	6.04
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.5	7.2	7.1	8.1	8.0
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.10	0.20	0.16	0.16	0.09
Phosphorus (total)	0.03	0.110	0.220	0.090	0.110	0.060
Potassium		3.0	3.0	3.0	4.0	5.0
Silicon		1.70	1.80	1.80	3.50	3.60
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		28.0	33.0	38.0	31.0	37.0
Strontium		0.593	0.596	0.650	0.735	0.732
Sulphate		52.0	49.0	67.0	74.0	107.0
Sulphur						
TDS		350	372	426	471	567
Temperature (C)		25.0	20.0	4.0	1.1	-1.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	0.020	<0.010	0.010	<0.010
TKN		1.66	1.19	0.81	1.30	1.18
TSS		14	99	13	14	<2
Turbidity (NTU)		8.0	74.4	2.0		7.1
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0060	0.0060	0.0040	0.0030	0.0020
Zinc	0.03	<0.005	<0.005	<0.005	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW7

Sheet: 7

Date Sampled: 31-Jan-2003 19-Feb-2003 20-Mar-2003 25-Apr-2003 15-May-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	263	278	UNSAFE	184	203
Aluminum	f (pH)	<0.010	<0.010	ACCESS	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)		0.44	0.28		0.02	0.03
Barium		0.090	0.100		0.050	0.050
Beryllium	f (Hardness)	<0.001	<0.001		<0.001	<0.001
BOD		<1.0	1.0		<1.0	<1.0
Boron	0.2	<0.050	<0.050		<0.050	<0.050
Cadmium	0.0002	<0.0001	<0.0001		<0.0001	<0.0001
Calcium		103.0	103.0		74.0	72.0
Chloride		85.0	89.0		35.0	33.0
Chromium		0.001	0.001		<0.001	0.002
Cobalt	0.0009	0.0002	0.0003		0.0003	0.0003
COD		21	28		23	32
Colour (TCU)						
Conductivity (uS/cm)		400	420		395	400
Copper	0.005	0.0030	0.0020		0.0030	0.0020
Dissolved Oxygen	f (Temp)	6.3	5.9		5.9	6.5
DOC		10.4	9.5		8.7	10.2
Hardness (CaCO ₃)		377	393		255	258
Hydrogen Sulphide	0.002					
Iron	0.3	0.11	0.09		0.33	0.30
Lead	f (Alk)	<0.0010	<0.0010		<0.0010	<0.0010
Magnesium		29.00	33.00		17.00	19.00
Manganese		0.037	0.069		0.023	0.035
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005		<0.005	<0.005
Nickel	0.025	<0.005	<0.005		<0.005	<0.005
Nitrate (as N)		3.12	2.35		4.53	3.00
Nitrite (as N)		<0.10	<0.10		<0.10	<0.10
pH (pH units)	6.5-8.5	7.8	7.6		7.5	7.8
Phenols	0.001	<0.001	<0.001		<0.001	<0.001
Phosphate (as P)		0.11	0.30		0.23	0.14
Phosphorus (total)	0.03	0.050	0.110		0.190	0.050
Potassium		6.0	5.0		3.0	3.0
Silicon		3.30	4.30		3.10	2.50
Silver	0.0001	<0.0001	<0.0001		<0.0001	<0.0001
Sodium		50.0	55.0		20.0	20.0
Strontium		0.812	0.883		0.476	0.427
Sulphate		129.0	127.0		52.0	58.0
Sulphur						
TDS		607	657		386	387
Temperature (C)		-1.0	0.0		5.0	13.0
Thallium	0.0003	<0.00100	<0.00100		<0.00100	<0.00100
Tin		<0.010	<0.010		<0.010	<0.010
Titanium		<0.010	<0.010		0.010	0.010
TKN		1.33	1.26		1.17	1.37
TSS		<2	3		26	26
Turbidity (NTU)		5.0	4.7		12.0	10.3
Unionized Ammonia	0.02	<0.020	<0.020		<0.020	<0.020
Vanadium	0.006	0.0010	0.0010		0.0020	0.0020
Zinc	0.03	<0.005	<0.005		<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW7

Sheet: 8

Date Sampled: 13-Jun-2003 17-Jul-2003 24-Aug-2003 23-Sep-2003 27-Oct-2003

Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	218	204	211	206	258
Aluminum	f (pH)	<0.010	<0.010	<0.010	<0.010	0.020
Aluminum (Total)						
Ammonia (as N)		0.04	0.04	0.11	0.06	0.09
Barium		0.050	0.050	0.060	0.060	0.070
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<1.0	<1.0	2.0	1.0	2.0
Boron	0.2	<0.050	0.080	0.080	0.060	0.050
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		76.0	64.0	72.0	65.0	85.0
Chloride		41.0	36.0	36.0	42.0	44.0
Chromium		0.004	0.002	0.004	0.004	0.002
Cobalt	0.0009	0.0004	0.0004	0.0004	0.0005	0.0004
COD		25	26	24	26	19
Colour (TCU)						
Conductivity (uS/cm)		410	360	310	410	320
Copper	0.005	0.0020	0.0020	0.0020	0.0030	0.0040
Dissolved Oxygen	f (Temp)	5.9	5.2	4.5	4.6	5.7
DOC		11.4	11.8	9.6	11.6	7.5
Hardness (CaCO3)		293	255	270	265	282
Hydrogen Sulphide	0.002					
Iron	0.3	0.28	0.03	0.30	1.10	0.36
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		25.00	23.00	22.00	25.00	17.00
Manganese		0.032	0.013	0.042	0.059	0.024
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	0.025	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		2.04	1.23	2.11	0.38	0.40
Nitrite (as N)		<0.10	<0.10	<0.10	0.34	<0.10
pH (pH units)	6.5-8.5	7.5	7.4	7.5	7.4	7.2
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.12	0.35	0.13	0.09	0.15
Phosphorus (total)	0.03	0.050	0.120	0.100	0.100	0.130
Potassium		2.0	2.0	4.0	5.0	20.0
Silicon		0.70	1.30	4.00	3.30	5.30
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		24.0	25.0	24.0	30.0	42.0
Strontium		0.493	0.531	0.575	0.593	0.600
Sulphate		51.0	58.0	50.0	60.0	79.0
Sulphur						
TDS		417	389	395	387	530
Temperature (C)		14.0	17.0	19.0	13.0	3.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		0.010	<0.010	0.020	0.020	0.020
TKN		1.06	1.51	1.45	1.05	1.08
TSS		8	21	38	36	775
Turbidity (NTU)		10.0	13.8	8.8	30.6	>100
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0030	0.0040	0.0050	0.0040	0.0020
Zinc	0.03	<0.005	<0.005	<0.005	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW7

Sheet: 9

Date Sampled: 26-Nov-2003 23-Dec-2003 29-Jan-2004 20-Feb-2004 26-Mar-2004

Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	211	191	252	274	151
Aluminum	f (pH)	<0.010	<0.010	0.007	0.006	0.066
Aluminum (Total)				0.189	0.167	1.500
Ammonia (as N)		0.05	0.26	0.10	0.16	0.52
Barium		0.060	0.050	0.064	0.077	0.059
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<1.0	1.0	<0.5	0.7	1.4
Boron	0.2	0.030	0.030	0.022	0.029	0.021
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		77.0	71.0	86.0	87.6	57.1
Chloride		31.0	36.0	35.6	55.9	32.3
Chromium		0.001	0.002	<0.005	<0.005	<0.005
Cobalt	0.0009	0.0002	0.0003	<0.0001	0.0001	0.0006
COD		22	20	36	40	29
Colour (TCU)						
Conductivity (uS/cm)		295	590	540	560	400
Copper	0.005	0.0020	0.0030	0.0016	0.0019	0.0031
Dissolved Oxygen	f (Temp)	6.0	>15	14.1	11.3	11.4
DOC		8.7	8.7	10.6	11.7	9.7
Hardness (CaCO3)		275	268	314	356	203
Hydrogen Sulphide	0.002					
Iron	0.3	0.18	0.22	0.25	0.19	1.64
Lead	f (Alk)	<0.0010	<0.0010	<0.0005	<0.0005	0.0008
Magnesium		20.00	22.00	22.60	25.20	17.20
Manganese		0.010	0.020	0.032	0.053	0.062
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	0.001	0.001	0.002
Nickel	0.025	<0.005	<0.005	<0.001	<0.001	0.002
Nitrate (as N)		4.10	3.73	2.40	1.90	1.10
Nitrite (as N)		<0.10	<0.10	<0.20	<0.20	<0.20
pH (pH units)	6.5-8.5	7.2	6.3	7.4	7.5	6.1
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	0.001
Phosphate (as P)		0.11	0.08	<1.00	<1.00	<1.00
Phosphorus (total)	0.03	0.070	0.060	0.049	0.070	0.143
Potassium		4.0	4.0	2.5	4.1	3.5
Silicon		4.20	4.20	4.68	4.36	5.20
Silver	0.0001	<0.0001	<0.0001	<0.0001	0.0004	<0.0001
Sodium		21.0	24.0	19.1	29.3	18.6
Strontium		0.481	0.456	0.515	0.630	0.358
Sulphate		49.0	46.0	47.0	59.1	40.9
Sulphur						
TDS		398	381	406	482	280
Temperature (C)		3.0	1.6	1.6	2.3	1.1
Thallium	0.0003	<0.00100	<0.00100	<0.00005	<0.00005	<0.00005
Tin		<0.010	<0.010	<0.001	<0.001	<0.001
Titanium		<0.010	<0.010	0.010	0.009	0.083
TKN		0.97	0.60	0.85	1.16	1.40
TSS		6	12	1	6	40
Turbidity (NTU)		6.0	8.7	4.7	4.8	38.0
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0010	0.0010	0.0011	0.0007	0.0031
Zinc	0.03	<0.010	0.030	0.038	0.010	0.031

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW7

Sheet: 10

Date Sampled: 29-Apr-2004 26-May-2004 29-Jun-2004 20-Jul-2004 20-Aug-2004

Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	210	222	216	203	197
Aluminum	f (pH)	0.009	0.024	0.007	0.020	0.007
Aluminum (Total)		1.440	0.621	0.444	0.221	0.374
Ammonia (as N)		0.18	0.09	0.11	0.06	0.18
Barium		0.071	0.059	0.059	0.044	0.056
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<0.5	<0.5	<0.5	1.1	0.7
Boron	0.2	0.023	0.024	0.037	0.028	0.046
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		69.8	73.5	72.2	61.4	62.8
Chloride		35.5	30.8	36.0	29.2	36.3
Chromium		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	0.0009	0.0008	0.0004	0.0004	0.0002	0.0003
COD		34	42	40	40	35
Colour (TCU)						
Conductivity (uS/cm)		420	476	530	440	490
Copper	0.005	0.0029	0.0030	0.0020	0.0016	0.0023
Dissolved Oxygen	f (Temp)	12.6	9.6	8.4	11.4	8.9
DOC		21.4	12.3	12.6	13.3	10.3
Hardness (CaCO3)		260	270	275	229	233
Hydrogen Sulphide	0.002					
Iron	0.3	1.71	0.66	0.47	0.22	0.51
Lead	f (Alk)	0.0009	<0.0005	<0.0005	<0.0005	<0.0005
Magnesium		20.90	20.90	22.90	18.30	18.50
Manganese		0.109	0.042	0.061	0.036	0.039
Mercury	0.0002					
Molybdenum	0.04	0.002	0.002	0.003	0.001	0.002
Nickel	0.025	0.002	0.001	0.001	0.001	0.002
Nitrate (as N)		2.20	3.20	1.00	0.60	1.30
Nitrite (as N)		<0.20	<0.20	<0.20	<0.20	<0.20
pH (pH units)	6.5-8.5	8.2	7.7	7.8	7.8	7.6
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<1.00	<1.00	<1.00	<1.00	<1.00
Phosphorus (total)	0.03	0.100	0.093	0.076	0.086	0.033
Potassium		2.8	2.6	2.1	1.7	3.3
Silicon		4.16	3.66	1.73	1.95	3.43
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		20.1	16.7	20.6	16.7	20.1
Strontium		0.469	0.440	0.507	0.419	0.521
Sulphate		38.2	29.7	37.8	22.1	35.8
Sulphur						
TDS		328	342	354	332	410
Temperature (C)		13.6	14.7	23.4	25.9	23.6
Thallium	0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium		0.088	0.035	0.024	0.010	0.022
TKN		1.02	1.07	1.11	1.21	1.04
TSS		280	18	26	7	20
Turbidity (NTU)		29.0	8.4	7.9	5.0	9.7
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	>0.02	<0.020
Vanadium	0.006	0.0031	0.0021	0.0042	0.0028	0.0035
Zinc	0.03	0.014	0.009	0.077	0.015	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW7

Sheet: 11

Date Sampled: 20-Sep-2004 25-Oct-2004 24-Nov-2004 24-Dec-2004

Parameter	PWQO				
Alkalinity (CaCO ₃)	75% Bkgd	179	228	229	UNSAFE ACCESS
Aluminum	f (pH)	0.112	0.005	<0.005	
Aluminum (Total)		0.435	0.382	0.189	
Ammonia (as N)		0.09	0.12	0.13	
Barium		0.053	0.074	0.060	
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	
BOD		1.4	<0.5	<0.5	
Boron	0.2	0.029	0.056	0.039	
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	
Calcium		63.1	76.9	82.3	
Chloride		22.6	49.1	52.8	
Chromium		<0.005	<0.005	<0.005	
Cobalt	0.0009	0.0003	0.0003	0.0002	
COD		41	31	49	
Colour (TCU)					
Conductivity (uS/cm)		440	400	490	
Copper	0.005	0.0029	0.0021	0.0015	
Dissolved Oxygen	f (Temp)	8.5	7.8	8.8	
DOC		13.7	13.1	11.8	
Hardness (CaCO ₃)		220	292	299	
Hydrogen Sulphide	0.002				
Iron	0.3	0.47	0.37	0.24	
Lead	f (Alk)	<0.0005	<0.0005	<0.0005	
Magnesium		15.20	24.40	22.70	
Manganese		0.047	0.048	0.025	
Mercury	0.0002				
Molybdenum	0.04	0.002	0.005	0.001	
Nickel	0.025	<0.001	0.001	<0.001	
Nitrate (as N)		1.60	0.40	2.30	
Nitrite (as N)		<0.20	<0.20	<0.20	
pH (pH units)	6.5-8.5	7.6	7.3	7.4	
Phenols	0.001	<0.001	<0.001	<0.001	
Phosphate (as P)		<1.00	<1.00	<1.00	
Phosphorus (total)	0.03	0.119	0.063	0.026	
Potassium		3.3	4.4	3.5	
Silicon		5.15	2.86	3.02	
Silver	0.0001	<0.0001	<0.0001	<0.0001	
Sodium		12.7	29.8	26.4	
Strontium		0.394	0.714	0.565	
Sulphate		32.0	69.0	56.8	
Sulphur					
TDS		304	432	416	
Temperature (C)		22.0	6.0	3.0	
Thallium	0.0003	<0.00005	<0.00005	<0.00005	
Tin		<0.001	<0.001	<0.001	
Titanium		0.025	0.021	0.011	
TKN		1.36	0.76	1.04	
TSS		20	7	5	
Turbidity (NTU)		6.8	6.8	4.6	
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	
Vanadium	0.006	0.0021	0.0027	0.0011	
Zinc	0.03	<0.005	<0.005	<0.005	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW8

Sheet: 1

Date Sampled: 13-May-1999 18-Oct-1999 06-Dec-1999 30-Dec-1999 31-Jan-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	222	209	220	230	183
Aluminum	f (pH)	0.230	0.100	0.100	0.070	0.130
Aluminum (Total)						
Ammonia (as N)		0.29	0.06	0.13	0.13	0.16
Barium		0.050	0.070	0.060	0.060	0.050
Beryllium	f (Hardness)	<0.010	<0.010	<0.002	<0.002	<0.002
BOD				1.0	2.0	2.0
Boron	0.2	0.020	0.030	0.020	0.060	<0.010
Cadmium	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Calcium		75.0	78.0	85.0	82.0	73.0
Chloride		36.0	58.0	46.0	49.0	27.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
COD		21	23	23	26	32
Colour (TCU)				26	27	34
Conductivity (uS/cm)		380	480	460	658	550
Copper	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Oxygen	f (Temp)	9.4	12.0	7.5	7.4	
DOC		11.2	7.6	9.6	9.6	11.9
Hardness (CaCO ₃)		282	289	311	312	265
Hydrogen Sulphide	0.002			0.01	<0.01	0.01
Iron	0.3	<0.01	0.59	0.30	0.21	0.12
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Magnesium		23.00	23.00	24.00	26.00	20.00
Manganese		<0.010	0.020	<0.010	<0.010	0.010
Mercury	0.0002			<0.0002	<0.0002	<0.0002
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		0.25	2.00	3.74	4.22	2.70
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.9	8.1	6.8	7.9	7.7
Phenols	0.001	<0.001	<0.001	<0.001	0.003	<0.001
Phosphate (as P)		0.36	0.03			
Phosphorus (total)	0.03	0.120	0.060	0.060	0.040	0.080
Potassium		3.0	4.0	4.0	3.0	4.0
Silicon		0.50	2.10	4.10	4.20	2.70
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		24.0	35.0	25.0	21.0	16.0
Strontium		0.510	0.689	0.516	0.639	0.410
Sulphate		45.0	70.0	69.0	75.0	50.0
Sulphur		15	22	23	25	20
TDS		348	436	404	424	316
Temperature (C)		17.0	4.0	3.0	0.0	0.0
Thallium	0.0003	<0.00500	<0.00500	<0.00500	<0.00500	<0.00200
Tin		<0.050		<0.050	<0.050	<0.050
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
TKN				0.98	1.01	1.15
TSS				7	4	2
Turbidity (NTU)				16.0	9.2	9.3
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0070	<0.0070	<0.0070	<0.0070	<0.0070
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW8

Sheet: 2

Date Sampled: 29-Feb-2000 30-Mar-2000 28-Apr-2000 27-May-2000 28-Jun-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	45	143	191	223	219
Aluminum	f (pH)	0.260	0.140	<0.050	<0.050	<0.050
Aluminum (Total)						
Ammonia (as N)		0.50	0.14	0.16	0.10	0.16
Barium		0.030	0.070	0.050	0.060	0.060
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		12.0	6.0	1.0	26.0	<1.0
Boron	0.2	0.020	0.020	0.030	0.030	0.040
Cadmium	0.0002	<0.0002	<0.0002	<0.0001	<0.0002	<0.0002
Calcium		16.0	52.0	68.0	72.0	70.0
Chloride		12.0	18.0	19.0	20.0	25.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	0.0006	0.0004	<0.0004	0.0008	0.0002
COD		27	29	36	26	31
Colour (TCU)		36	44	30	34	38
Conductivity (uS/cm)		155	415	400	525	650
Copper	0.005	<0.0050	0.0070	0.0180	<0.0100	0.0100
Dissolved Oxygen	f (Temp)	11.8	10.1		9.2	7.7
DOC		9.9	10.7	9.4	10.9	11.9
Hardness (CaCO ₃)		56	188	244	262	253
Hydrogen Sulphide	0.002	0.09	0.06	0.03	0.04	<0.01
Iron	0.3	0.85	1.65	0.51	0.58	0.56
Lead	f (Alk)	<0.0020	<0.0020	<0.0010	<0.0020	<0.0010
Magnesium		4.00	14.00	18.00	20.00	19.00
Manganese		0.070	0.160	0.050	0.040	0.040
Mercury	0.0002	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		1.00	3.92	2.86	3.81	4.10
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	0.14
pH (pH units)	6.5-8.5	7.6	7.4	7.8	8.0	7.4
Phenols	0.001	0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)						
Phosphorus (total)	0.03	0.270	0.380	0.030	0.070	0.070
Potassium		5.0	5.0	3.0	3.0	3.0
Silicon		2.10	4.30	1.77	3.55	4.13
Silver	0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0004
Sodium		8.0	12.0	16.0	16.0	15.0
Strontium		0.086	0.278	0.358	0.448	0.417
Sulphate		8.0	22.0	32.0	29.0	28.0
Sulphur		<3	9	12	10	10
TDS		108	228	316	336	408
Temperature (C)		0.0	2.0	8.0	14.0	21.0
Thallium	0.0003	<0.00500	<0.00500	<0.00100	<0.00020	<0.00200
Tin		<0.050	<0.050	<0.010	<0.050	<0.010
Titanium		0.020	0.030	0.020	0.020	0.020
TKN		1.76	1.94	1.02	0.89	1.05
TSS		74	243	18	30	26
Turbidity (NTU)		74.0	>100	16.1	21.0	15.2
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0100	<0.0100	<0.0020	<0.0050	0.0010
Zinc	0.03	<0.010	0.020	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW8

Sheet: 3

Date Sampled: 25-Jul-2000 28-Aug-2000 01-Nov-2000 22-Jun-2001 31-Jul-2001

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	228	208	220	215	185
Aluminum	f (pH)	<0.050	<0.050	<0.050	<0.050	<0.050
Aluminum (Total)						
Ammonia (as N)		0.10	0.09	<0.02	0.10	0.19
Barium		0.090	0.050	0.060	0.050	0.050
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		5.0	7.0	1.0	1.0	2.0
Boron	0.2	0.040	0.040	0.030	0.050	0.060
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		57.0	58.0	67.0	73.0	48.0
Chloride		25.0	38.0	46.0	41.0	49.0
Chromium		<0.010	<0.010	<0.010	0.002	0.006
Cobalt	0.0009	0.0006	0.0004	0.0003	0.0003	0.0002
COD		36	24	22	21	27
Colour (TCU)		48	22			
Conductivity (uS/cm)		491	540	520	479	462
Copper	0.005	0.0020	0.0020	0.0020	0.0020	0.0020
Dissolved Oxygen	f (Temp)	7.0	5.1	7.3	5.1	5.7
DOC		15.1	10.9	11.0	8.5	7.8
Hardness (CaCO ₃)		221	223	266	290	223
Hydrogen Sulphide	0.002	0.07	0.01			
Iron	0.3	0.90	0.03	0.25	0.37	0.13
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		19.00	19.00	24.00	26.00	25.00
Manganese		0.090	<0.010	0.030	0.040	0.020
Mercury	0.0002	<0.0001	<0.0001			
Molybdenum	0.04	<0.010	<0.010	0.020	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		0.14	0.35	0.13	2.87	0.19
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	8.4	8.4	8.2	8.2	8.4
Phenols	0.001	0.003	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)				<0.03	0.05	0.20
Phosphorus (total)	0.03	0.160	0.100	0.210	0.070	0.080
Potassium		2.0	3.0	4.0	3.0	3.0
Silicon		2.27	2.33	1.92	1.69	1.84
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		27.0	24.0	27.0	25.0	33.0
Strontium		0.434	0.474	0.539	0.627	0.633
Sulphate		21.0	38.0	49.0	50.0	50.0
Sulphur		9	14	16		
TDS		268	392	436	404	388
Temperature (C)		27.0	23.5	10.0	23.0	24.3
Thallium	0.0003	<0.00200	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		0.030	<0.010	0.010	0.010	<0.010
TKN		0.90	1.49	1.04	0.76	1.00
TSS		54	20	48	22	4
Turbidity (NTU)		35.0	18.0	21.0	13.0	15.0
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	0.030
Vanadium	0.006	0.0030	0.0050	0.0040	0.0030	0.0060
Zinc	0.03	0.020	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW8

Sheet: 4

Date Sampled: 25-Aug-2001 22-Sep-2001 15-Oct-2001 03-Dec-2001 24-Dec-2001

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	182	165	178	202	FROZEN
Aluminum	f (pH)	<0.050	<0.050	<0.050	<0.050	
Aluminum (Total)						
Ammonia (as N)		<0.02	0.11	0.12	0.19	
Barium		0.050	0.050	0.050	0.050	
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	
BOD		2.0	<1.0	<1.0	4.0	
Boron	0.2	0.080	0.060	0.070	<0.050	
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	
Calcium		45.0	40.0	49.0	87.0	
Chloride		68.0	55.0	65.0	67.0	
Chromium		<0.001	<0.001	0.003	0.002	
Cobalt	0.0009	0.0002	0.0003	0.0003	0.0002	
COD		19	21	16	25	
Colour (TCU)						
Conductivity (uS/cm)		345	380	390	430	
Copper	0.005	0.0020	0.0010	0.0020	0.0020	
Dissolved Oxygen	f (Temp)	6.3	4.9	5.1	5.4	
DOC		8.2	7.5	7.6	6.2	
Hardness (CaCO ₃)		211	215	230	329	
Hydrogen Sulphide	0.002					
Iron	0.3	0.37	0.32	0.29	0.26	
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	
Magnesium		24.00	28.00	26.00	27.00	
Manganese		0.060	0.040	0.030	0.020	
Mercury	0.0002					
Molybdenum	0.04	0.020	<0.010	<0.010	<0.010	
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	
Nitrate (as N)		<0.10	<0.10	0.50	4.55	
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	8.1	7.9	7.8	7.8	
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	
Phosphate (as P)		0.24	0.16	0.07	0.06	
Phosphorus (total)	0.03	0.110	0.110	0.060	0.050	
Potassium		4.0	3.0	4.0	4.0	
Silicon		2.31	1.18	1.60	2.44	
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Sodium		43.0	39.0	38.0	34.0	
Strontium		0.583	0.600	0.562	0.470	
Sulphate		60.0	49.0	62.0	109.0	
Sulphur						
TDS		384	348	380	470	
Temperature (C)		21.0	18.0	14.0	3.0	
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	
Tin		<0.010	<0.010	<0.010	<0.010	
Titanium		0.010	0.020	0.010	0.020	
TKN		0.74	0.69	0.82	1.17	
TSS		27	27	4	11	
Turbidity (NTU)		23.0	14.0	8.1	15.0	
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	
Vanadium	0.006	0.0010	0.0030	0.0040	0.0020	
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW8

Sheet: 5

Date Sampled: 11-Jan-2002 09-Apr-2002 17-May-2002 21-Jun-2002 30-Jul-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	211	167	185	193	206
Aluminum	f (pH)	<0.050	<0.050	0.080	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)		0.07	0.15	0.14	0.16	0.15
Barium		0.040	0.040	0.040	0.060	0.060
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.001	<0.001
BOD		21.0	<1.0	2.0	3.0	<1.0
Boron	0.2	<0.050	<0.050	<0.050	<0.020	<0.020
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		93.0	57.0	63.0	64.0	67.0
Chloride		53.0	28.0	27.0	20.0	30.0
Chromium		<0.001	0.002	0.003	0.003	<0.001
Cobalt	0.0009	<0.0002	0.0004	0.0006	0.0015	0.0004
COD		30	16	25	47	32
Colour (TCU)						
Conductivity (uS/cm)		458	520	490	580	520
Copper	0.005	0.0020	0.0020	0.0030	0.0040	0.0020
Dissolved Oxygen	f (Temp)	11.1	12.1	10.7	8.9	6.4
DOC		10.7	6.9	9.0	13.2	10.2
Hardness (CaCO ₃)		340	216	236	234	254
Hydrogen Sulphide	0.002					
Iron	0.3	0.14	0.03	0.42	0.53	0.35
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		26.00	18.00	19.00	18.00	21.00
Manganese		0.010	0.010	0.030	0.108	0.056
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.005	0.008
Nickel	0.025	<0.010	<0.010	<0.010	<0.005	<0.005
Nitrate (as N)		4.99	4.01	4.42	<0.10	2.69
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	0.14
pH (pH units)	6.5-8.5	7.3	7.4	7.2	7.8	7.4
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.03	0.03	0.04	0.17	0.33
Phosphorus (total)	0.03	0.030	0.140	0.050	0.160	0.130
Potassium		3.0	2.0	2.0	2.0	3.0
Silicon		2.08	2.13	3.47	5.11	1.90
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		29.0	19.0	17.0	16.0	20.0
Strontium		0.822	0.361	0.356	0.390	0.640
Sulphate		93.0	49.0	40.0	27.0	46.0
Sulphur						
TDS		480	337	347	323	372
Temperature (C)		1.4	4.0	9.0	16.0	21.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	0.020	0.020	0.010
TKN		1.02	1.21	1.12	1.24	1.38
TSS		4	32	17	41	27
Turbidity (NTU)		7.6	12.1	8.8	19.9	12.1
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0010	0.0020	0.0030	0.0030	0.0030
Zinc	0.03	<0.010	<0.010	<0.010	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW8

Sheet: 6

Date Sampled: 21-Aug-2002 23-Sep-2002 31-Oct-2002 28-Nov-2002 30-Dec-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	202	175	197	195	229
Aluminum	f (pH)	<0.010	0.020	<0.010	0.010	0.240
Aluminum (Total)						
Ammonia (as N)		0.03	<0.02	0.08	0.15	0.18
Barium		0.040	0.050	0.050	0.060	0.080
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		5.0	3.0	<1.0	<1.0	2.0
Boron	0.2	<0.050	<0.050	<0.050	<0.050	<0.050
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		50.0	47.0	58.0	86.0	94.0
Chloride		40.0	46.0	59.0	55.0	64.0
Chromium		0.001	0.001	0.001	0.003	0.004
Cobalt	0.0009	0.0004	0.0004	0.0006	0.0004	0.0002
COD		29	32	17	11	23
Colour (TCU)						
Conductivity (uS/cm)		520	470	490	480	450
Copper	0.005	0.0030	0.0030	0.0030	0.0020	0.0030
Dissolved Oxygen	f (Temp)	5.0	4.8	5.7	11.2	7.4
DOC		10.6	10.6	10.0	7.7	7.6
Hardness (CaCO ₃)		215	212	260	289	350
Hydrogen Sulphide	0.002					
Iron	0.3	0.09	0.30	0.23	0.21	0.18
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		22.00	23.00	28.00	18.00	28.00
Manganese		0.032	0.049	0.072	0.019	0.019
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	0.005	<0.005	<0.005
Nickel	0.025	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		0.17	<0.10	0.43	6.90	5.92
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.3	7.1	7.0	8.1	7.9
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.17	0.24	0.37	0.16	0.14
Phosphorus (total)	0.03	0.100	0.150	0.190	0.090	0.050
Potassium		3.0	3.0	4.0	4.0	4.0
Silicon		1.60	1.50	1.90	3.30	3.80
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		28.0	32.0	37.0	31.0	37.0
Strontium		0.596	0.595	0.649	0.722	0.747
Sulphate		52.0	49.0	67.0	73.0	105.0
Sulphur						
TDS		345	376	424	475	553
Temperature (C)		26.0	21.0	8.0	1.5	0.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	0.010	<0.010	0.010	<0.010
TKN		1.47	1.15	1.20	1.30	1.09
TSS		25	46	12	13	6
Turbidity (NTU)		9.0	33.7	2.7		11.1
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0060	0.0050	0.0050	0.0020	0.0030
Zinc	0.03	<0.005	<0.005	<0.005	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW8

Sheet: 7

Date Sampled: 31-Jan-2003 19-Feb-2003 20-Mar-2003 25-Apr-2003 15-May-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	263	277	UNSAFE	186	195
Aluminum	f (pH)	<0.010	<0.010	ACCESS	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)		0.21	0.32		0.03	0.05
Barium		0.080	0.100		0.050	0.050
Beryllium	f (Hardness)	<0.001	<0.001		<0.001	<0.001
BOD		<1.0	2.0		<1.0	<1.0
Boron	0.2	0.070	<0.050		<0.050	<0.050
Cadmium	0.0002	<0.0001	<0.0001		<0.0001	<0.0001
Calcium		99.0	112.0		71.0	71.0
Chloride		84.0	84.0		37.0	38.0
Chromium		<0.001	0.001		<0.001	0.002
Cobalt	0.0009	0.0003	0.0003		0.0003	0.0003
COD		22	26		26	30
Colour (TCU)						
Conductivity (uS/cm)		470	450		370	460
Copper	0.005	0.0030	0.0020		0.0030	0.0020
Dissolved Oxygen	f (Temp)	6.3	5.6		5.6	6.3
DOC		10.2	10.7		9.2	10.5
Hardness (CaCO ₃)		363	416		256	251
Hydrogen Sulphide	0.002					
Iron	0.3	0.09	0.11		0.25	0.29
Lead	f (Alk)	<0.0010	<0.0010		<0.0010	<0.0010
Magnesium		28.00	33.00		19.00	18.00
Manganese		0.034	0.071		0.016	0.029
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005		<0.005	<0.005
Nickel	0.025	<0.005	<0.005		<0.005	<0.005
Nitrate (as N)		3.12	2.42		4.31	3.72
Nitrite (as N)		<0.10	<0.10		<0.10	<0.10
pH (pH units)	6.5-8.5	7.7	7.5		7.4	7.7
Phenols	0.001	<0.001	<0.001		<0.001	<0.001
Phosphate (as P)		0.14	0.14		0.33	0.11
Phosphorus (total)	0.03	0.050	0.060		0.150	0.040
Potassium		6.0	6.0		3.0	3.0
Silicon		3.10	4.50		3.00	2.40
Silver	0.0001	<0.0001	<0.0001		<0.0001	<0.0001
Sodium		51.0	56.0		20.0	20.0
Strontium		0.753	0.888		0.487	0.439
Sulphate		127.0	125.0		48.0	46.0
Sulphur						
TDS		606	643		385	389
Temperature (C)		-1.0	0.0		5.0	13.0
Thallium	0.0003	<0.00100	<0.00100		<0.00100	<0.00100
Tin		<0.010	<0.010		<0.010	<0.010
Titanium		<0.010	<0.010		0.010	0.010
TKN		1.35	1.34		1.17	1.23
TSS		<2	2		18	3
Turbidity (NTU)		5.8	4.6		11.1	7.1
Unionized Ammonia	0.02	<0.020	<0.020		<0.020	<0.020
Vanadium	0.006	0.0010	0.0010		0.0010	0.0020
Zinc	0.03	<0.005	<0.005		<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW8

Sheet: 8

Date Sampled: 13-Jun-2003 17-Jul-2003 24-Aug-2003 23-Sep-2003 27-Oct-2003

Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	217	203	212	200	210
Aluminum	f (pH)	<0.010	<0.010	<0.010	<0.010	0.010
Aluminum (Total)						
Ammonia (as N)		0.05	0.05	0.09	0.10	0.09
Barium		0.050	0.050	0.070	0.070	0.060
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<1.0	<1.0	2.0	1.0	<1.0
Boron	0.2	<0.050	0.100	0.060	0.050	0.040
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		75.0	65.0	72.0	63.0	86.0
Chloride		38.0	40.0	45.0	41.0	31.0
Chromium		0.004	0.002	0.005	0.008	0.002
Cobalt	0.0009	0.0004	0.0003	0.0007	0.0010	0.0004
COD		32	31	23	30	16
Colour (TCU)						
Conductivity (uS/cm)		405	420	430	385	410
Copper	0.005	0.0020	0.0020	0.0030	0.0030	0.0020
Dissolved Oxygen	f (Temp)	6.4	5.0	4.6	4.7	5.6
DOC		12.0	11.3	9.5	10.8	6.7
Hardness (CaCO3)		278	261	270	256	289
Hydrogen Sulphide	0.002					
Iron	0.3	0.31	0.19	0.64	1.07	0.29
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		22.00	24.00	22.00	24.00	18.00
Manganese		0.031	0.027	0.081	0.067	0.021
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	0.025	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		1.96	1.33	2.13	0.34	7.07
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.6	7.5	7.6	7.3	7.0
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.11	0.14	0.17	0.18	0.29
Phosphorus (total)	0.03	0.110	0.070	0.150	0.070	0.140
Potassium		2.0	2.0	4.0	4.0	5.0
Silicon		0.70	1.50	4.40	3.80	5.00
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		23.0	25.0	24.0	27.0	20.0
Strontium		0.494	0.530	0.590	0.617	0.576
Sulphate		85.0	48.0	65.0	53.0	48.0
Sulphur						
TDS		404	385	411	369	411
Temperature (C)		14.0	17.0	20.0	13.0	4.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		0.010	<0.010	0.020	0.060	0.010
TKN		1.10	1.34	1.16	0.99	0.91
TSS		13	16	142	31	13
Turbidity (NTU)		11.3	4.3	36.1	28.2	21.8
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0030	0.0040	0.0060	0.0080	0.0020
Zinc	0.03	<0.005	<0.005	<0.005	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW8

Sheet: 9

Date Sampled: 26-Nov-2003 23-Dec-2003 29-Jan-2004 20-Feb-2004 26-Mar-2004

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	212	194	253	272	155
Aluminum	f (pH)	<0.010	<0.010	0.007	0.005	0.018
Aluminum (Total)				0.163	0.209	1.590
Ammonia (as N)		0.06	0.14	0.09	0.16	0.50
Barium		0.060	0.050	0.064	0.080	0.061
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<1.0	2.0	<0.5	<0.5	1.3
Boron	0.2	0.030	0.030	0.021	0.032	0.018
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	0.0002	<0.0001
Calcium		76.0	73.0	83.9	95.3	53.9
Chloride		30.0	35.0	37.0	55.2	36.6
Chromium		0.001	0.003	<0.005	<0.005	<0.005
Cobalt	0.0009	0.0002	0.0002	<0.0001	0.0002	0.0007
COD		21	19	36	37	42
Colour (TCU)						
Conductivity (uS/cm)		335	590	620	640	410
Copper	0.005	0.0020	0.0020	0.0016	0.0022	0.0030
Dissolved Oxygen	f (Temp)	5.8	>15	11.9	10.3	11.6
DOC		8.8	8.3	10.8	11.6	10.0
Hardness (CaCO ₃)		272	265	323	359	207
Hydrogen Sulphide	0.002					
Iron	0.3	0.20	0.20	0.23	0.21	1.73
Lead	f (Alk)	<0.0010	<0.0010	<0.0005	<0.0005	0.0009
Magnesium		20.00	20.00	22.90	26.40	16.30
Manganese		0.010	0.020	0.028	0.059	0.061
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	0.001	0.002	0.002
Nickel	0.025	<0.005	<0.005	0.001	<0.001	0.002
Nitrate (as N)		3.69	3.31	2.50	1.90	1.20
Nitrite (as N)		<0.10	<0.10	<0.20	<0.20	<0.20
pH (pH units)	6.5-8.5	6.9	6.7	7.6	7.6	6.4
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	0.001
Phosphate (as P)		0.11	0.15	<1.00	<1.00	<1.00
Phosphorus (total)	0.03	0.040	0.050	0.045	0.057	0.143
Potassium		4.0	4.0	2.5	3.5	3.5
Silicon		4.40	4.40	4.84	4.57	5.28
Silver	0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001
Sodium		21.0	23.0	19.5	30.4	18.6
Strontium		0.486	0.468	0.523	0.660	0.365
Sulphate		68.0	45.0	48.2	59.7	37.4
Sulphur						
TDS		393	371	412	512	292
Temperature (C)		3.0	0.4	0.4	1.2	0.9
Thallium	0.0003	<0.00100	<0.00100	<0.00005	0.00011	<0.00005
Tin		<0.010	<0.010	<0.001	<0.001	<0.001
Titanium		0.010	<0.010	0.009	0.010	0.088
TKN		0.97	0.97	0.89	1.02	1.60
TSS		4	6	3	3	38
Turbidity (NTU)		5.4	5.7	3.9	4.8	44.0
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0010	0.0020	0.0011	0.0010	0.0032
Zinc	0.03	<0.010	0.010	<0.005	0.052	0.012

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW8

Sheet: 10

Date Sampled: 29-Apr-2004 26-May-2004 29-Jun-2004 20-Jul-2004 20-Aug-2004

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	210	217	214	197	188
Aluminum	f (pH)	0.010	0.010	<0.005	0.009	0.304
Aluminum (Total)		1.530	0.970	0.795	0.352	0.399
Ammonia (as N)		0.14	0.12	0.09	0.09	0.07
Barium		0.063	0.062	0.059	0.043	0.052
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		0.7	0.6	0.7	1.0	<0.5
Boron	0.2	0.021	0.028	0.037	0.027	0.040
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		64.5	74.9	73.1	59.2	58.9
Chloride		34.1	29.3	35.6	31.2	35.2
Chromium		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	0.0009	0.0008	0.0006	0.0006	0.0003	0.0003
COD		31	40	41	40	36
Colour (TCU)						
Conductivity (uS/cm)		400	469	530	460	520
Copper	0.005	0.0031	0.0028	0.0023	0.0019	0.0025
Dissolved Oxygen	f (Temp)	14.4	9.2	8.4	9.4	9.6
DOC		9.2	11.6	12.7	12.2	10.4
Hardness (CaCO ₃)		239	274	276	221	221
Hydrogen Sulphide	0.002					
Iron	0.3	1.71	1.11	0.84	0.35	0.50
Lead	f (Alk)	0.0008	0.0006	<0.0005	<0.0005	<0.0005
Magnesium		18.90	21.10	22.70	17.80	17.80
Manganese		0.105	0.057	0.070	0.040	0.038
Mercury	0.0002					
Molybdenum	0.04	0.002	0.002	0.003	0.001	0.002
Nickel	0.025	0.002	0.001	0.002	0.001	0.002
Nitrate (as N)		2.10	3.10	1.30	1.00	1.40
Nitrite (as N)		<0.20	<0.20	<0.20	<0.20	<0.20
pH (pH units)	6.5-8.5	8.2	7.9	7.8	7.7	7.5
Phenols	0.001	<0.001	<0.001	<0.001	0.001	<0.001
Phosphate (as P)		<1.00	<1.00	<1.00	<1.00	<1.00
Phosphorus (total)	0.03	0.107	0.098	0.080	0.091	0.066
Potassium		2.6	2.8	2.3	1.8	3.1
Silicon		4.28	4.53	2.45	2.37	3.29
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		17.3	16.8	20.2	16.3	19.2
Strontium		0.416	0.440	0.499	0.409	0.479
Sulphate		36.5	28.5	37.5	20.7	34.1
Sulphur						
TDS		324	326	362	340	408
Temperature (C)		14.5	14.7	22.9	26.5	23.6
Thallium	0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium		0.091	0.055	0.043	0.017	0.023
TKN		0.92	1.01	1.04	0.98	0.84
TSS		52	26	25	11	22
Turbidity (NTU)		44.0	3.6	19.0	5.4	7.9
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0040	0.0029	0.0047	0.0030	0.0037
Zinc	0.03	0.013	0.014	0.100	<0.005	0.006

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW8

Sheet: 11

Date Sampled:

20-Sep-2004

25-Oct-2004

24-Nov-2004

24-Dec-2004

Parameter	PWQO				
Alkalinity (CaCO ₃)	75% Bkgd	182	224	231	UNSAFE ACCESS
Aluminum	f (pH)	0.007	<0.005	<0.005	
Aluminum (Total)		0.518	0.281	0.209	
Ammonia (as N)		0.09	0.19	0.14	
Barium		0.053	0.069	0.056	
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	
BOD		2.0	<0.5	0.8	
Boron	0.2	0.033	0.055	0.038	
Cadmium	0.0002	<0.0001	0.0001	<0.0001	
Calcium		60.9	77.7	78.7	
Chloride		24.2	48.7	53.7	
Chromium		<0.005	<0.005	<0.005	
Cobalt	0.0009	0.0003	0.0003	0.0001	
COD		38	36	30	
Colour (TCU)					
Conductivity (uS/cm)		460	395	480	
Copper	0.005	0.0039	0.0030	0.0020	
Dissolved Oxygen	f (Temp)	8.4	8.1	8.2	
DOC		14.2	14.6	11.6	
Hardness (CaCO ₃)		212	310	286	
Hydrogen Sulphide	0.002				
Iron	0.3	0.56	0.21	0.25	
Lead	f (Alk)	<0.0005	<0.0005	<0.0005	
Magnesium		14.60	25.20	21.70	
Manganese		0.052	0.047	0.025	
Mercury	0.0002				
Molybdenum	0.04	0.002	0.005	0.001	
Nickel	0.025	0.001	<0.001	0.001	
Nitrate (as N)		1.80	0.40	2.10	
Nitrite (as N)		<0.20	<0.20	<0.20	
pH (pH units)	6.5-8.5	7.5	7.3	7.2	
Phenols	0.001	<0.001	<0.001	<0.001	
Phosphate (as P)		<1.00	<1.00	<1.00	
Phosphorus (total)	0.03	0.098	0.068	0.030	
Potassium		3.4	4.6	3.4	
Silicon		5.16	2.79	2.92	
Silver	0.0001	<0.0001	<0.0001	<0.0001	
Sodium		12.5	30.1	24.7	
Strontium		0.383	0.698	0.541	
Sulphate		34.3	67.6	56.7	
Sulphur					
TDS		288	436	404	
Temperature (C)		22.0	5.0	2.0	
Thallium	0.0003	<0.00005	<0.00005	<0.00005	
Tin		<0.001	<0.001	<0.001	
Titanium		0.030	0.014	0.012	
TKN		1.07	0.93	0.78	
TSS		15	7	6	
Turbidity (NTU)		8.9	5.1	4.8	
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	
Vanadium	0.006	0.0022	0.0027	0.0010	
Zinc	0.03	0.009	0.008	<0.005	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW9

Sheet: 1

Date Sampled: 06-Dec-1999 30-Dec-1999 31-Jan-2000 29-Feb-2000 30-Mar-2000

Parameter	PWQO				
Alkalinity (CaCO ₃)	75% Bkgd	221	223	185	Same as SW10 Same as SW10
Aluminum	f (pH)	<0.030	<0.030	0.120	
Aluminum (Total)					
Ammonia (as N)		0.10	0.19	0.15	
Barium		0.060	0.060	0.050	
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	
BOD		1.0	1.0	<1.0	
Boron	0.2	0.020	0.050	<0.010	
Cadmium	0.0002	<0.0002	<0.0002	<0.0002	
Calcium		86.0	96.0	73.0	
Chloride		45.0	49.0	25.0	
Chromium		<0.010	<0.010	<0.010	
Cobalt	0.0009	<0.0004	<0.0004	<0.0004	
COD		23	13	34	
Colour (TCU)		26	25	37	
Conductivity (uS/cm)		470	639	490	
Copper	0.005	<0.0050	<0.0050	<0.0050	
Dissolved Oxygen	f (Temp)	14.1	8.6		
DOC		9.8	9.1	12.0	
Hardness (CaCO ₃)		314	347	265	
Hydrogen Sulphide	0.002	0.02	<0.01	0.01	
Iron	0.3	0.19	0.21	0.30	
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	
Magnesium		24.00	26.00	20.00	
Manganese		<0.010	<0.010	0.020	
Mercury	0.0002	<0.0002	<0.0002	<0.0002	
Molybdenum	0.04	<0.010	<0.010	<0.010	
Nickel	0.025	<0.010	<0.010	<0.010	
Nitrate (as N)		3.59	4.17	2.58	
Nitrite (as N)		<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.5	7.9	7.7	
Phenols	0.001	<0.001	0.011	<0.001	
Phosphate (as P)					
Phosphorus (total)	0.03	0.070	0.040	0.060	
Potassium		3.0	3.0	3.0	
Silicon		3.70	4.20	3.50	
Silver	0.0001	<0.0001	<0.0001	<0.0001	
Sodium		25.0	26.0	16.0	
Strontium		0.513	0.639	0.426	
Sulphate		66.0	76.0	48.0	
Sulphur		23	25	16	
TDS		408	408	336	
Temperature (C)		2.5	0.0	0.0	
Thallium	0.0003	<0.00500	<0.00500	<0.00200	
Tin		<0.050	<0.050	<0.050	
Titanium		<0.010	<0.010	<0.010	
TKN		1.06	1.01	1.14	
TSS		12	2	2	
Turbidity (NTU)		19.0	9.2	9.9	
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	
Vanadium	0.006	<0.0070	<0.0070	<0.0070	
Zinc	0.03	<0.010	<0.010	<0.010	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW9

Sheet: 2

Date Sampled: 28-Apr-2000 27-May-2000 28-Jun-2000 25-Jul-2000 28-Aug-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	191	223	214	236	207
Aluminum	f (pH)	<0.050	<0.050	<0.050	<0.050	<0.050
Aluminum (Total)						
Ammonia (as N)		0.12	0.09	0.10	0.45	0.04
Barium		0.050	0.050	0.060	0.050	0.050
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		2.0	23.0	<1.0	7.0	4.0
Boron	0.2	0.030	0.030	0.040	0.060	0.040
Cadmium	0.0002	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001
Calcium		68.0	73.0	69.0	67.0	56.0
Chloride		20.0	20.0	24.0	28.0	42.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	<0.0004	0.0004	0.0002	0.0007	0.0004
COD		26	23	40	36	24
Colour (TCU)		30	31	38	36	22
Conductivity (uS/cm)		385	480	650	591	535
Copper	0.005	0.0150	<0.0100	<0.0100	0.0040	0.0020
Dissolved Oxygen	f (Temp)	10.8	8.6	7.8	7.6	4.2
DOC		10.2	10.5	11.5	14.8	10.8
Hardness (CaCO ₃)		244	265	251	254	226
Hydrogen Sulphide	0.002	0.03	0.04	0.02	0.05	<0.01
Iron	0.3	0.48	0.07	0.58	1.38	0.03
Lead	f (Alk)	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010
Magnesium		18.00	20.00	19.00	21.00	21.00
Manganese		0.050	0.020	0.040	0.100	0.010
Mercury	0.0002	0.0008	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	0.04	0.030	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		2.87	3.63	4.05	0.26	0.33
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.8	7.9	7.4	8.5	8.2
Phenols	0.001	<0.001	<0.001	<0.001	0.002	<0.001
Phosphate (as P)						
Phosphorus (total)	0.03	0.110	0.070	0.140	0.210	0.080
Potassium		3.0	3.0	3.0	3.0	3.0
Silicon		1.75	2.91	4.22	3.42	2.34
Silver	0.0001	<0.0001	0.0002	0.0004	<0.0001	<0.0001
Sodium		16.0	16.0	15.0	19.0	26.0
Strontium		0.359	0.445	0.417	0.428	0.474
Sulphate		33.0	28.0	28.0	26.0	42.0
Sulphur		13	11	10	11	14
TDS		320	340	404	336	368
Temperature (C)		9.5	14.5	21.0	27.0	23.5
Thallium	0.0003	<0.00100	<0.00020	<0.00200	<0.00200	<0.00100
Tin		<0.010	<0.050	<0.010	<0.010	<0.010
Titanium		0.040	<0.010	0.020	0.040	<0.010
TKN		1.15	0.87	1.09	1.69	1.22
TSS		24	21	41	286	14
Turbidity (NTU)		15.3	20.4	16.3	>100.0	14.0
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	0.077	<0.020
Vanadium	0.006	<0.0020	<0.0050	0.0010	0.0040	0.0050
Zinc	0.03	0.010	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW9

Sheet: 3

Date Sampled: 01-Nov-2000 22-Jun-2001 31-Jul-2001 25-Aug-2001 22-Sep-2001

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	222	219	186	182	166
Aluminum	f (pH)	<0.050	<0.050	0.060	<0.050	<0.050
Aluminum (Total)						
Ammonia (as N)		0.12	0.16	0.19	<0.02	0.10
Barium		0.060	0.050	0.050	0.050	0.050
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		3.0	<1.0	2.0	<1.0	2.0
Boron	0.2	0.040	0.050	0.060	0.080	0.060
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		69.0	71.0	48.0	46.0	43.0
Chloride		45.0	40.0	51.0	58.0	58.0
Chromium		<0.010	0.002	0.003	<0.001	0.001
Cobalt	0.0009	0.0003	<0.0002	0.0003	<0.0002	0.0003
COD		28	26	27	27	15
Colour (TCU)						
Conductivity (uS/cm)		620	499	459	410	400
Copper	0.005	0.0020	0.0020	0.0020	0.0010	0.0020
Dissolved Oxygen	f (Temp)	7.8	5.1	6.4	6.3	5.1
DOC		11.6	7.5	8.5	7.7	7.5
Hardness (CaCO ₃)		275	276	223	222	223
Hydrogen Sulphide	0.002					
Iron	0.3	0.16	0.24	0.21	0.29	0.34
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		25.00	24.00	25.00	26.00	28.00
Manganese		0.020	0.030	0.080	0.050	0.040
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.010	<0.010	0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		<0.10	2.92	0.19	<0.10	<0.10
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.8	8.0	8.4	7.9	7.7
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.03	0.06	0.18	0.24	0.14
Phosphorus (total)	0.03	0.040	0.050	0.080	0.100	0.080
Potassium		4.0	3.0	3.0	5.0	3.0
Silicon		1.93	1.74	1.57	2.27	1.18
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		26.0	25.0	33.0	43.0	39.0
Strontium		0.546	0.612	0.609	0.581	0.592
Sulphate		48.0	49.0	52.0	62.0	54.0
Sulphur		16				
TDS		420	412	380	336	368
Temperature (C)		9.0	23.0	23.9	20.0	18.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	0.010	<0.010	0.010	0.020
TKN		1.12	0.72	0.88	0.75	0.76
TSS		7	23	2	21	13
Turbidity (NTU)		4.2	10.0	9.0	16.0	14.0
Un-ionized Ammonia	0.02	<0.020	<0.020	0.030	<0.020	<0.020
Vanadium	0.006	0.0040	0.0030	0.0050	0.0040	0.0030
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW9

Sheet: 4

Date Sampled: 15-Oct-2001 03-Dec-2001 24-Dec-2001 11-Jan-2002 09-Apr-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	173	199	FROZEN	217	166
Aluminum	f (pH)	<0.050	<0.050		<0.050	<0.050
Aluminum (Total)						
Ammonia (as N)		0.38	0.44		0.06	0.12
Barium		0.050	0.050		0.040	0.040
Beryllium	f (Hardness)	<0.002	<0.002		<0.002	<0.002
BOD		<1.0	3.0		2.0	1.0
Boron	0.2	0.080	0.070		<0.050	<0.050
Cadmium	0.0002	<0.0001	<0.0001		<0.0001	<0.0001
Calcium		50.0	89.0		98.0	58.0
Chloride		65.0	63.0		55.0	28.0
Chromium		0.001	0.001		<0.001	0.001
Cobalt	0.0009	<0.0002	0.0002		<0.0002	0.0005
COD		16	28		29	25
Colour (TCU)						
Conductivity (uS/cm)		410	475		505	510
Copper	0.005	0.0010	0.0020		0.0020	0.0050
Dissolved Oxygen	f (Temp)	5.1	5.0		12.0	12.4
DOC		7.5	7.1		7.6	7.1
Hardness (CaCO ₃)		232	325		348	219
Hydrogen Sulphide	0.002					
Iron	0.3	0.37	0.24		0.13	0.03
Lead	f (Alk)	<0.0010	<0.0010		<0.0010	0.0030
Magnesium		26.00	25.00		25.00	18.00
Manganese		0.030	0.020		0.010	0.020
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.010		<0.010	<0.010
Nickel	0.025	<0.010	<0.010		<0.010	<0.010
Nitrate (as N)		0.29	4.54		4.82	4.00
Nitrite (as N)		<0.10	<0.10		<0.10	<0.10
pH (pH units)	6.5-8.5	7.8	7.6		7.3	7.3
Phenols	0.001	<0.001	<0.001		<0.001	<0.001
Phosphate (as P)		0.06	0.06		<0.03	0.05
Phosphorus (total)	0.03	0.070	0.040		0.030	0.310
Potassium		4.0	4.0		3.0	2.0
Silicon		1.67	2.32		2.14	1.98
Silver	0.0001	<0.0001	<0.0001		<0.0001	<0.0001
Sodium		38.0	34.0		32.0	25.0
Strontium		0.569	0.473		0.842	0.366
Sulphate		62.0	107.0		95.0	48.0
Sulphur						
TDS		408	462		507	336
Temperature (C)		14.0	3.0		0.2	3.0
Thallium	0.0003	<0.00100	<0.00100		<0.00100	<0.00100
Tin		<0.010	<0.010		<0.010	<0.010
Titanium		0.010	0.020		<0.010	<0.010
TKN		0.80	0.98		0.89	1.19
TSS		7	16		<2	57
Turbidity (NTU)		11.0	15.0		6.6	21.2
Unionized Ammonia	0.02	<0.020	<0.020		<0.020	<0.020
Vanadium	0.006	0.0030	0.0010		0.0010	0.0020
Zinc	0.03	<0.010	<0.010		<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW9

Sheet: 5

Date Sampled: 17-May-2002 21-Jun-2002 30-Jul-2002 21-Aug-2002 23-Sep-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	186	193	204	185	174
Aluminum	f (pH)	<0.050	<0.010	<0.010	0.010	<0.010
Aluminum (Total)						
Ammonia (as N)		0.23	0.13	0.10	0.22	0.03
Barium		0.050	0.060	0.070	0.050	0.050
Beryllium	f (Hardness)	<0.002	<0.001	<0.001	<0.001	<0.001
BOD		2.0	2.0	1.0	5.0	3.0
Boron	0.2	<0.050	0.060	0.030	<0.050	0.050
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		63.0	64.0	67.0	52.0	45.0
Chloride		28.0	22.0	29.0	43.0	46.0
Chromium		0.004	0.004	<0.001	0.003	0.001
Cobalt	0.0009	0.0009	0.0014	0.0004	0.0006	0.0004
COD		26	24	28	32	30
Colour (TCU)						
Conductivity (uS/cm)		460	520	420	550	490
Copper	0.005	0.0040	0.0030	0.0020	0.0090	0.0020
Dissolved Oxygen	f (Temp)	10.5	7.9	6.6	5.0	4.9
DOC		8.9	13.4	11.0	11.0	8.8
Hardness (CaCO ₃)		240	230	262	229	207
Hydrogen Sulphide	0.002					
Iron	0.3	0.54	0.55	0.29	0.09	0.30
Lead	f (Alk)	0.0010	<0.0010	<0.0010	0.0010	<0.0010
Magnesium		20.00	17.00	23.00	24.00	23.00
Manganese		0.050	0.059	0.039	0.033	0.049
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.005	<0.005	0.005	<0.005
Nickel	0.025	<0.010	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		4.11	<0.10	2.59	0.25	<0.10
Nitrite (as N)		<0.10	<0.10	0.14	<0.10	<0.10
pH (pH units)	6.5-8.5	7.0	7.3	7.6	7.2	7.3
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.03	0.18	0.17	0.11	0.21
Phosphorus (total)	0.03	0.070	0.150	0.120	0.120	0.160
Potassium		2.0	2.0	3.0	4.0	3.0
Silicon		3.28	5.24	2.32	1.70	1.50
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		19.0	17.0	20.0	30.0	30.0
Strontium		0.361	0.406	0.758	0.596	0.591
Sulphate		40.0	32.0	46.0	51.0	48.0
Sulphur						
TDS		352	327	375	356	374
Temperature (C)		8.0	15.0	20.0	26.0	21.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		0.020	0.020	0.010	<0.010	0.010
TKN		1.29	1.05	1.35	1.80	1.17
TSS		27	49	23	17	33
Turbidity (NTU)		13.4	7.9	13.6	8.5	21.7
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0040	0.0030	0.0030	0.0060	0.0050
Zinc	0.03	<0.010	<0.005	<0.005	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW9

Sheet: 6

Date Sampled: 31-Oct-2002 28-Nov-2002 30-Dec-2002 31-Jan-2003 19-Feb-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	197	198	237	264	280
Aluminum	f (pH)	<0.010	<0.010	0.260	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)		0.10	0.14	0.07	0.23	0.40
Barium		0.050	0.070	0.080	0.080	0.100
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<1.0	<1.0	1.0	<1.0	1.0
Boron	0.2	0.070	0.060	0.110	<0.050	<0.050
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		59.0	81.0	95.0	112.0	110.0
Chloride		60.0	55.0	65.0	86.0	89.0
Chromium		0.003	0.005	0.004	0.001	0.001
Cobalt	0.0009	0.0003	0.0007	0.0002	0.0002	0.0003
COD		24	10	25	20	27
Colour (TCU)						
Conductivity (uS/cm)		600	338	400	460	430
Copper	0.005	0.0020	0.0030	0.0020	0.0030	0.0030
Dissolved Oxygen	f (Temp)	6.0	11.2	7.0	6.1	5.7
DOC		8.7	8.3	9.9	10.2	9.7
Hardness (CaCO ₃)		259	280	340	416	419
Hydrogen Sulphide	0.002					
Iron	0.3	0.04	0.47	0.16	0.09	0.10
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		27.00	19.00	25.00	33.00	35.00
Manganese		0.030	0.074	0.019	0.032	0.074
Mercury	0.0002					
Molybdenum	0.04	0.005	<0.005	<0.005	<0.005	<0.005
Nickel	0.025	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		0.41	6.88	6.01	3.18	2.40
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	6.9	8.1	8.1	7.8	7.7
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.19	0.18	0.08	0.17	0.11
Phosphorus (total)	0.03	0.070	0.180	0.050	0.060	0.050
Potassium		3.0	4.0	4.0	6.0	5.0
Silicon		1.80	3.50	3.90	2.90	4.50
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		36.0	31.0	37.0	56.0	56.0
Strontium		0.648	0.726	0.762	0.716	0.934
Sulphate		67.0	73.0	107.0	127.0	127.0
Sulphur						
TDS		424	469	565	604	650
Temperature (C)		3.0	1.0	-1.0	-1.0	-1.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	0.020	<0.010	<0.010	<0.010
TKN		0.99	1.86	1.20	1.33	1.36
TSS		4	54	<2	3	3
Turbidity (NTU)		1.9		5.6	7.9	5.4
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0050	0.0030	0.0030	0.0010	0.0010
Zinc	0.03	<0.005	<0.005	<0.005	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW9

Sheet: 7

Date Sampled: 20-Mar-2003 25-Apr-2003 15-May-2003 13-Jun-2003 17-Jul-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	UNSAFE	184	197	218	203
Aluminum	f (pH)	ACCESS	<0.010	<0.010	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)			0.04	0.05	0.10	0.08
Barium			0.060	0.050	0.050	0.040
Beryllium	f (Hardness)		<0.001	<0.001	<0.001	<0.001
BOD			<1.0	<1.0	<1.0	<1.0
Boron	0.2		<0.050	<0.050	<0.050	0.100
Cadmium	0.0002		<0.0001	<0.0001	<0.0001	<0.0001
Calcium			73.0	73.0	77.0	65.0
Chloride			38.0	39.0	41.0	37.0
Chromium			0.001	0.002	0.007	0.004
Cobalt	0.0009		0.0005	0.0003	0.0004	0.0007
COD			23	30	33	31
Colour (TCU)						
Conductivity (uS/cm)			485	410	440	390
Copper	0.005		0.0030	0.0020	0.0020	0.0040
Dissolved Oxygen	f (Temp)		5.7	6.4	6.1	5.1
DOC			8.8	10.3	11.2	11.6
Hardness (CaCO ₃)			256	269	287	257
Hydrogen Sulphide	0.002					
Iron	0.3		0.50	0.25	0.28	0.02
Lead	f (Alk)		<0.0010	<0.0010	<0.0010	<0.0010
Magnesium			18.00	21.00	23.00	23.00
Manganese			0.044	0.027	0.027	0.007
Mercury	0.0002					
Molybdenum	0.04		<0.005	<0.005	<0.005	<0.005
Nickel	0.025		<0.005	<0.005	<0.005	<0.005
Nitrate (as N)			4.49	3.74	2.03	1.14
Nitrite (as N)			<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5		7.4	7.7	7.6	7.5
Phenols	0.001		<0.001	<0.001	<0.001	<0.001
Phosphate (as P)			0.16	0.11	0.07	0.23
Phosphorus (total)	0.03		0.210	0.040	0.040	0.140
Potassium			3.0	3.0	2.0	2.0
Silicon			2.80	2.20	0.60	1.20
Silver	0.0001		<0.0001	<0.0001	<0.0001	<0.0001
Sodium			22.0	21.0	22.0	24.0
Strontium			0.500	0.436	0.492	0.515
Sulphate			49.0	47.0	51.0	58.0
Sulphur						
TDS			387	389	416	389
Temperature (C)			5.0	12.0	14.0	16.0
Thallium	0.0003		<0.00100	<0.00100	<0.00100	<0.00100
Tin			<0.010	<0.010	<0.010	<0.010
Titanium			0.020	0.010	0.010	<0.010
TKN			1.30	1.27	1.18	1.53
TSS			13	9	11	45
Turbidity (NTU)			13.0	7.7	11.5	34.7
Unionized Ammonia	0.02		<0.020	<0.020	<0.020	<0.020
Vanadium	0.006		0.0020	0.0020	0.0040	0.0060
Zinc	0.03		<0.005	<0.005	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW9

Sheet: 8

Date Sampled: 24-Aug-2003 23-Sep-2003 27-Oct-2003 26-Nov-2003 23-Dec-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	212	204	211	215	182
Aluminum	f (pH)	<0.010	<0.010	<0.010	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)		0.10	0.14	0.09	0.11	0.23
Barium		0.060	0.060	0.070	0.060	0.050
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		1.0	1.0	<1.0	<1.0	1.0
Boron	0.2	0.060	0.060	0.050	0.040	0.030
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		72.0	64.0	85.0	77.0	67.0
Chloride		35.0	41.0	31.0	31.0	34.0
Chromium		0.005	0.002	0.002	0.001	0.002
Cobalt	0.0009	0.0003	0.0004	0.0004	0.0002	0.0002
COD		24	27	16	28	21
Colour (TCU)						
Conductivity (uS/cm)		400	375	380	370	590
Copper	0.005	0.0020	0.0020	0.0030	0.0020	0.0020
Dissolved Oxygen	f (Temp)	4.6	4.8	5.7	5.8	>15
DOC		9.6	10.8	7.6	8.3	8.3
Hardness (CaCO ₃)		270	263	290	275	254
Hydrogen Sulphide	0.002					
Iron	0.3	0.22	0.30	0.34	0.18	0.19
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		22.00	25.00	19.00	20.00	21.00
Manganese		0.038	0.035	0.027	0.010	0.020
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	0.025	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		2.06	0.38	6.97	4.18	3.71
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.3	7.2	7.3	7.0	6.5
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.13	0.12	0.33	0.10	0.08
Phosphorus (total)	0.03	0.100	0.070	0.260	0.050	0.060
Potassium		4.0	5.0	6.0	4.0	4.0
Silicon		3.80	3.00	5.10	4.20	4.30
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		24.0	28.0	20.0	21.0	23.0
Strontium		0.571	0.586	0.601	0.494	0.428
Sulphate		50.0	55.0	47.0	48.0	45.0
Sulphur						
TDS		395	380	415	398	371
Temperature (C)		19.0	13.0	3.0	2.0	0.3
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		0.010	0.020	0.010	<0.010	<0.010
TKN		1.36	0.55	1.57	1.05	1.04
TSS		29	17	15	16	2
Turbidity (NTU)		15.3	12.6	23.4	7.9	5.7
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0050	0.0040	0.0020	0.0010	0.0010
Zinc	0.03	<0.005	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW9

Sheet: 9

Date Sampled: 29-Jan-2004 20-Feb-2004 26-Mar-2004 29-Apr-2004 26-May-2004

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	256	272	143	208	218
Aluminum	f (pH)	0.007	0.007	0.057	0.013	0.009
Aluminum (Total)		0.164	0.173	1.930	1.960	0.514
Ammonia (as N)		0.09	0.16	0.62	0.19	0.11
Barium		0.060	0.080	0.062	0.077	0.058
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<0.5	<0.5	0.6	<0.5	0.8
Boron	0.2	0.020	0.030	0.022	0.028	0.030
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		79.1	91.5	54.1	71.0	73.2
Chloride		36.5	54.3	33.5	36.0	30.8
Chromium		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	0.0009	<0.0001	<0.0001	0.0009	0.0012	0.0004
COD		36	37	39	40	39
Colour (TCU)						
Conductivity (uS/cm)		600	640	400	450	482
Copper	0.005	0.0017	0.0020	0.0033	0.0043	0.0020
Dissolved Oxygen	f (Temp)	11.9	8.7	14.6	13.2	8.8
DOC		11.1	11.4	10.3	10.6	11.8
Hardness (CaCO ₃)		318	358	202	266	267
Hydrogen Sulphide	0.002					
Iron	0.3	0.22	0.19	2.11	2.26	0.57
Lead	f (Alk)	<0.0005	<0.0005	0.0011	0.0012	<0.0005
Magnesium		21.30	25.80	16.00	21.40	20.50
Manganese		0.030	0.055	0.073	0.117	0.043
Mercury	0.0002					
Molybdenum	0.04	0.001	0.001	0.002	0.002	0.002
Nickel	0.025	<0.001	<0.001	0.003	0.003	<0.001
Nitrate (as N)		2.50	1.80	1.10	2.20	3.30
Nitrite (as N)		<0.20	<0.20	<0.20	<0.20	<0.20
pH (pH units)	6.5-8.5	7.7	7.7	7.0	8.2	7.9
Phenols	0.001	0.001	<0.001	0.001	<0.001	<0.001
Phosphate (as P)		<1.00	<1.00	<1.00	<1.00	<1.00
Phosphorus (total)	0.03	0.043	0.048	0.161	0.141	0.072
Potassium		2.3	3.2	4.1	3.0	2.7
Silicon		4.72	4.54	5.86	4.93	3.55
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		18.1	30.2	18.5	20.5	16.7
Strontium		0.491	0.651	0.350	0.475	0.432
Sulphate		47.2	59.2	34.7	38.1	29.7
Sulphur						
TDS		408	484	268	348	342
Temperature (C)		0.2	1.2	2.5	14.0	14.8
Thallium	0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium		0.010	0.010	0.111	0.110	0.029
TKN		0.87	1.05	1.67	1.03	1.05
TSS		3	8	50	110	14
Turbidity (NTU)		4.1	4.0	47.0	48.0	11.0
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0011	0.0009	0.0039	0.0051	0.0019
Zinc	0.03	0.007	0.009	0.013	0.016	0.009

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW9

Sheet: 10

Date Sampled: 29-Jun-2004 20-Jul-2004 20-Aug-2004 20-Sep-2004 25-Oct-2004

Parameter	PWQQ					
Alkalinity (CaCO ₃)	75% Bkgd	218	200	193	184	231
Aluminum	f (pH)	0.007	0.012	0.011	0.014	0.012
Aluminum (Total)		0.439	0.389	1.180	0.578	0.545
Ammonia (as N)		0.16	0.10	0.15	0.10	0.16
Barium		0.055	0.045	0.061	0.056	0.070
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<0.5	1.2	0.7	1.3	<0.5
Boron	0.2	0.044	0.026	0.043	0.031	0.056
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		64.9	63.3	61.4	64.2	75.8
Chloride		36.5	29.8	35.9	22.7	49.0
Chromium		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	0.0009	0.0004	0.0003	0.0008	0.0004	0.0004
COD		40	39	36	40	34
Colour (TCU)						
Conductivity (uS/cm)		530	450	490	425	430
Copper	0.005	0.0018	0.0022	0.0032	0.0035	0.0019
Dissolved Oxygen	f (Temp)	8.9	11.5	8.9	8.2	7.4
DOC		12.9	13.0	10.8	13.4	14.0
Hardness (CaCO ₃)		251	234	229	225	306
Hydrogen Sulphide	0.002					
Iron	0.3	0.47	0.39	1.40	0.64	0.43
Lead	f (Alk)	<0.0005	<0.0005	0.0006	0.0006	<0.0005
Magnesium		21.60	18.30	18.30	15.70	24.70
Manganese		0.052	0.042	0.065	0.059	0.049
Mercury	0.0002					
Molybdenum	0.04	0.003	0.001	0.002	0.002	0.005
Nickel	0.025	0.001	0.001	0.003	0.001	0.001
Nitrate (as N)		1.00	0.60	1.40	1.70	0.30
Nitrite (as N)		<0.20	<0.20	<0.20	<0.20	<0.20
pH (pH units)	6.5-8.5	7.7	8.0	7.7	7.5	7.2
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<1.00	<1.00	<1.00	<1.00	<1.00
Phosphorus (total)	0.03	0.076	0.085	0.072	0.102	0.077
Potassium		2.3	1.8	3.5	3.5	4.3
Silicon		1.78	2.33	4.98	5.50	3.28
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		20.0	16.6	19.4	13.2	29.8
Strontium		0.483	0.416	0.498	0.406	0.688
Sulphate		38.3	21.0	34.6	32.7	68.2
Sulphur						
TDS		358	334	416	314	428
Temperature (C)		23.0	26.7	23.6	23.0	5.0
Thallium	0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium		0.023	0.019	0.067	0.035	0.028
TKN		0.96	1.01	0.88	1.30	0.81
TSS		18	14	39	12	16
Turbidity (NTU)		7.3	7.9	12.0	11.3	25.0
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0037	0.0031	0.0052	0.0024	0.0030
Zinc	0.03	0.015	0.049	0.017	0.007	<0.005

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW9

Sheet: 11

Date Sampled: 24-Nov-2004 24-Dec-2004

Parameter	PWQO		
Alkalinity (CaCO ₃)	75% Bkgd	228	UNSAFE
Aluminum	f (pH)	0.008	ACCESS
Aluminum (Total)		0.289	
Ammonia (as N)		0.10	
Barium		0.057	
Beryllium	f (Hardness)	<0.001	
BOD		<0.5	
Boron	0.2	0.035	
Cadmium	0.0002	<0.0001	
Calcium		78.1	
Chloride		53.5	
Chromium		<0.005	
Cobalt	0.0009	0.0002	
COD		30	
Colour (TCU)			
Conductivity (uS/cm)		500	
Copper	0.005	0.0018	
Dissolved Oxygen	f (Temp)	8.4	
DOC		11.0	
Hardness (CaCO ₃)		285	
Hydrogen Sulphide	0.002		
Iron	0.3	0.34	
Lead	f (Alk)	<0.0005	
Magnesium		21.80	
Manganese		0.027	
Mercury	0.0002		
Molybdenum	0.04	0.001	
Nickel	0.025	0.001	
Nitrate (as N)		2.30	
Nitrite (as N)		<0.20	
pH (pH units)	6.5-8.5	7.3	
Phenols	0.001	<0.001	
Phosphate (as P)		<1.00	
Phosphorus (total)	0.03	0.035	
Potassium		3.3	
Silicon		3.05	
Silver	0.0001	<0.0001	
Sodium		24.8	
Strontium		0.546	
Sulphate		58.1	
Sulphur			
TDS		398	
Temperature (C)		2.0	
Thallium	0.0003	<0.00005	
Tin		<0.001	
Titanium		0.016	
TKN		1.00	
TSS		9	
Turbidity (NTU)		5.5	
Unionized Ammonia	0.02	<0.020	
Vanadium	0.006	0.0012	
Zinc	0.03	<0.005	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW10

Sheet: 1

Date Sampled: 06-Dec-1999 30-Dec-1999 31-Jan-2000 29-Feb-2000 30-Mar-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	220	245	184	43	143
Aluminum	f (pH)	0.120	<0.030	0.070	0.280	0.180
Aluminum (Total)						
Ammonia (as N)		0.12	0.11	0.25	0.51	0.16
Barium		0.060	0.070	0.050	0.030	0.070
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		1.0	<1.0	<1.0	5.0	5.0
Boron	0.2	0.020	0.050	<0.010	0.040	0.020
Cadmium	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Calcium		85.0	99.0	72.0	15.0	52.0
Chloride		46.0	48.0	26.0	12.0	19.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	<0.0004	<0.0004	<0.0004	0.0005	0.0009
COD		21	15	29	29	24
Colour (TCU)		26	24	36	36	30
Conductivity (uS/cm)		465	685	480	140	390
Copper	0.005	<0.0050	<0.0050	<0.0050	0.0060	<0.0050
Dissolved Oxygen	f (Temp)	13.0	6.8		14.5	8.9
DOC		9.8	9.5	12.6	11.0	10.9
Hardness (CaCO ₃)		311	355	258	54	188
Hydrogen Sulphide	0.002	0.02	<0.01	0.01	0.09	0.07
Iron	0.3	0.25	0.27	0.31	0.81	2.24
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Magnesium		24.00	26.00	19.00	4.00	14.00
Manganese		<0.010	<0.010	0.020	0.060	0.200
Mercury	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		3.55	4.17	2.65	1.06	3.95
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.2	7.9	7.5	7.5	7.6
Phenols	0.001	<0.001	0.008	<0.001	0.001	<0.001
Phosphate (as P)						
Phosphorus (total)	0.03	0.050	0.040	0.060	0.250	0.370
Potassium		3.0	3.0	3.0	5.0	5.0
Silicon		3.90	4.30	3.40	2.20	4.80
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Sodium		25.0	26.0	16.0	8.0	12.0
Strontium		0.510	0.655	0.409	0.086	0.280
Sulphate		65.0	76.0	50.0	7.0	22.0
Sulphur		22	25	15	<3	9
TDS		404	420	332	108	212
Temperature (C)		3.0	0.0	0.0	0.0	2.0
Thallium	0.0003	<0.00500	<0.00500	<0.00200	<0.00500	<0.00500
Tin		<0.050	<0.050	<0.050	<0.050	<0.050
Titanium		<0.010	<0.010	0.010	0.030	0.030
TKN		1.01	1.03	1.15	1.97	1.80
TSS		13	5	<2	76	160
Turbidity (NTU)		17.0	9.4	9.9	80.0	>100
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0070	<0.0070	<0.0070	<0.0100	0.0100
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	0.020

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW10

Sheet: 2

Date Sampled: 28-Apr-2000 27-May-2000 28-Jun-2000 25-Jul-2000 28-Aug-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	191	224	215	237	210
Aluminum	f (pH)	<0.050	<0.050	0.050	<0.050	<0.050
Aluminum (Total)						
Ammonia (as N)		0.36	0.27	0.17	0.71	0.37
Barium		0.050	0.060	0.060	0.050	0.050
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		2.0	23.0	2.0	7.0	6.0
Boron	0.2	0.040	0.050	0.040	0.070	0.050
Cadmium	0.0002	<0.0001	<0.0002	<0.0002	<0.0001	<0.0001
Calcium		68.0	73.0	69.0	62.0	59.0
Chloride		20.0	20.0	24.0	30.0	38.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	0.0005	0.0011	0.0003	0.0010	0.0005
COD		29	23	15	39	24
Colour (TCU)		30	33	40	41	23
Conductivity (uS/cm)		420	530	660	541	554
Copper	0.005	0.0100	<0.0100	<0.0100	0.0020	0.0020
Dissolved Oxygen	f (Temp)	10.6	9.3	7.3	7.2	4.2
DOC		9.6	10.8	11.6	15.7	11.0
Hardness (CaCO ₃)		248	265	251	237	230
Hydrogen Sulphide	0.002	0.03	0.05	0.02	0.05	<0.01
Iron	0.3	0.61	0.72	0.74	0.03	0.06
Lead	f (Alk)	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010
Magnesium		19.00	20.00	19.00	20.00	20.00
Manganese		0.060	0.050	0.050	0.030	0.020
Mercury	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		2.79	3.78	4.10	0.27	<0.10
Nitrite (as N)		<0.10	0.12	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.8	7.9	7.4	8.3	8.2
Phenols	0.001	<0.001	<0.001	<0.001	0.003	<0.001
Phosphate (as P)						
Phosphorus (total)	0.03	0.180	0.070	0.140	0.210	0.080
Potassium		3.0	3.0	3.0	3.0	4.0
Silicon		1.84	3.74	4.25	1.55	2.40
Silver	0.0001	<0.0001	0.0001	0.0004	<0.0001	<0.0001
Sodium		16.0	16.0	16.0	27.0	25.0
Strontium		0.366	0.451	0.413	0.447	0.481
Sulphate		32.0	29.0	28.0	25.0	37.0
Sulphur		12	10	10	10	14
TDS		316	344	388	340	380
Temperature (C)		9.0	14.0	22.0	28.0	23.3
Thallium	0.0003	<0.00100	<0.00020	<0.00200	<0.00200	<0.00100
Tin		<0.010	<0.050	<0.010	<0.010	<0.010
Titanium		0.030	0.030	0.030	0.010	<0.010
TKN		1.21	1.07	1.05	2.50	1.72
TSS		23	27	29	138	17
Turbidity (NTU)		14.7	20.7	15.7	51.0	18.0
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	0.087	0.027
Vanadium	0.006	<0.0020	<0.0050	0.0010	0.0030	0.0050
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW10

Sheet: 3

Date Sampled: 01-Nov-2000 22-Jun-2001 31-Jul-2001 25-Aug-2001 22-Sep-2001

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	221	216	184	179	166
Aluminum	f (pH)	<0.050	<0.050	<0.050	<0.050	<0.050
Aluminum (Total)						
Ammonia (as N)		0.06	0.07	0.52	<0.02	0.11
Barium		0.060	0.050	0.050	0.050	0.050
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		1.0	1.0	1.0	2.0	1.0
Boron	0.2	0.040	0.040	0.060	0.080	0.060
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		68.0	71.0	48.0	40.0	42.0
Chloride		46.0	40.0	50.0	60.0	56.0
Chromium		<0.010	0.002	0.004	<0.001	<0.001
Cobalt	0.0009	0.0003	0.0003	0.0003	0.0004	0.0003
COD		22	26	38	16	19
Colour (TCU)						
Conductivity (uS/cm)		490	476	460	390	420
Copper	0.005	0.0020	0.0030	0.0020	0.0030	0.0010
Dissolved Oxygen	f (Temp)	7.1	5.4	7.5	6.5	5.0
DOC		11.5	7.8	8.9	7.4	7.7
Hardness (CaCO ₃)		269	276	223	203	216
Hydrogen Sulphide	0.002					
Iron	0.3	0.06	0.36	0.23	0.57	0.31
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		24.00	24.00	25.00	25.00	27.00
Manganese		<0.010	0.040	0.060	0.050	0.040
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		<0.10	3.02	0.16	<0.10	<0.10
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	6.9	8.3	8.5	8.2	7.8
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.03	0.06	0.15	0.21	0.17
Phosphorus (total)	0.03	0.060	0.080	0.070	0.110	0.130
Potassium		4.0	3.0	3.0	4.0	3.0
Silicon		1.76	1.66	1.53	2.25	1.15
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		25.0	25.0	34.0	42.0	39.0
Strontium		0.545	0.625	0.596	0.576	0.598
Sulphate		49.0	50.0	52.0	62.0	52.0
Sulphur		16				
TDS		416	392	384	364	372
Temperature (C)		9.0	23.0	23.6	22.0	18.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	0.010	0.010	0.010	0.010
TKN		1.35	0.91	0.88	0.74	0.60
TSS		21	40	<2	178	18
Turbidity (NTU)		8.2	12.0	10.0	63.0	13.0
Unionized Ammonia	0.02	<0.020	<0.020	0.070	<0.020	<0.020
Vanadium	0.006	0.0040	0.0030	0.0050	0.0050	0.0030
Zinc	0.03	<0.010	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW10

Sheet: 4

Date Sampled: 15-Oct-2001 03-Dec-2001 24-Dec-2001 11-Jan-2002 09-Apr-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	176	202	FROZEN	97	168
Aluminum	f (pH)	<0.050	<0.050		<0.050	<0.050
Aluminum (Total)						
Ammonia (as N)		0.11	0.18		0.40	0.20
Barium		0.050	0.050		<0.010	0.040
Beryllium	f (Hardness)	<0.002	<0.002		<0.002	<0.002
BOD		<1.0	3.0		2.0	2.0
Boron	0.2	0.060	<0.050		<0.050	<0.050
Cadmium	0.0002	<0.0001	<0.0001		<0.0001	<0.0001
Calcium		49.0	86.0		40.0	60.0
Chloride		66.0	63.0		32.0	29.0
Chromium		0.002	0.001		<0.001	0.001
Cobalt	0.0009	0.0003	0.0002		<0.0002	0.0003
COD		21	30		16	19
Colour (TCU)						
Conductivity (uS/cm)		400	520		420	480
Copper	0.005	0.0020	0.0020		0.0040	0.0050
Dissolved Oxygen	f (Temp)	5.1	5.3		12.2	12.1
DOC		7.2	6.3		5.6	7.1
Hardness (CaCO ₃)		234	322		178	228
Hydrogen Sulphide	0.002					
Iron	0.3	0.26	0.25		0.05	0.03
Lead	f (Alk)	<0.0010	<0.0010		<0.0010	0.0020
Magnesium		27.00	26.00		19.00	19.00
Manganese		0.030	0.020		<0.010	0.020
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.010		<0.010	<0.010
Nickel	0.025	<0.010	<0.010		<0.010	<0.010
Nitrate (as N)		0.18	4.30		4.48	4.02
Nitrite (as N)		<0.10	<0.10		<0.10	<0.10
pH (pH units)	6.5-8.5	7.9	7.7		7.3	7.1
Phenols	0.001	<0.001	<0.001		<0.001	<0.001
Phosphate (as P)		0.07	0.06		<0.03	0.04
Phosphorus (total)	0.03	0.050	0.050		0.040	0.110
Potassium		4.0	4.0		2.0	2.0
Silicon		1.59	2.34		1.15	1.94
Silver	0.0001	<0.0001	<0.0001		<0.0001	<0.0001
Sodium		38.0	34.0		18.0	20.0
Strontium		0.570	0.467		0.365	0.369
Sulphate		62.0	107.0		56.0	50.0
Sulphur						
TDS		384	461		280	341
Temperature (C)		15.0	3.0		0.3	3.0
Thallium	0.0003	<0.00100	<0.00100		<0.00100	<0.00100
Tin		<0.010	<0.010		<0.010	<0.010
Titanium		0.010	0.020		<0.010	<0.010
TKN		0.76	1.06		0.93	1.05
TSS		4	14		<2	80
Turbidity (NTU)		8.2	16.0		2.9	13.3
Unionized Ammonia	0.02	<0.020	<0.020		<0.020	<0.020
Vanadium	0.006	0.0040	0.0010		<0.0010	0.0010
Zinc	0.03	<0.010	<0.010		<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW10

Sheet: 5

Date Sampled: 17-May-2002 21-Jun-2002 30-Jul-2002 21-Aug-2002 23-Sep-2002

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	187	191	206	188	174
Aluminum	f (pH)	<0.050	<0.010	<0.010	<0.010	0.150
Aluminum (Total)						
Ammonia (as N)		0.15	0.13	0.13	0.05	0.03
Barium		0.050	0.050	0.060	0.050	0.050
Beryllium	f (Hardness)	<0.002	<0.001	<0.001	<0.001	<0.001
BOD		2.0	3.0	<1.0	5.0	3.0
Boron	0.2	<0.050	<0.020	<0.020	<0.050	0.060
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		63.0	65.0	67.0	51.0	47.0
Chloride		26.0	4.0	30.0	38.0	46.0
Chromium		0.003	0.001	<0.001	0.001	0.001
Cobalt	0.0009	0.0007	0.0013	0.0004	0.0004	0.0004
COD		27	24	26	30	33
Colour (TCU)						
Conductivity (uS/cm)		520	520	570	500	520
Copper	0.005	0.0040	0.0030	0.0020	0.0260	0.0020
Dissolved Oxygen	f (Temp)	10.4	8.8	6.4	5.2	4.9
DOC		8.5	13.4	9.8	10.8	9.8
Hardness (CaCO ₃)		236	232	262	222	208
Hydrogen Sulphide	0.002					
Iron	0.3	0.50	0.34	0.40	0.11	0.31
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		19.00	17.00	23.00	23.00	22.00
Manganese		0.040	0.049	0.041	0.032	0.046
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.005	0.008	<0.005	<0.005
Nickel	0.025	<0.010	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		4.33	0.27	2.60	0.21	<0.10
Nitrite (as N)		<0.10	0.12	0.12	<0.10	<0.10
pH (pH units)	6.5-8.5	7.0	7.3	7.3	7.4	7.0
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.03	0.15	0.17	0.11	0.22
Phosphorus (total)	0.03	0.070	0.100	0.120	0.110	0.160
Potassium		2.0	2.0	4.0	3.0	3.0
Silicon		3.51	4.84	1.89	1.80	1.60
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		19.0	12.0	21.0	28.0	35.0
Strontium		0.357	0.398	0.641	0.609	0.592
Sulphate		41.0	28.0	45.0	51.0	47.0
Sulphur						
TDS		350	320	370	348	374
Temperature (C)		9.0	16.0	21.0	26.0	21.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		0.020	0.020	0.020	<0.010	0.020
TKN		1.29	1.17	1.35	1.60	1.28
TSS		33	34	35	19	22
Turbidity (NTU)		24.6	9.3	12.0	9.0	19.5
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0030	0.0020	0.0040	0.0060	0.0050
Zinc	0.03	<0.010	<0.005	0.006	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW10

Sheet: 6

Date Sampled: 31-Oct-2002 28-Nov-2002 30-Dec-2002 31-Jan-2003 19-Feb-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	196	198	233	266	281
Aluminum	f (pH)	<0.010	<0.010	0.260	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)		0.08	0.14	0.07	0.37	0.29
Barium		0.050	0.060	0.080	0.080	0.100
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<1.0	<1.0	2.0	<1.0	1.0
Boron	0.2	<0.050	<0.050	<0.050	<0.050	0.050
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		59.0	87.0	91.0	111.0	96.0
Chloride		60.0	57.0	65.0	85.0	90.0
Chromium		0.001	0.003	0.014	0.001	<0.001
Cobalt	0.0009	0.0004	0.0004	0.0002	0.0002	0.0003
COD		19	14	24	23	30
Colour (TCU)						
Conductivity (uS/cm)		490	610	540	500	490
Copper	0.005	0.0020	0.0020	0.0020	0.0030	0.0020
Dissolved Oxygen	f (Temp)	5.8	10.8	7.4	6.0	5.7
DOC		8.9	8.5	9.0	10.6	9.3
Hardness (CaCO ₃)		254	295	338	401	363
Hydrogen Sulphide	0.002					
Iron	0.3	0.06	0.23	0.79	0.10	0.09
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		26.00	19.00	27.00	30.00	30.00
Manganese		0.035	0.019	0.023	0.035	0.073
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	0.025	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		0.39	6.98	5.94	3.22	2.44
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.3	8.0	7.9	7.7	7.6
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.16	0.19	0.12	0.11	0.13
Phosphorus (total)	0.03	0.110	0.080	0.050	0.040	0.050
Potassium		4.0	4.0	4.0	6.0	6.0
Silicon		1.80	3.50	3.90	3.10	4.50
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		38.0	31.0	39.0	54.0	56.0
Strontium		0.644	0.730	0.758	0.760	0.933
Sulphate		69.0	75.0	106.0	129.0	128.0
Sulphur						
TDS		426	480	557	608	650
Temperature (C)		2.0	1.6	-1.0	0.0	0.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	0.010	<0.010	<0.010	<0.010
TKN		1.08	1.26	1.13	1.49	1.30
TSS		14	18	2	<2	2
Turbidity (NTU)		2.8		5.2	8.9	5.0
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0040	0.0020	0.0020	0.0010	0.0010
Zinc	0.03	<0.005	<0.005	<0.005	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW10

Sheet: 7

Date Sampled: 20-Mar-2003 25-Apr-2003 15-May-2003 13-Jun-2003 17-Jul-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	UNSAFE	186	196	218	204
Aluminum	f (pH)	ACCESS	<0.010	<0.010	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)			0.05	0.05	0.04	0.05
Barium			0.050	0.050	0.050	0.050
Beryllium	f (Hardness)		<0.001	<0.001	<0.001	<0.001
BOD			<1.0	<1.0	<1.0	<1.0
Boron	0.2		<0.050	<0.050	<0.050	0.080
Cadmium	0.0002		<0.0001	<0.0001	<0.0001	<0.0001
Calcium			71.0	71.0	77.0	64.0
Chloride			38.0	39.0	38.0	37.0
Chromium			<0.001	0.002	0.003	0.002
Cobalt	0.0009		0.0003	0.0003	0.0004	0.0003
COD			24	31	33	34
Colour (TCU)						
Conductivity (uS/cm)			390	420	415	440
Copper	0.005		0.0020	0.0020	0.0020	0.0020
Dissolved Oxygen	f (Temp)		5.5	6.3	6.3	5.0
DOC			8.8	10.8	11.5	11.6
Hardness (CaCO ₃)			256	260	287	255
Hydrogen Sulphide	0.002					
Iron	0.3		0.29	0.26	0.29	0.16
Lead	f (Alk)		<0.0010	<0.0010	<0.0010	<0.0010
Magnesium			19.00	20.00	23.00	23.00
Manganese			0.022	0.025	0.029	0.023
Mercury	0.0002					
Molybdenum	0.04		<0.005	<0.005	<0.005	<0.005
Nickel	0.025		<0.005	<0.005	<0.005	<0.005
Nitrate (as N)			4.38	3.77	1.96	1.28
Nitrite (as N)			<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5		7.4	7.6	7.6	7.4
Phenols	0.001		<0.001	<0.001	<0.001	<0.001
Phosphate (as P)			0.23	0.09	0.06	0.19
Phosphorus (total)	0.03		0.160	0.040	0.050	0.070
Potassium			3.0	3.0	2.0	2.0
Silicon			2.70	2.30	0.60	1.50
Silver	0.0001		<0.0001	<0.0001	<0.0001	<0.0001
Sodium			21.0	21.0	23.0	24.0
Strontium			0.497	0.438	0.493	0.530
Sulphate			49.0	47.0	67.0	56.0
Sulphur						
TDS			388	390	416	385
Temperature (C)			5.0	12.0	13.0	16.0
Thallium	0.0003		<0.00100	<0.00100	<0.00100	<0.00100
Tin			<0.010	<0.010	<0.010	<0.010
Titanium			0.010	0.010	0.010	<0.010
TKN			1.14	1.29	1.19	1.44
TSS			16	17	18	11
Turbidity (NTU)			9.7	7.6	11.7	6.1
Unionized Ammonia	0.02		<0.020	<0.020	<0.020	<0.020
Vanadium	0.006		0.0010	0.0020	0.0030	0.0040
Zinc	0.03		<0.005	<0.005	<0.005	<0.005

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW10

Sheet: 8

Date Sampled: 24-Aug-2003 23-Sep-2003 27-Oct-2003 26-Nov-2003 23-Dec-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	211	202	208	214	206
Aluminum	f (pH)	<0.010	<0.010	<0.010	0.010	0.010
Aluminum (Total)						
Ammonia (as N)		0.09	0.07	0.07	0.08	0.09
Barium		0.060	0.060	0.060	0.060	0.050
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		1.0	1.0	<1.0	<1.0	2.0
Boron	0.2	0.060	0.060	0.040	0.030	0.030
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		73.0	63.0	84.0	76.0	77.0
Chloride		39.0	40.0	31.0	31.0	36.0
Chromium		0.005	<0.001	0.002	0.001	0.002
Cobalt	0.0009	0.0004	0.0004	0.0004	0.0002	0.0002
COD		22	26	22	25	19
Colour (TCU)						
Conductivity (uS/cm)		420	400	390	380	600
Copper	0.005	0.0030	0.0020	0.0030	0.0020	0.0020
Dissolved Oxygen	f (Temp)	4.6	4.8	5.4	5.5	>15
DOC		8.9	10.9	7.2	7.6	8.2
Hardness (CaCO ₃)		277	256	284	272	279
Hydrogen Sulphide	0.002					
Iron	0.3	0.30	0.27	0.32	0.19	0.19
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		23.00	24.00	18.00	20.00	21.00
Manganese		0.040	0.034	0.020	0.010	0.020
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	0.025	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		2.11	0.36	6.79	4.00	3.13
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.5	7.3	7.1	7.0	6.8
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.14	0.16	0.36	0.13	0.08
Phosphorus (total)	0.03	0.110	0.060	0.160	0.070	0.050
Potassium		5.0	4.0	6.0	4.0	4.0
Silicon		4.00	3.00	5.40	4.40	4.70
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		25.0	28.0	19.0	21.0	24.0
Strontium		0.585	0.623	0.574	0.497	0.482
Sulphate		52.0	54.0	46.0	47.0	43.0
Sulphur						
TDS		399	371	408	400	392
Temperature (C)		19.0	14.0	4.0	3.0	0.4
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		0.020	0.010	0.020	<0.010	<0.010
TKN		1.34	0.93	0.93	0.79	0.97
TSS		39	24	9	12	3
Turbidity (NTU)		18.4	16.9	22.0	7.3	5.5
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0050	0.0050	0.0020	0.0010	0.0010
Zinc	0.03	<0.005	<0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW10

Sheet: 9

Date Sampled: 29-Jan-2004 20-Feb-2004 26-Mar-2004 29-Apr-2004 26-May-2004

Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	253	276	143	211	222
Aluminum	f (pH)	0.007	0.008	0.073	<0.005	0.009
Aluminum (Total)		0.258	0.172	1.680	0.664	0.670
Ammonia (as N)		0.09	0.16	0.65	0.15	0.12
Barium		0.067	0.082	0.057	0.064	0.062
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<0.5	<0.5	0.9	<0.5	0.8
Boron	0.2	0.022	0.033	0.020	0.026	0.031
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		92.8	93.3	50.4	71.8	75.8
Chloride		36.1	55.2	34.0	35.9	31.7
Chromium		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	0.0009	0.0001	0.0001	0.0008	0.0004	0.0004
COD		37	36	40	31	40
Colour (TCU)						
Conductivity (uS/cm)		560	660	410	460	490
Copper	0.005	0.0019	0.0042	0.0032	0.0024	0.0021
Dissolved Oxygen	f (Temp)	11.8	8.3	14.6	13.0	8.7
DOC		10.9	11.3	10.3	9.1	11.4
Hardness (CaCO3)		316	357	197	267	278
Hydrogen Sulphide	0.002					
Iron	0.3	0.30	0.23	1.87	0.73	0.72
Lead	f (Alk)	<0.0005	<0.0005	0.0010	<0.0005	<0.0005
Magnesium		23.40	26.80	15.00	21.20	21.60
Manganese		0.042	0.057	0.067	0.074	0.048
Mercury	0.0002					
Molybdenum	0.04	0.001	0.001	0.002	0.002	0.002
Nickel	0.025	0.001	<0.001	0.003	0.001	<0.001
Nitrate (as N)		2.60	1.90	1.20	2.20	3.40
Nitrite (as N)		<0.20	<0.20	<0.20	<0.20	<0.20
pH (pH units)	6.5-8.5	7.7	7.7	7.0	8.1	7.9
Phenols	0.001	<0.001	<0.001	0.001	<0.001	0.001
Phosphate (as P)		<1.00	<1.00	<1.00	<1.00	<1.00
Phosphorus (total)	0.03	0.042	0.047	0.160	0.068	0.078
Potassium		2.6	3.3	3.8	2.7	2.9
Silicon		4.67	4.67	5.21	2.69	4.10
Silver	0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001
Sodium		19.5	30.6	17.4	20.8	17.4
Strontium		0.525	0.665	0.326	0.472	0.454
Sulphate		47.0	60.3	35.2	38.0	30.9
Sulphur						
TDS		408	488	268	344	334
Temperature (C)		0.4	0.8	2.6	14.0	14.8
Thallium	0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium		0.011	0.009	0.096	0.035	0.038
TKN		0.90	1.02	1.72	0.84	0.99
TSS		3	5	44	33	17
Turbidity (NTU)		2.8	4.6	42.0	43.0	9.6
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	0.0014	0.0009	0.0035	0.0022	0.0023
Zinc	0.03	0.112	0.014	0.013	0.009	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW10

Sheet: 10

Date Sampled: 29-Jun-2004 20-Jul-2004 20-Aug-2004 20-Sep-2004 25-Oct-2004

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	218	199	195	185	230
Aluminum	f (pH)	0.013	0.009	0.009	0.017	<0.005
Aluminum (Total)		0.625	0.321	0.727	0.446	0.328
Ammonia (as N)		0.11	0.68	0.08	0.09	0.27
Barium		0.058	0.044	0.059	0.054	0.073
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		<0.5	1.2	0.6	1.6	<0.5
Boron	0.2	0.038	0.030	0.041	0.030	0.060
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		66.0	60.0	63.5	63.0	81.0
Chloride		35.3	29.4	37.1	23.1	49.8
Chromium		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	0.0009	0.0005	0.0003	0.0005	0.0003	0.0003
COD		41	39	38	40	34
Colour (TCU)						
Conductivity (uS/cm)		540	450	500	470	420
Copper	0.005	0.0020	0.0018	0.0037	0.0036	0.0041
Dissolved Oxygen	f (Temp)	8.9	11.5	8.8	8.1	8.0
DOC		12.8	13.0	10.7	14.8	14.1
Hardness (CaCO ₃)		255	225	234	220	309
Hydrogen Sulphide	0.002					
Iron	0.3	0.66	0.33	0.86	0.49	0.26
Lead	f (Alk)	<0.0005	<0.0005	0.0006	<0.0005	<0.0005
Magnesium		21.90	18.20	18.30	15.10	25.60
Manganese		0.067	0.034	0.050	0.048	0.053
Mercury	0.0002					
Molybdenum	0.04	0.003	0.001	0.002	0.002	0.005
Nickel	0.025	0.001	0.001	0.002	<0.001	<0.001
Nitrate (as N)		1.00	0.70	1.50	1.60	0.40
Nitrite (as N)		<0.20	<0.20	<0.20	<0.20	<0.20
pH (pH units)	6.5-8.5	7.8	8.0	7.7	7.4	7.2
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<1.00	<1.00	<1.00	<1.00	<1.00
Phosphorus (total)	0.03	0.072	0.078	0.067	0.099	0.068
Potassium		2.1	1.9	3.3	3.4	4.9
Silicon		2.11	2.09	4.03	5.13	2.99
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		19.9	16.7	19.5	13.0	31.2
Strontium		0.494	0.412	0.500	0.395	0.722
Sulphate		37.8	22.8	37.6	33.3	69.0
Sulphur						
TDS		370	328	414	310	440
Temperature (C)		23.7	26.6	23.5	23.0	5.0
Thallium	0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Tin		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium		0.034	0.016	0.041	0.026	0.017
TKN		0.88	1.04	0.88	1.36	0.97
TSS		18	9	33	12	9
Turbidity (NTU)		9.6	3.9	19.5	8.4	5.1
Unionized Ammonia	0.02	<0.020	0.041	<0.020	<0.020	<0.020
Vanadium	0.006	0.0043	0.0030	0.0043	0.0021	0.0027
Zinc	0.03	0.020	0.009	0.033	0.007	<0.005

All values reported in mg/L unless otherwise noted.

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW10

Sheet: 11

Date Sampled: 24-Nov-2004 24-Dec-2004

Parameter	PWQO		
Alkalinity (CaCO ₃)	75% Bkgd	229	UNSAFE
Aluminum	f (pH)	0.006	ACCESS
Aluminum (Total)		0.232	
Ammonia (as N)		0.10	
Barium		0.060	
Beryllium	f (Hardness)	<0.001	
BOD		0.8	
Boron	0.2	0.041	
Cadmium	0.0002	<0.0001	
Calcium		83.5	
Chloride		54.1	
Chromium		<0.005	
Cobalt	0.0009	0.0001	
COD		28	
Colour (TCU)			
Conductivity (uS/cm)		625	
Copper	0.005	0.0018	
Dissolved Oxygen	f (Temp)	8.2	
DOC		11.7	
Hardness (CaCO ₃)		305	
Hydrogen Sulphide	0.002		
Iron	0.3	0.25	
Lead	f (Alk)	<0.0005	
Magnesium		23.40	
Manganese		0.026	
Mercury	0.0002		
Molybdenum	0.04	0.001	
Nickel	0.025	<0.001	
Nitrate (as N)		2.10	
Nitrite (as N)		<0.20	
pH (pH units)	6.5-8.5	7.1	
Phenols	0.001	<0.001	
Phosphate (as P)		<1.00	
Phosphorus (total)	0.03	0.026	
Potassium		3.6	
Silicon		3.12	
Silver	0.0001	<0.0001	
Sodium		26.2	
Strontium		0.578	
Sulphate		57.3	
Sulphur			
TDS		406	
Temperature (C)		3.0	
Thallium	0.0003	<0.00005	
Tin		<0.001	
Titanium		0.012	
TKN		0.97	
TSS		5	
Turbidity (NTU)		3.9	
Unionized Ammonia	0.02	<0.020	
Vanadium	0.006	0.0012	
Zinc	0.03	<0.005	

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW11

Sheet: 1

Date Sampled: 21-Jun-2002 31-Oct-2002 25-Apr-2003 27-Oct-2003 29-Apr-2004

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	288	DRY	339	443	239
Aluminum	f (pH)	0.040		<0.010	0.040	0.011
Aluminum (Total)						0.142
Ammonia (as N)		7.54		7.67	17.50	2.66
Barium		0.100		0.150	0.180	0.080
Beryllium	f (Hardness)	<0.001		<0.001	<0.001	<0.001
BOD		5.0		3.0	2.0	2.5
Boron	0.2	0.030		0.100	0.210	0.038
Cadmium	0.0002	<0.0001		<0.0001	<0.0001	<0.0001
Calcium		63.0		78.0	96.0	62.8
Chloride		30.0		43.0	60.0	13.4
Chromium		0.003		0.001	0.010	<0.005
Cobalt	0.0009	0.0023		0.0021	0.0020	0.0004
COD		56		49	50	40
Conductivity (uS/cm)		480		510	410	480
Copper	0.005	0.0040		0.0020	0.0040	0.0021
Dissolved Oxygen	f (Temp)	2.0		2.1	3.9	10.6
DOC		21.8		15.9	18.8	12.8
Hardness (CaCO ₃)		231		289	326	218
Iron	0.3	2.06		1.87	0.79	0.57
Lead	f (Alk)	<0.0010		<0.0010	<0.0010	<0.0005
Magnesium		18.00		23.00	21.00	14.90
Manganese		0.219		0.208	0.226	0.060
Molybdenum	0.04	<0.005		<0.005	<0.005	<0.001
Nickel	0.025	<0.005		<0.005	0.005	<0.001
Nitrate (as N)		0.22		0.14	3.84	1.00
Nitrite (as N)		<0.10		<0.10	0.25	0.60
pH (pH units)	6.5-8.5	8.1		7.7	7.3	8.1
Phenols	0.001	0.002		<0.001	<0.001	<0.001
Phosphate (as P)		0.13		0.27	0.09	<1.00
Phosphorus (total)	0.03	0.080		0.120	0.050	0.060
Potassium		15.0		18.0	35.0	6.0
Silicon		8.35		5.30	6.00	4.37
Silver	0.0001	<0.0001		<0.0001	<0.0001	<0.0001
Sodium		33.0		41.0	61.0	12.0
Strontium		0.219		0.253	0.357	0.164
Sulphate		31.0		26.0	23.0	15.8
TDS		405		525	689	260
Temperature (C)		18.0		6.0	3.0	19.0
Thallium	0.0003	<0.00100		<0.00100	<0.00100	<0.00005
Tin		<0.010		<0.010	<0.010	<0.001
Titanium		<0.010		<0.010	<0.010	0.008
TKN		9.22		8.07	19.10	3.41
TSS		167		14	3	24
Turbidity (NTU)		16.1		14.5	6.1	16.7
Unionized Ammonia	0.02	0.250		0.052	0.037	0.120
Vanadium	0.006	0.0030		0.0010	0.0040	0.0010
Zinc	0.03	<0.005		<0.005	<0.010	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW12

Sheet: 1

Date Sampled: 21-Jun-2002 31-Oct-2002 25-Apr-2003 27-Oct-2003 29-Apr-2004

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	501	DRY	422	986	432
Aluminum	f (pH)	<0.010		<0.010	<0.010	<0.005
Aluminum (Total)						0.059
Ammonia (as N)		17.30		12.60	42.00	13.00
Barium		0.370		0.170	0.300	0.174
Beryllium	f (Hardness)	<0.001		<0.001	<0.001	<0.001
BOD		9.0		3.0	7.0	1.4
Boron	0.2	0.210		0.150	0.470	0.156
Cadmium	0.0002	0.0004		<0.0001	<0.0001	<0.0001
Calcium		98.0		91.0	237.0	99.2
Chloride		64.0		52.0	132.0	38.2
Chromium		0.005		0.001	0.029	<0.005
Cobalt	0.0009	0.0070		0.0032	0.0094	0.0026
COD		77		55	122	54
Conductivity (uS/cm)		560		495	505	650
Copper	0.005	0.0150		0.0020	0.0030	0.0012
Dissolved Oxygen	f (Temp)	2.0		2.4	3.9	12.8
DOC		32.8		18.5	43.0	19.7
Hardness (CaCO ₃)		356		334	781	344
Iron	0.3	8.12		3.12	15.80	1.87
Lead	f (Alk)	0.0050		<0.0010	<0.0010	<0.0005
Magnesium		27.00		26.00	46.00	23.20
Manganese		1.460		0.302	1.140	0.233
Molybdenum	0.04	<0.005		<0.005	<0.005	<0.001
Nickel	0.025	<0.005		<0.005	0.014	0.003
Nitrate (as N)		<0.10		0.36	0.70	<0.20
Nitrite (as N)		<0.10		<0.10	<0.10	<0.20
pH (pH units)	6.5-8.5	8.0		7.5	7.2	7.9
Phenols	0.001	0.002		<0.001	<0.001	0.001
Phosphate (as P)		0.31		0.29	0.14	<1.00
Phosphorus (total)	0.03	0.240		0.120	0.090	0.033
Potassium		33.0		27.0	76.0	19.7
Silicon		10.40		5.60	8.80	5.45
Silver	0.0001	<0.0001		<0.0001	<0.0001	<0.0001
Sodium		63.0		50.0	117.0	35.6
Strontium		0.525		0.317	0.912	0.340
Sulphate		17.0		24.0	9.0	14.9
TDS		696		634	1370	464
Temperature (C)		20.0		5.0	4.0	18.5
Thallium	0.0003	<0.00100		<0.00100	<0.00100	<0.00005
Tin		<0.010		<0.010	<0.010	<0.001
Titanium		<0.010		<0.010	0.200	<0.005
TKN		19.60		14.10	49.10	12.20
TSS		1250		12	40	11
Turbidity (NTU)		25.8		25.0	94.9	9.8
Unionized Ammonia	0.02	0.660		0.049	0.076	0.330
Vanadium	0.006	0.0060		0.0010	0.0100	0.0009
Zinc	0.03	0.193		<0.005	<0.010	0.019

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW13

Sheet: 1

Date Sampled: 14-Mar-1991 13-Jul-1993 21-Jun-2002 31-Oct-2002 25-Apr-2003

Parameter	PWQO			
Alkalinity (CaCO ₃)	75% Bkgd	497	DRY	379
Aluminum	f (pH)	<0.010		<0.010
Aluminum (Total)				
Ammonia (as N)		16.80		8.40
Barium		0.180		0.140
Beryllium	f (Hardness)	<0.001		<0.001
BOD		7.0		2.0
Boron	0.2	0.200		0.120
Cadmium	0.0002	<0.0001		<0.0001
Calcium		108.0		85.0
Chloride		61.0		46.0
Chromium		0.012		<0.001
Cobalt	0.0009	0.0039		0.0026
COD		88		47
Conductivity (uS/cm)		620		505
Copper	0.005	0.0040		0.0020
Dissolved Oxygen	f (Temp)	3.8		2.8
DOC		28.7		17.1
Hardness (CaCO ₃)		381		323
Iron	0.3	2.79	0.03	1.54
Lead	f (Alk)	<0.0010		<0.0010
Magnesium		27.00		27.00
Manganese		0.222		0.269
Molybdenum	0.04	<0.005		<0.005
Nickel	0.025	<0.005		<0.005
Nitrate (as N)		0.35		0.78
Nitrite (as N)		<0.10		<0.10
pH (pH units)	6.5-8.5	8.1		7.8
Phenols	0.001	<0.001		<0.001
Phosphate (as P)		0.17		0.31
Phosphorus (total)	0.03	0.080		0.120
Potassium		35.0		22.0
Silicon		9.87		5.20
Silver	0.0001	<0.0001		<0.0001
Sodium		60.0		44.0
Strontium		0.406		0.295
Sulphate		18.0		26.0
TDS		702		577
Temperature (C)		15.0		5.0
Thallium	0.0003	<0.00100		<0.00100
Tin		<0.010		<0.010
Titanium		0.010		<0.010
TKN		19.80		9.18
TSS		35		8
Turbidity (NTU)		24.1		15.1
Unionized Ammonia	0.02	0.450		0.066
Vanadium	0.006	0.0050		<0.0010
Zinc	0.03	<0.005		<0.005

VOC's:

Pentachlorophenol <20.0000

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: SW13

Sheet: 2

Date Sampled: 27-Oct-2003 29-Apr-2004

Parameter	PWQO		
Alkalinity (CaCO ₃)	75% Bkgd	381	407
Aluminum	f (pH)	<0.010	<0.005
Aluminum (Total)			0.015
Ammonia (as N)		7.53	9.80
Barium		0.140	0.153
Beryllium	f (Hardness)	<0.001	<0.001
BOD		1.0	1.2
Boron	0.2	0.170	0.143
Cadmium	0.0002	<0.0001	<0.0001
Calcium		91.0	93.1
Chloride		42.0	39.8
Chromium		0.003	<0.005
Cobalt	0.0009	0.0019	0.0020
COD		39	46
Conductivity (uS/cm)		480	600
Copper	0.005	0.0040	0.0013
Dissolved Oxygen	f (Temp)	5.0	11.2
DOC		15.4	18.2
Hardness (CaCO ₃)		314	326
Iron	0.3	0.86	0.93
Lead	f (Alk)	<0.0010	<0.0005
Magnesium		21.00	22.70
Manganese		0.109	0.204
Molybdenum	0.04	<0.005	<0.001
Nickel	0.025	0.006	0.003
Nitrate (as N)		1.18	0.30
Nitrite (as N)		<0.10	0.40
pH (pH units)	6.5-8.5	7.1	8.1
Phenols	0.001	<0.001	<0.001
Phosphate (as P)		0.17	<1.00
Phosphorus (total)	0.03	0.120	0.035
Potassium		24.0	17.7
Silicon		6.30	5.16
Silver	0.0001	<0.0001	<0.0001
Sodium		45.0	33.7
Strontium		0.325	0.322
Sulphate		19.0	17.7
TDS		562	462
Temperature (C)		3.0	17.5
Thallium	0.0003	<0.00100	<0.00005
Tin		<0.010	<0.001
Titanium		0.020	<0.005
TKN		9.30	9.41
TSS		47	4
Turbidity (NTU)		26.0	5.7
Unionized Ammonia	0.02	<0.020	0.370
Vanadium	0.006	0.0020	0.0006
Zinc	0.03	<0.010	<0.005

VOC's:

Pentachlorophenol

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: CSW-1

Sheet: 1

Date Sampled: 06-Dec-1999 30-Dec-1999 31-Jan-2000 29-Feb-2000 30-Mar-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	419	1090	1120	248	720
Aluminum	f (pH)	0.170	<0.030	0.100	0.550	0.060
Aluminum (Total)						
Ammonia (as N)		22.50	75.10	73.20	12.80	35.80
Barium		0.230	0.700	0.600	0.160	0.380
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		25.0	14.0	6.0	10.0	6.0
Boron	0.2	0.640	1.850	1.370	1.090	1.660
Cadmium	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Calcium		118.0	216.0	215.0	82.0	186.0
Chloride		85.0	250.0	234.0	42.0	113.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	0.0015	0.0017	0.0013	0.0020	0.0014
COD		73	115	122	49	86
Colour (TCU)		18	29	30	13	18
Conductivity (uS/cm)		1000	2510	2800	6900	1150
Copper	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Oxygen	f (Temp)	9.3			9.6	3.0
DOC		27.4	50.0	50.4	19.7	30.7
Hardness (CaCO ₃)		435	770	789	279	654
Hydrogen Sulphide	0.002	0.10	<0.01	0.01	0.12	<0.01
Iron	0.3	11.20	47.60	37.00	10.20	22.00
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	0.0040	<0.0020
Magnesium		34.00	56.00	61.00	18.00	46.00
Manganese		0.180	0.450	0.380	0.270	0.460
Mercury	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	<0.010	<0.010	<0.010	<0.010
Nitrate (as N)		1.20	<0.10	0.12	0.55	1.84
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.1	7.1	7.0	7.0	6.7
Phenols	0.001	0.006	0.007	<0.001	0.001	<0.001
Phosphate (as P)						
Phosphorus (total)	0.03	0.330	0.110	0.120	0.440	0.220
Potassium		43.0	100.0	103.0	29.0	74.0
Silicon		5.90	10.10	8.00	4.90	7.60
Silver	0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		57.0	166.0	171.0	43.0	104.0
Strontium		0.479	1.120	0.975	0.334	0.772
Sulphate		105.0	74.0	47.0	96.0	158.0
Sulphur		36	26	15	31	54
TDS		736	1490	1380	512	1040
Temperature (C)		7.0	4.0	8.0	2.0	2.0
Thallium	0.0003	<0.00500	<0.00500	<0.00200	<0.00500	<0.00500
Tin		<0.050	<0.050	<0.050	<0.050	<0.050
Titanium		0.040	<0.010	<0.010	0.040	<0.010
TKN		24.30	75.10	73.20	12.90	35.80
TSS		182	113	140	404	5290
Turbidity (NTU)		>100	>100	>100	>100	>100
Unionized Ammonia	0.02	0.033	0.108	0.116	<0.020	<0.020
Vanadium	0.006	<0.0070	<0.0070	<0.0070	<0.0100	<0.0100
Zinc	0.03	0.030	<0.010	<0.010	0.040	0.020

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: CSW-1

Sheet: 2

Date Sampled: 28-Apr-2000 27-May-2000 28-Jun-2000 25-Jul-2000 28-Aug-2000

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	1040	1070	1180	1240	1080
Aluminum	f (pH)	<0.050	0.060	0.080	0.120	<0.050
Aluminum (Total)						
Ammonia (as N)		63.90	29.70	67.10	5.53	70.00
Barium		0.530	0.570	0.630	0.570	0.340
Beryllium	f (Hardness)	<0.002	<0.002	<0.002	<0.002	<0.002
BOD		15.0	121.0	9.0	10.0	7.0
Boron	0.2	1.630	1.790	1.800	1.320	1.210
Cadmium	0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001
Calcium		240.0	295.0	304.0	259.0	209.0
Chloride		240.0	213.0	221.0	156.0	244.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	0.0017	0.0023	0.0016	0.0020	0.0018
COD		133	121	133	125	120
Colour (TCU)		25	31	35	33	31
Conductivity (uS/cm)		2000	2300	2700	3040	2870
Copper	0.005	0.0080	0.0130	<0.0010	0.0010	0.0010
Dissolved Oxygen	f (Temp)	1.9	3.2	11.2	1.1	4.3
DOC		46.9	47.7	45.6	49.2	45.7
Hardness (CaCO ₃)		822	976	1020	944	765
Hydrogen Sulphide	0.002	<0.01	0.02	<0.01	0.01	<0.01
Iron	0.3	38.60	38.60	46.70	35.80	10.50
Lead	f (Alk)	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010
Magnesium		54.00	58.00	64.00	72.00	59.00
Manganese		0.760	0.830	0.820	0.720	0.660
Mercury	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	0.04	<0.010	<0.010	<0.010	<0.010	<0.010
Nickel	0.025	<0.010	0.010	<0.010	<0.010	<0.010
Nitrate (as N)		0.48	0.66	0.33	<0.10	<0.10
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	6.6	6.9	6.8	6.8	7.1
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)						
Phosphorus (total)	0.03	0.140	0.120	0.140	0.110	0.080
Potassium		100.0	108.0	125.0	115.0	105.0
Silicon		8.26	9.74	10.20	10.40	9.37
Silver	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Sodium		167.0	160.0	45.0	160.0	144.0
Strontium		1.000	1.270	1.290	1.320	1.120
Sulphate		125.0	214.0	192.0	67.0	44.0
Sulphur		40	72	59	26	18
TDS		1480	1660	1680	1540	1500
Temperature (C)		14.5	13.5	20.0	19.8	18.6
Thallium	0.0003	<0.00100	<0.00020	<0.00200	<0.00200	<0.00100
Tin		<0.010	<0.050	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
TKN		71.90	49.00	67.10	43.00	70.10
TSS		106	103	157	107	71
Turbidity (NTU)		356.0	>100.0	>100	>100	>100.0
Unionized Ammonia	0.02	0.067	0.057	0.167	<0.020	0.313
Vanadium	0.006	<0.0020	0.0080	<0.0010	0.0100	0.0100
Zinc	0.03	0.030	0.050	0.020	0.080	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: CSW-1

Sheet: 3

Date Sampled: 01-Nov-2000 20-Mar-2003 25-Apr-2003 15-May-2003 13-Jun-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	1070	1190	900	769	1150
Aluminum	f (pH)	<0.050	0.020	0.030	<0.010	<0.010
Aluminum (Total)						
Ammonia (as N)		62.60	82.00	52.00	38.00	74.00
Barium		0.350	0.600	0.430	0.240	0.360
Beryllium	f (Hardness)	<0.002	<0.001	<0.001	<0.001	<0.001
BOD		2.0	10.0	4.0	6.0	6.0
Boron	0.2	0.990	1.020	1.270	1.150	1.190
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		213.0	193.0	203.0	140.0	202.0
Chloride		257.0	315.0	203.0	110.0	281.0
Chromium		<0.010	0.031	0.002	0.011	0.036
Cobalt	0.0009	0.0016	0.0014	0.0016	0.0017	0.0016
COD		133	143	109	99	131
Colour (TCU)						
Conductivity (uS/cm)		390	2040	2610	3980	4110
Copper	0.005	0.0010	0.0020	0.0030	0.0020	0.0010
Dissolved Oxygen	f (Temp)	9.8	1.3	0.8	0.5	0.8
DOC		41.7	56.1	38.3	34.4	50.5
Hardness (CaCO ₃)		771	721	725	543	768
Hydrogen Sulphide	0.002					
Iron	0.3	26.10	52.10	30.20	4.62	14.90
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium		58.00	58.00	53.00	47.00	64.00
Manganese		0.800	0.284	0.427	0.726	0.500
Mercury	0.0002					
Molybdenum	0.04	<0.010	<0.005	<0.005	<0.005	<0.005
Nickel	0.025	<0.010	<0.005	<0.005	<0.005	<0.005
Nitrate (as N)		0.16	<0.10	0.33	0.85	0.23
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	6.7	6.7	6.8	6.4	6.3
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		<0.03	0.44	0.53	0.36	0.24
Phosphorus (total)	0.03	0.070	0.660	0.220	0.160	0.100
Potassium		92.0	114.0	95.0	76.0	115.0
Silicon		8.76	9.30	6.80	6.50	6.20
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		131.0	204.0	159.0	149.0	223.0
Strontium		1.050	0.939	0.916	0.833	0.961
Sulphate		29.0	14.0	170.0	170.0	99.0
Sulphur		10				
TDS		1450	1940	1640	1430	1970
Temperature (C)		9.2	4.0	9.0	15.0	16.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
TKN		62.60	90.60	64.80	40.40	99.00
TSS		40	150	118	26	46
Turbidity (NTU)		32.0	>100	>100	47.5	163.0
Unionized Ammonia	0.02	0.052	0.047	0.056	0.026	0.043
Vanadium	0.006	0.0090	0.0100	<0.0010	0.0040	0.0120
Zinc	0.03	<0.010	<0.005	0.011	0.007	<0.005

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: CSW-1

Sheet: 4

Date Sampled: 17-Jul-2003 24-Aug-2003 23-Sep-2003 27-Oct-2003 26-Nov-2003

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	1370	1270	1000	213	1110
Aluminum	f (pH)	0.050	0.030	<0.010	<0.010	0.010
Aluminum (Total)						
Ammonia (as N)		95.00	91.00	52.00	8.94	45.00
Barium		0.540	0.540	0.480	0.230	0.410
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		7.0	8.0	20.0	<1.0	10.0
Boron	0.2	1.310	1.230	1.610	0.450	1.430
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		228.0	204.0	205.0	86.0	250.0
Chloride		321.0	311.0	223.0	32.0	218.0
Chromium		0.026	0.058	0.030	0.009	0.004
Cobalt	0.0009	0.0017	0.0017	0.0036	0.0049	0.0029
COD		158	168	134	38	130
Colour (TCU)						
Conductivity (uS/cm)		3940	4100	4210	2985	2875
Copper	0.005	<0.0010	<0.0010	0.0030	0.0180	0.0020
Dissolved Oxygen	f (Temp)	0.5	0.4	0.4	3.2	2.1
DOC		53.2	53.8	49.5	16.3	44.0
Hardness (CaCO ₃)		849	756	726	293	871
Hydrogen Sulphide	0.002					
Iron	0.3	37.40	39.60	25.80	4.68	23.10
Lead	f (Alk)	<0.0010	<0.0010	<0.0010	0.0050	<0.0010
Magnesium		68.00	60.00	52.00	19.00	60.00
Manganese		0.433	0.369	1.190	0.636	1.750
Mercury	0.0002					
Molybdenum	0.04	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel	0.025	<0.005	<0.005	0.012	0.010	0.013
Nitrate (as N)		0.18	0.11	0.41	6.70	0.17
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	6.6	6.8	6.7	6.9	6.6
Phenols	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphate (as P)		0.64	0.20	0.23	0.29	0.39
Phosphorus (total)	0.03	0.310	0.120	0.200	0.880	0.250
Potassium		134.0	128.0	95.0	5.0	95.0
Silicon		8.80	9.30	10.10	5.60	12.20
Silver	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Sodium		247.0	230.0	209.0	20.0	186.0
Strontium		2.410	0.966	1.240	0.280	1.280
Sulphate		34.0	23.0	86.0	51.0	131.0
Sulphur						
TDS		2240	2090	1700	417	1790
Temperature (C)		18.0	24.0	17.0	5.0	5.0
Thallium	0.0003	<0.00100	<0.00100	<0.00100	<0.00100	<0.00100
Tin		<0.010	<0.010	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	0.010	0.020	<0.010
TKN		101.00	98.10	55.80	13.10	62.00
TSS		325	163	430	11	124
Turbidity (NTU)		531.0	9.9	>100	23.0	0.7
Unionized Ammonia	0.02	0.129	0.300	0.083	<0.020	0.022
Vanadium	0.006	0.0080	0.0180	0.0110	0.0120	0.0020
Zinc	0.03	<0.005	0.017	0.370	0.040	0.050

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: CSW-1

Sheet: 5

Date Sampled: 23-Dec-2003 29-Jan-2004 20-Feb-2004 26-Mar-2004 29-Apr-2004

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	1220	1370	1380	1110	1120
Aluminum	f (pH)	0.010	<0.005	<0.005	0.017	0.007
Aluminum (Total)			0.417	0.046	0.217	1.400
Ammonia (as N)		70.00	96.50	96.80	56.90	59.80
Barium		0.490	0.506	0.589	0.489	0.500
Beryllium	f (Hardness)	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		8.0	5.3	<0.5	3.4	8.3
Boron	0.2	1.420	1.150	1.110	1.410	1.200
Cadmium	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium		250.0	222.0	210.0	251.0	219.0
Chloride		267.0	291.0	327.0	209.0	216.0
Chromium		0.019	<0.005	<0.005	<0.005	<0.005
Cobalt	0.0009	0.0029	0.0022	0.0016	0.0017	0.0023
COD		136	169	187	142	130
Colour (TCU)						
Conductivity (uS/cm)		3200	3600	3800	2700	2000
Copper	0.005	0.0020	0.0012	<0.0005	0.0006	0.0161
Dissolved Oxygen	f (Temp)	0.0	5.3	—	9.0	6.8
DOC		47.5	52.2	46.6	41.4	44.7
Hardness (CaCO ₃)		892	859	844	884	800
Hydrogen Sulphide	0.002					
Iron	0.3	36.30	38.50	52.80	46.60	48.90
Lead	f (Alk)	<0.0010	0.0005	<0.0005	0.0008	0.0014
Magnesium		65.00	61.80	62.80	64.40	61.10
Manganese		1.170	1.000	0.798	1.080	1.120
Mercury	0.0002					
Molybdenum	0.04	<0.005	0.001	0.001	0.001	<0.001
Nickel	0.025	0.013	0.010	0.007	0.008	0.008
Nitrate (as N)		0.16	<0.20	<0.20	<0.20	<0.20
Nitrite (as N)		<0.10	<0.20	<0.20	<0.20	<0.20
pH (pH units)	6.5-8.5	6.6	7.1	6.8	6.3	7.3
Phenols	0.001	<0.001	0.004	0.114	0.002	0.002
Phosphate (as P)		0.41	<1.00	<1.00	<1.00	<1.00
Phosphorus (total)	0.03	0.330	0.120	0.275	0.213	0.441
Potassium		111.0	101.0	106.0	89.3	81.9
Silicon		12.00	10.00	9.97	9.90	11.40
Silver	0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Sodium		198.0	191.0	215.0	147.0	163.0
Strontium		1.290	1.360	1.220	1.240	1.200
Sulphate		95.0	53.0	30.6	196.0	98.7
Sulphur						
TDS		1940	1628	1590	1524	1430
Temperature (C)		7.7	6.3	13.5	11.8	19.3
Thallium	0.0003	<0.00100	<0.00005	<0.00005	<0.00005	<0.00005
Tin		<0.010	<0.001	<0.001	<0.001	<0.001
Titanium		0.010	0.035	<0.005	0.016	0.114
TKN		92.70	97.20	93.00	58.60	59.50
TSS		1160	127	126	119	327
Turbidity (NTU)		>100	463.0	770.0	580.0	700.0
Unionized Ammonia	0.02	0.043	0.170	0.150	0.024	0.450
Vanadium	0.006	0.0070	0.0022	0.0010	0.0012	0.0048
Zinc	0.03	0.100	0.105	0.132	0.222	0.111

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: CSW-1

Sheet: 6

Date Sampled: 26-May-2004 29-Jun-2004 20-Jul-2004 20-Aug-2004 20-Sep-2004

Parameter	PWQO					
Alkalinity (CaCO ₃)	75% Bkgd	1130	DRY	DRY	DRY	DRY
Aluminum	f (pH)	0.007				
Aluminum (Total)		0.398				
Ammonia (as N)		63.10				
Barium		0.482				
Beryllium	f (Hardness)	<0.001				
BOD		8.6				
Boron	0.2	0.992				
Cadmium	0.0002	<0.0001				
Calcium		217.0				
Chloride		236.0				
Chromium		<0.005				
Cobalt	0.0009	0.0018				
COD		145				
Colour (TCU)						
Conductivity (uS/cm)		1830				
Copper	0.005	0.0007				
Dissolved Oxygen	f (Temp)	4.0				
DOC		42.3				
Hardness (CaCO ₃)		811				
Hydrogen Sulphide	0.002					
Iron	0.3	46.20				
Lead	f (Alk)	<0.0005				
Magnesium		65.30				
Manganese		1.020				
Mercury	0.0002					
Molybdenum	0.04	0.001				
Nickel	0.025	0.007				
Nitrate (as N)		<0.20				
Nitrite (as N)		<0.20				
pH (pH units)	6.5-8.5	7.1				
Phenols	0.001	0.002				
Phosphate (as P)		<1.00				
Phosphorus (total)	0.03	0.242				
Potassium		87.6				
Silicon		10.00				
Silver	0.0001	<0.0001				
Sodium		164.0				
Strontium		1.200				
Sulphate		52.2				
Sulphur						
TDS		1382				
Temperature (C)		16.2				
Thallium	0.0003	<0.00005				
Tin		<0.001				
Titanium		0.032				
TKN		83.10				
TSS		125				
Turbidity (NTU)		9.1				
Unionized Ammonia	0.02	0.237				
Vanadium	0.006	0.0017				
Zinc	0.03	0.068				

All values reported in mg/L unless otherwise noted.

Golder Associates

CENTRAL LANDFILL SITE - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Project: 051120-712

Sample Source: CSW-1

Sheet: 7

Date Sampled:

25-Oct-2004

24-Nov-2004

23-Dec-2004

Parameter	PWQO			
Alkalinity (CaCO ₃)	75% Bkgd	1180	1180	not measured
Aluminum	f (pH)	0.010	0.010	0.030
Aluminum (Total)		0.051	0.211	0.656
Ammonia (as N)		74.10	81.00	42.90
Barium		0.266	0.375	0.219
Beryllium	f (Hardness)	<0.001	<0.001	<0.001
BOD		16.2	13.6	4.3
Boron	0.2	1.160	1.090	0.770
Cadmium	0.0002	<0.0001	<0.0001	<0.0001
Calcium		248.0	242.0	203.0
Chloride		256.0	279.0	176.0
Chromium		<0.005	<0.005	<0.005
Cobalt	0.0009	0.0043	0.0041	0.0028
COD		140	154	96
Colour (TCU)				
Conductivity (uS/cm)		2110	1885	1250
Copper	0.005	0.0014	0.0020	0.0020
Dissolved Oxygen	f (Temp)	4.9	6.3	7.1
DOC		43.6	58.3	36.2
Hardness (CaCO ₃)		884	878	713
Hydrogen Sulphide	0.002			
Iron	0.3	21.20	30.20	12.30
Lead	f (Alk)	<0.0005	<0.0005	<0.0005
Magnesium		64.40	66.40	49.90
Manganese		1.740	1.490	1.320
Mercury	0.0002			
Molybdenum	0.04	0.001	0.001	0.001
Nickel	0.025	0.016	0.016	0.008
Nitrate (as N)		<0.20	<0.20	<0.20
Nitrite (as N)		<0.20	<0.20	<0.20
pH (pH units)	6.5-8.5	6.7	6.7	6.9
Phenols	0.001	<0.001	<0.001	0.001
Phosphate (as P)		<1.00	<1.00	<1.00
Phosphorus (total)	0.03	0.090	0.930	0.123
Potassium		83.9	96.4	53.1
Silicon		8.24	8.74	7.94
Silver	0.0001	<0.0001	<0.0001	<0.0001
Sodium		170.0	169.0	95.6
Strontium		1.470	1.380	1.020
Sulphate		101.0	70.0	254.0
Sulphur				
TDS		1572	1522	1208
Temperature (C)		7.0	4.0	1.0
Thallium	0.0003	0.00016	0.00020	0.00006
Tin		<0.001	<0.001	<0.001
Titanium		<0.005	0.016	0.050
TKN		91.00	106.00	39.50
TSS		79	83	46
Turbidity (NTU)		236.0	175.0	79.0
Unionized Ammonia	0.02	0.054	0.047	0.031
Vanadium	0.006	0.0012	0.0019	0.0021
Zinc	0.03	0.028	0.036	0.075

All values reported in mg/L unless otherwise noted.

APPENDIX D

**TOXICITY TEST REPORTS
HYDROQUAL LABORATORIES LTD.**

HydroQual

Laboratories Ltd.

Test Report

#3, 6125 12th Street SE
Calgary, Alberta Canada T2H 2K1
Tel (403) 253-7121
Fax (403) 252-9363

Client

Client: Golder Associates Ltd.
Address: 1796 Courtwood Cres.
City: Ottawa
Country: Canada

Billing:

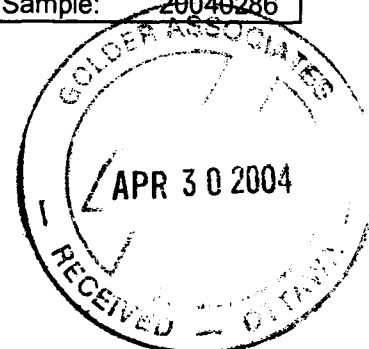
Tel: 613-224-5864

Client: GAL100 Sample: 20040286

Operation: Ottawa

Prov./State: Ontario
Postal/ZIP Code: K2C 2B5

Contact: Marie Gauthier
Fax: 613-224-9928



Sample

type	water; grab sample; SA-1; SA-2; CassLeman				
collected	2004/03/26	at	PM	by	T. Clark
shipped	2004/03/26	by	Mantoulin		
received	2004/03/29	at	1530	by	B. Crago
container	4 x 20L plastic carboys				
seals	none	initials	no	frozen	no
storage	4 ± 2 °C in darkness			initial temperature (°C)	12
disposed on		by		method	

Physical and Chemical Measurements at Sample Receipt

lab code	-1	-2
client code	SA-1 (SW6)	SA-2 (CSW-1)

water/effluent/pore water

pH	7.5	6.8
EC (uS/cm)	1037	2890
DO (mg/L)	7.6	2.5
temp (°C)	18	18
alkalinity	not done	not done
hardness	398	797
NH4 (mg/L)	not done	not done
TRC (mg/L)	not done	not done
colour	pale yellow	orange/cloudy
odour	odourless	organic

soil/sediment

moisture (%)	na	na
sand:silt:clay	na	na
TOC (%)	na	na

Test Log

	-1	-1	-2	-2
type	TR-D	DA-D	TR-D	DA-D
number	20040815	20040816	20040817	20040818
started	2004/03/30	2004/03/30	2004/03/30	2004/03/30
ended	2004/04/03	2004/04/01	2004/04/03	2004/04/01
reported	2004/04/08	2004/04/08	2004/04/08	2004/04/08
faxed	2004/04/03		2004/04/03	

Notes: D, definitive; S, single treatment; EC, electrical conductivity; DO, dissolved oxygen; TRC, total residual chlorine;
TOC, total organic carbon; na, not applicable

Test Report

Client: GAL100	Sample: 20040286	Test: 20040815

Method Trout 96h Static Acute Test (five treatments plus a control)
Reference: Biological Test method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13. (amended 1996 and 2000)

Client: Golder Associates Ltd.

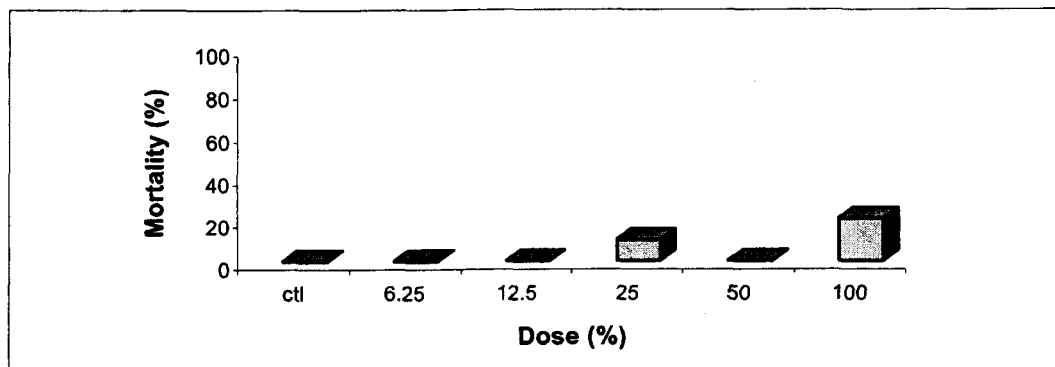
Sample: SA-1 (sub) - no pH adjustment
description: water; grab sample; SA-1; SA-2; CassLeman
collected: 2004/03/26 at PM by T. Clark
received: 2004/03/29 at 1530 by B. Crago

Test:
started: 2004/03/30 at 1445 by B. Crago/L. Guignon
ended: 2004/04/03 at 1245 by K. Steele/J. Vaughan
reported: 2004/04/08 by B. Armit

Result:

Endpoint	Value (%)	Confidence Limits (95%)		Method Calculated
		lower	upper	
LC50	>100			estimated
LC25	>100			estimated
NOEC	100			estimated
LOEC	>100			estimated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population
NOEC, highest concentration tested that had no significant observed effect
LOEC, lowest concentration tested that had an observed significant effect



Test Report

Test Data

Client: GAL100 Sample: 20040286 Test: 20040815

Day	Time	Technician	Comment/Observation
0	1445	B. Crago/L. Guignon	test fish loaded at 1450 h
1	1220	B. Crago/L. Guignon	all test fish appear normal
2	1030	L. Guignon/B. Crago	all test fish appear normal
3	1430	L. Guignon/B. Crago	all test fish appear normal
4	1245	K. Steele/J. Vaughan	all test fish appear normal

Preaeration (6.5 mL/min/L)
DO (mg/L)

0.5	1.0	1.5	2.0 (h)
8.4			

Dose(%)	ctl	6.25	12.5	25	50	100		

day	pH (units)						
0	8.0	8.1	8.1	8.0	8.0	8.0	
1	8.3	8.3	8.4	8.4	8.4	8.4	
2	8.3	8.3	8.4	8.4	8.4	8.5	
3	8.3	8.3	8.3	8.3	8.4	8.4	
4	8.2	8.3	8.4	8.4	8.4	8.5	

	EC (uS/cm)						
0	469	520	552	650	731	1050	
1	467	520	550	641	727	1024	
2	471	525	556	640	744	1032	
3	477	524	571	662	750	1075	
4	495	546	580	672	754	1090	

	DO (mg/L)						
0	9.1	8.9	8.9	8.7	8.7	8.4	
1	9.1	9.2	9.2	9.2	9.2	9.1	
2	8.9	9.0	9.1	8.9	9.0	8.8	
3	9.2	9.1	9.2	9.1	9.1	8.7	
4	8.1	8.4	8.5	8.4	8.6	8.2	

	Temperature (°C)						
0	15	15	15	15	15	16	
1	14	14	14	14	14	14	
2	14	14	14	15	14	15	
3	14	16	16	14	14	15	
4	14	14	14	14	14	14	

	Number Alive						
0	10	10	10	10	10	10	
1	10	10	10	10	10	10	
2	10	10	10	9	10	10	
3	10	10	10	9	10	8	
4	10	10	10	9	10	8	

	Mortality (%)						
	0	0	0	10	0	20	

Test Data

Client:	GAL100	Sample:	20040286	Test:	20040815

Control Fish	Length (cm)	Weight (g)	Dose (%)	Group Weight (g)	Ammonium (mg NH ₄ ⁺ -N/L)	
					initial	final
1	3.9	0.5	ctl	4.9	na	na
2	3.6	0.4	6.25	5.3	na	na
3	3.9	0.5	12.5	4.9		
4	3.7	0.5	25	4.9		
5	3.3	0.4	50	5.2		
6	3.3	0.3	100	5.3		
7	3.5	0.4				
8	3.8	0.6				
9	4.2	0.7				
10	4.0	0.6				

average	3.7	0.5
sd	0.3	0.1
cv(%)	8.0	23.0

Test Information

organism: *Oncorhynchus mykiss* from Ackenberry Trout Farms

age and condition: The fish were held 6 days before testing (batch 20040324TR).

Conditions

The tests were conducted in 22 L plastic pails with polyethylene liners. The test volume was 10 L and there was one replicate per treatment. There were ten fish per replicate (loading density of <0.5 g per litre). All treatments aerated at 6.5 mL/min/L. The sample was not pH adjusted.

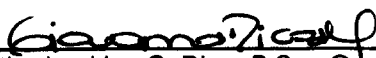
Mortality of fish 7 days before test <2%.

Comments

The test fish were held less than 14 days prior to testing.

Notes: EC, electrical conductivity; DO, dissolved oxygen; nd, not done; na, not applicable; sd, standard deviation; cv(%), coefficient of variance

The test data and results are verified correct.


Authorized by: G. Diaz, B.Sc., Quality Assurance Officer

Test Report

Client: GAL100	Sample: 20040286	Test: 20040815

Method Trout 96h Static Acute Test (five treatments plus a control)
Reference: Biological Test method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13. (amended 1996 and 2000)

Client: Golder Associates Ltd.

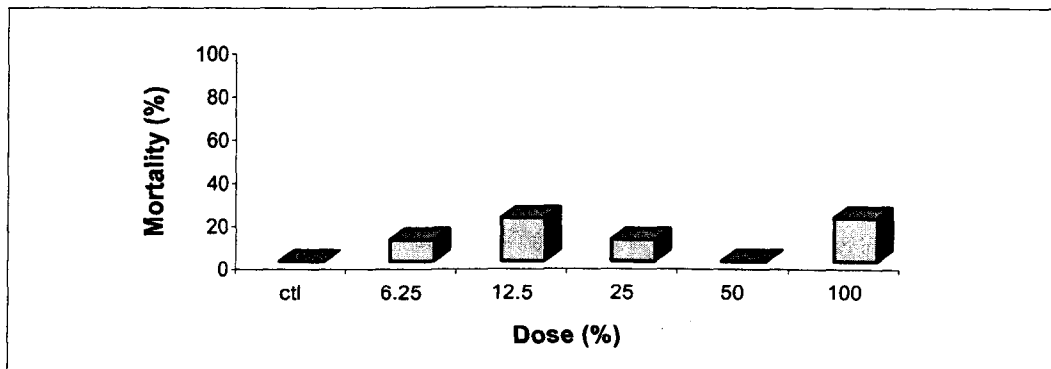
Sample: SA-1; CO₂ adjusted (sw6) - with pH adjustment
description: water; grab sample; SA-1; SA-2; CassLeman
collected: 2004/03/26 at PM by T. Clark
received: 2004/03/29 at 1530 by B. Crago

Test:
started: 2004/03/30 at 1445 by B. Crago/L. Guignon
ended: 2004/04/03 at 1240 by K. Steele/J. Vaughan
reported: 2004/04/08 by B. Armit

Result:

Endpoint	Value (%)	Confidence Limits (95%)		Method Calculated
		lower	upper	
LC50	>100			estimated
LC25	>100			estimated
NOEC	100			estimated
LOEC	>100			estimated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population
NOEC, highest concentration tested that had no significant observed effect
LOEC, lowest concentration tested that had an observed significant effect



Test Report

#3, 6125 12th Street SE
Calgary, Alberta Canada T2H 2K1
Tel (403) 253-7121
Fax (403) 252-9363

Test Data

Client:	GAL100	Sample:	20040286	Test:	20040815

Day	Time	Technician	Comment/Observation
0	1445	B. Crago/L. Guignon	test fish loaded at 1450 h
1	1220	B. Crago/L. Guignon	all test fish appear normal
2	1030	L. Guignon/B. Crago	all test fish appear normal
3	1430	L. Guignon/B. Crago	all test fish appear normal
4	1240	K. Steele/J. Vaughan	all test fish appear normal

Preaeration (6.5 mL/min/L)
DO (mg/L)

0.5	1.0	1.5	2.0 (h)
11.7			

Dose(%)	ctl	6.25	12.5	25	50	100		

day

pH (units)

0	7.6	7.6	7.5	7.5	7.5	7.7		
1	7.3	7.1	7.5	7.5	7.7	7.6		
2	7.3	7.2	7.5	7.5	7.7	7.5		
3	7.4	7.3	7.5	7.5	7.7	7.6		
4	7.1	7.0	7.4	7.4	7.6	7.6		

EC (uS/cm)

0	460	512	567	634	762	1053		
1	480	523	578	625	758	1044		
2	454	514	574	647	756	1053		
3	477	529	587	655	769	1051		
4	493	538	590	669	792	1090		

DO (mg/L)

0	11.7	11.4	12.8	12.2	11.9	11.7		
1	19.6	23.4	12.6	13.2	11.7	14.6		
2	19.9	23.2	12.8	13.3	11.6	14.7		
3	19.7	22.6	14.0	13.5	11.6	13.4		
4	18.2	23.2	12.4	13.3	11.0	12.5		

Temperature (°C)

0	15	15	15	15	16	16		
1	14	14	14	15	14	14		
2	15	14	15	15	15	15		
3	15	15	15	15	14	15		
4	15	14	15	15	15	15		

Number Alive

0	10	10	10	10	10	10		
1	10	10	10	10	10	10		
2	10	10	10	10	10	10		
3	10	9	8	10	10	9		
4	10	9	8	9	10	8		

Mortality (%)

0	10	20	10	0	20		

Test Data

Client:	GAL100	Sample:	20040286	Test:	20040815

Control Fish	Length (cm)	Weight (g)	Dose (%)	Group Weight (g)	Ammonium (mg NH ₄ ⁺ -N/L)	
					initial	final
1	3.5	0.4	ctl	5.0	na	na
2	3.7	0.5	6.25	5.6	na	na
3	4.1	0.6	12.5	5.0		
4	3.5	0.5	25	5.1		
5	4.2	0.6	50	5.7		
6	3.9	0.5	100	5.4		
7	4.0	0.6				
8	3.6	0.4				
9	3.4	0.3				
10	3.7	0.5				
average	3.8	0.5				
sd	0.3	0.1				
cv(%)	7.3	20.5				

Test Information

organism: *Oncorhynchus mykiss* from Ackenberry Trout Farms

age and condition: The fish were held 6 days before testing (batch 20040324TR).

Conditions

The tests were conducted in 22 L plastic pails with polyethylene liners. The test volume was 10 L and there was one replicate per treatment. There were ten fish per replicate (loading density of <0.5 g per litre). All treatments aerated at 6.5 mL/min/L.

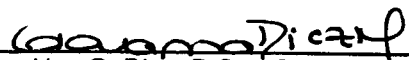
Mortality of fish 7 days before test <2%.

Comments

The test fish were held less than 14 days prior to testing.
Sample was CO₂ adjusted.

Notes: EC, electrical conductivity; DO, dissolved oxygen; nd, not done; na, not applicable; sd, standard deviation; cv(%), coefficient of variance

The test data and results are verified correct.


Authorized by: G. Diaz, B.Sc., Quality Assurance Officer

Test Report

Client: GAL100	Sample: 20040286	Test: 20040816

Method *Daphnia* 48h Static Acute Test (five treatments plus a control)
Reference: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*, 1990. Environ. Can., EPS 1/RM/14. (amended 1996 and 2000)

Client: Golder Associates Ltd.

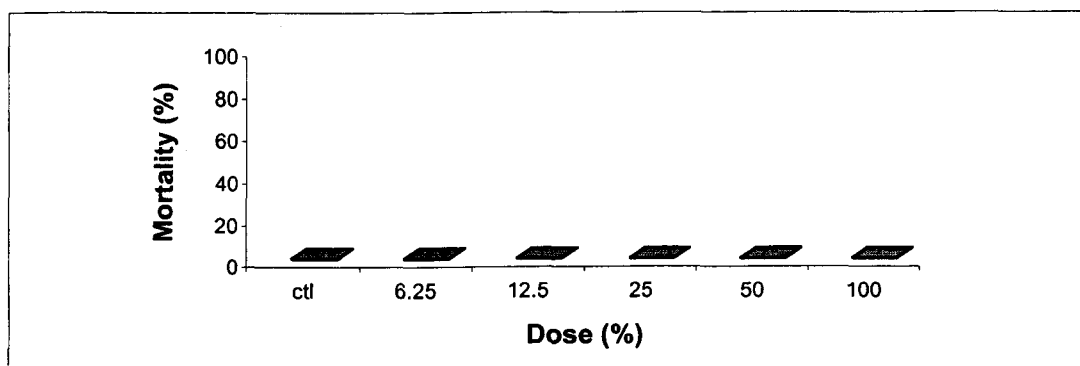
Sample: SA-1 (SW6)
description: water; grab sample; SA-1; SA-2; CassLeman
collected: 2004/03/26 at PM by T. Clark
received: 2004/03/29 at 1530 by B. Crago

Test:
started: 2004/03/30 at 1630 by L. Guignon
ended: 2004/04/01 at 1645 by L. Guignon
reported: 2004/04/08 by B. Armit

Result:

Endpoint	Value (%)	Confidence Limits (95%)		Method Calculated
		lower	upper	
LC50	>100			estimated
LC25	>100			estimated
NOEC	100			estimated
LOEC	>100			estimated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population
NOEC, highest concentration tested that had no significant observed effect
LOEC, lowest concentration tested that had an observed significant effect



Test Report

Test Data

Client:	GAL100	Sample:	20040286	Test:	20040816

Day	Time	Technician	Comment/Observation
0	1630	L. Guignon	Test <i>Daphnia</i> appear normal.
1	1205	L. Guignon	Test <i>Daphnia</i> appear normal.
2	1645	L. Guignon	Test <i>Daphnia</i> appear normal.

Dose (%)	ctl	6.25	12.5	25	50	100		

day	pH (units)						
0	8.3	8.3	8.3	8.2	8.1	8.0	
1							
2	8.3	8.4	8.4	8.4	8.5	8.3	

	EC (uS/cm)						
0	428	460	492	567	716	1001	
1							
2	443	461	513	576	722	987	

	DO (mg/L)						
0	8.4	8.4	8.4	8.4	8.4	8.4	
1							
2	7.4	7.4	7.3	7.3	7.4	7.2	

	Temperature (°C)						
0	20	20	20	20	20	20	
1							
2	22	22	22	22	22	22	

Number Alive - day 1 (F, floating; I, immobile; B, stuck on bubble; D, caught in debris)							
10 (2F)	10	10	10	10	10		

Number Alive - day 2							
10 (1F)	10 (1F)	10	10	10	10 (1D)		

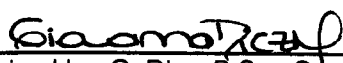
Mortality (%)							
0	0	0	0	0	0		

Comments: organism: <24 h old *Daphnia magna* from in-house cultures from culture jar: D2
Cultures time to first brood (d): 12 brood size (neonates per brood): 20
No adjustments were made to sample pH and hardness before testing. The sample was not aerated before testing. Lab dilution water hardness was (mg CaCO₃/L): 198 water pail: A
The test was conducted in 385 mL plastic vessels containing 150 mL of test solution and ten daphnids (loading density of 15 mL per daphnid or neonate).

There were no protocol deviations during the conduct of this test.

Notes: EC, electrical conductivity; DO, dissolved oxygen; nd, not done; na, not applicable

The test data and results are verified correct.


Authorized by: G. Diaz, B.Sc., Quality Assurance Officer

Test Report

#3, 6125 12th Street SE
Calgary, Alberta Canada T2H 2K1
Tel (403) 253-7121
Fax (403) 252-9363

Client: GAL100	Sample: 20040286	Test: 20040817

Method Trout 96h Static Acute Test (five treatments plus a control)

Reference: Biological Test method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13. (amended 1996 and 2000)

Client: Golder Associates Ltd.

Sample: SA-2 (CSW-1) - no pH adjustment

description: water; grab sample; SA-1; SA-2; CassLeman

collected:	2004/03/26	at	PM	by	T. Clark
received:	2004/03/29	at	1530	by	B. Crago

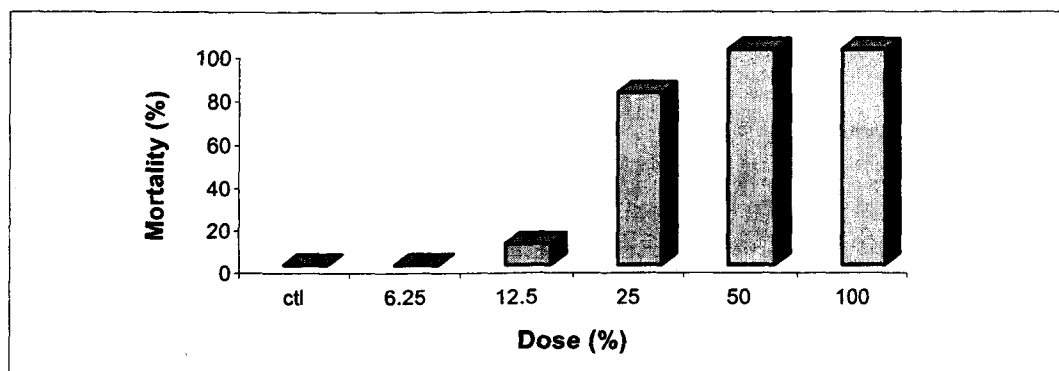
Test:

started:	2004/03/30	at	1445	by	B. Crago/L. Guignon
ended:	2004/04/03	at	1240	by	K. Steele/J. Vaughan
reported:	2004/04/08			by	B. Armit

Result:

Endpoint	Value (%)	Confidence Limits (95%)		Method Calculated
		lower	upper	
LC50	18.9	14.5	24.8	Probit
LC25	15.2	could not be calculated		linear interpolation
NOEC	12.5			estimated
LOEC	25			estimated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population
NOEC, highest concentration tested that had no significant observed effect
LOEC, lowest concentration tested that had an observed significant effect



Test Report

#3, 6125 12th Street SE
Calgary, Alberta Canada T2H 2K1
Tel (403) 253-7121
Fax (403) 252-9363

Test Data

Client:	GAL100	Sample:	20040286	Test:	20040817

Day	Time	Technician	Comment/Observation
0	1445	B. Crago/L. Guignon	test fish loaded at 1450 h
1	1220	B. Crago/L. Guignon	all test fish appear normal
2	1030	L. Guignon/B. Crago	all test fish appear normal
3	1430	L. Guignon/B. Crago	all test fish appear normal
4	1240	K. Steele/J. Vaughan	all test fish appear normal

Preaeration (6.5 mL/min/L)
DO (mg/L)

0.5	1.0	1.5	2.0 (h)
7.4			

Dose(%)	ctl	6.25	12.5	25	50	100		

day	pH (units)						
0	8.0	7.6	7.6	7.4	7.4	7.3	
1	8.2	8.4	8.3	8.3	8.2	8.1	
2	8.2	8.3	8.4	8.2			
3	8.3	8.3	8.3	8.2			
4	8.4	8.4	8.3	8.2			

	EC (uS/cm)						
0	464	655	902	1098	1593	2960	
1	473	646	871	1080	1313	2430	
2	468	653	879	1026			
3	477	592	848	957			
4	477	590	830	944			

	DO (mg/L)						
0	9.1	9.1	8.8	8.8	8.6	7.4	
1	9.0	8.9	8.2	8.4	9.2	9.2	
2	8.3	8.3	8.7	8.6			
3	9.2	9.1	8.6	8.7			
4	8.5	8.4	8.0	8.2			

	Temperature (°C)						
0	15	15	15	15	15	16	
1	16	15	15	15	15	15	
2	16	16	16	16			
3	16	16	16	16			
4	15	15	16	16			

	Number Alive						
0	10	10	10	10	10	10	
1	10	10	9	3	0	0	
2	10	10	9	2	0	0	
3	10	10	9	2	0	0	
4	10	10	9	2	0	0	

	Mortality (%)						
	0	0	10	80	100	100	

Test Report

#3, 6125 12th Street SE
Calgary, Alberta Canada T2H 2K1
Tel (403) 253-7121
Fax (403) 252-9363

Test Data

Client:	GAL100	Sample:	20040286	Test:	20040817

Control Fish	Length (cm)	Weight (g)	Dose (%)	Group Weight (g)	Ammonium (mg NH ₄ ⁺ -N/L)	
					initial	final
1	4.3	0.6	ctl	4.6	0	1.2
2	4.1	0.5	6.25	5.5	37.5	42
3	3.5	0.4	12.5	5.3		
4	4.0	0.5	25	6.2		
5	3.7	0.4	50	7.7		
6	4.1	0.6	100	7.2		
7	4.0	0.6				
8	3.7	0.5				
9	4.1	0.6				
10	4.0	0.6				
average	4.0	0.5				
sd	0.2	0.1				
cv(%)	6.2	16.7				

Test Information

organism: *Oncorhynchus mykiss* from Ackenberry Trout Farms

age and condition: The fish were held 6 days before testing (batch 20040324TR).

Conditions

The tests were conducted in 22 L plastic pails with polyethylene liners. The test volume was 10 L and there was one replicate per treatment. There were ten fish per replicate (loading density of <0.5 g per litre). All treatments aerated at 6.5 mL/min/L. The sample was not pH adjusted.

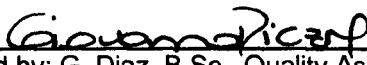
Mortality of fish 7 days before test <2%.

Comments

The test fish were held less than 14 days prior to testing.

Notes: EC, electrical conductivity; DO, dissolved oxygen; nd, not done; na, not applicable; sd, standard deviation; cv(%), coefficient of variance

The test data and results are verified correct.


Authorized by: G. Diaz, B.Sc., Quality Assurance Officer

Test Report

Client: GAL100	Sample: 20040286	Test: 20040817

Method Trout 96h Static Acute Test (five treatments plus a control)
Reference: Biological Test method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13. (amended 1996 and 2000)

Client: Golder Associates Ltd.

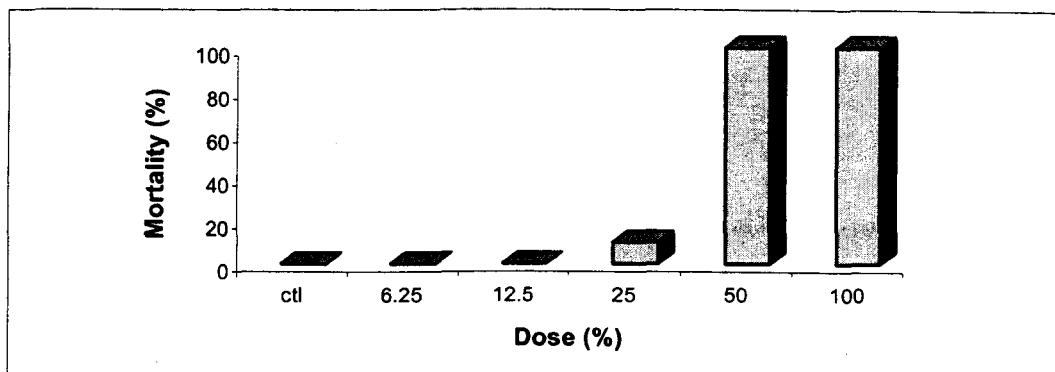
Sample: SA-2; CO₂ adjusted *(CSW-1) - with pH adjustment*
description: water; grab sample; SA-1; SA-2; CassLeman
collected: 2004/03/26 at PM by T. Clark
received: 2004/03/29 at 1530 by B. Crago

Test:
started: 2004/03/30 at 1445 by B. Crago/L. Guignon
ended: 2004/04/03 at 1240 by K. Steele/J. Vaughan
reported: 2004/04/08 by B. Armit

Result:

Endpoint	Value (%)	Confidence Limits (95%)		Method Calculated
		lower	upper	
LC50	32.9	25	50	linear interpolation
LC25	29.2	could not be calculated		linear interpolation
NOEC	25			estimated
LOEC	50			estimated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population
NOEC, highest concentration tested that had no significant observed effect
LOEC, lowest concentration tested that had an observed significant effect



Test Report

Test Data

Client:	GAL100	Sample:	20040286	Test:	20040817

Day	Time	Technician	Comment/Observation
0	1445	B. Crago/L. Guignon	test fish loaded at 1450 h
1	1220	B. Crago/L. Guignon	all test fish appear normal
2	1030	L. Guignon/B. Crago	all test fish appear normal
3	1430	L. Guignon/B. Crago	all test fish appear normal
4	1240	K. Steele/J. Vaughan	all test fish appear normal

Preaeration (6.5 mL/min/L)
DO (mg/L)

0.5	1.0	1.5	2.0 (h)
8.2			

Dose(%)	ctl	6.25	12.5	25	50	100		

day

pH (units)

0	7.9	7.8	7.5	7.4	7.3	7.8		
1	7.6	7.6	7.8	7.9	7.9	7.8		
2	7.5	7.5	7.8	7.8				
3	7.5	7.5	7.7	7.8				
4	7.6	7.5	7.7	7.8				

EC (uS/cm)

0	457	597	859	1101	1689	2930		
1	485	601	842	1090	1597	2480		
2	476	600	839	1096				
3	493	594	850	1097				
4	491	609	853	1110				

DO (mg/L)

0	9.3	9.1	8.9	8.8	8.0	8.2		
1	11.7	11.8	10.8	11.8	11.7	15.9		
2	12.2	12.5	10.7	11.7				
3	12.5	13.3	11.2	12.0				
4	9.9	12.3	10.0	11.3				

Temperature (°C)

0	15	15	15	15	15	16		
1	16	16	16	15	16	16		
2	16	16	16	15				
3	16	16	16	16				
4	16	16	16	15				

Number Alive

0	10	10	10	10	10	10		
1	10	10	10	10	0	0		
2	10	10	10	10	0	0		
3	10	10	10	10	0	0		
4	10	10	10	9	0	0		

Mortality (%)

0	0	0	10	100	100		

Test Report

#3, 6125 12th Street SE
Calgary, Alberta Canada T2H 2K1
Tel (403) 253-7121
Fax (403) 252-9363

Test Data

Client:	GAL100	Sample:	20040286	Test:	20040817

Control Fish	Length (cm)	Weight (g)	Dose (%)	Group Weight (g)	Ammonium (mg NH ₄ ⁺ -N/L)		
					control	initial	final
1	4.1	0.6	ctl	5.1	100%	0	0.9
2	3.9	0.5	6.25	4.6		37.5	39
3	4.0	0.6	12.5	6.0			
4	3.9	0.5	25	5.0			
5	3.5	0.4	50	6.5			
6	3.5	0.4	100	5.1			
7	4.3	0.7					
8	3.9	0.6					
9	3.4	0.3					
10	3.7	0.5					
average	3.8	0.5					
sd	0.3	0.1					
cv(%)	7.6	21.7					

Test Information

organism: *Oncorhynchus mykiss* from Ackenberry Trout Farms

age and condition: The fish were held 6 days before testing (batch 20040324TR).

Conditions

The tests were conducted in 22 L plastic pails with polyethylene liners. The test volume was 10 L and there was one replicate per treatment. There were ten fish per replicate (loading density of <0.5 g per litre). All treatments aerated at 6.5 mL/min/L.

Mortality of fish 7 days before test <2%.

Comments

The test fish were held less than 14 days prior to testing.

Sample was CO₂ adjusted.

After 2 hours, there were 10 dead fish in the 100% concentration, so fish were removed and reloaded.

Notes: EC, electrical conductivity; DO, dissolved oxygen; nd, not done; na, not applicable; sd, standard deviation; cv(%), coefficient of variance

The test data and results are verified correct.


Authorized by: G. Diaz, B.Sc., Quality Assurance Officer

Test Report

Client: GAL100	Sample: 20040286	Test: 20040818

Method *Daphnia* 48h Static Acute Test (five treatments plus a control)

Reference: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*, 1990. Environ. Can., EPS 1/RM/14. (amended 1996 and 2000)

Client: Golder Associates Ltd.

Sample: SA-2 (CSW-1)

description: water; grab sample; SA-1; SA-2; CassLeman

collected: 2004/03/26	at	PM	by	T. Clark
received: 2004/03/29	at	1530	by	B. Crago

Test:

started: 2004/03/30	at	1630	by	L. Guignon
ended: 2004/04/01	at	1640	by	L. Guignon
reported: 2004/04/08			by	B. Armit

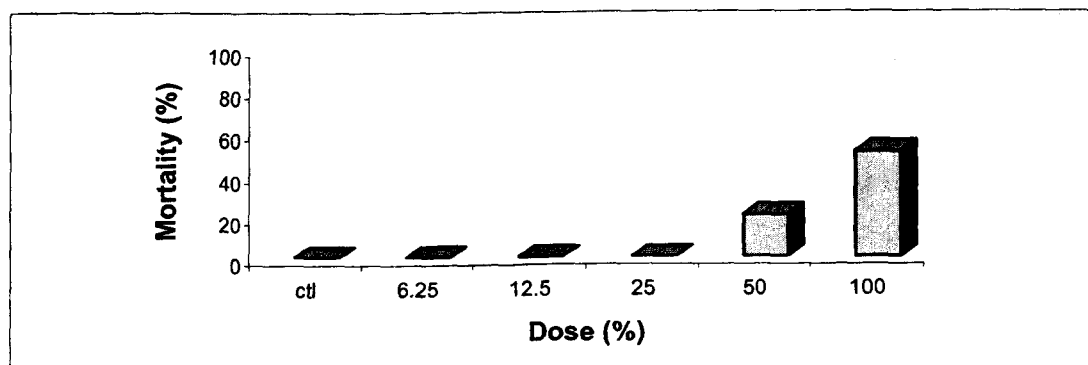
Result:

Endpoint	Value (%)	Confidence Limits (95%)		Method Calculated
		lower	upper	
LC50	100	25	100.0	linear interpolation
LC25	58.3	could not be calculated		linear interpolation
NOEC	50			estimated
LOEC	100			estimated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population

NOEC, highest concentration tested that had no significant observed effect

LOEC, lowest concentration tested that had an observed significant effect



Test Report

Test Data

Client:	GAL100	Sample:	20040286	Test:	20040818

Day	Time	Technician	Comment/Observation
0	1630	L. Guignon	Test <i>Daphnia</i> appear normal.
1	1210	L. Guignon	Test <i>Daphnia</i> appear normal.
2	1640	L. Guignon	Test <i>Daphnia</i> appear normal.

Dose (%)	ctl	6.25	12.5	25	50	100		

day	pH (units)						
0	8.3	8.3	8.2	8.2	8.1	7.9	
1							
2	8.3	8.3	8.3	8.2	8.0	7.9	

	EC (uS/cm)						
0	437	561	708	997	1557	2770	
1							
2	451	544	654	874	1347	2350	

	DO (mg/L)						
0	8.1	8.2	8.2	8.2	8.2	8.1	
1							
2	7.4	7.4	7.3	7.3	7.1	6.9	

	Temperature (°C)						
0	20	20	20	20	20	20	
1							
2	22	22	22	22	22	22	

Number Alive - day 1 (F, floating; I, immobile; B, stuck on bubble; D, caught in debris)

10 (4F, 1B)	10	10 (3F)	10 (1F)	10	na		

Number Alive - day 2

10 (3F, 1B)	10 (1F)	10 (3F, 1D)	10 (2F)	8 (1D, 2I)	5 (1D, 1I)		

Mortality (%)

0	0	0	0	20	50		

Comments: organism: <24 h old *Daphnia magna* from in-house cultures from culture jar: D1, D3, C1
Cultures time to first brood (d): 12 brood size (neonates per brood): 20
No adjustments were made to sample pH and hardness before testing. The sample was not aerated before testing. Lab dilution water hardness was (mg CaCO₃/L): 198 water pail: A
The test was conducted in 385 mL plastic vessels containing 150 mL of test solution and ten daphnids (loading density of 15 mL per daphnid or neonate).
The 100% concentration was too dark to count organism on day 1.
There were no protocol deviations during the conduct of this test.

Notes: EC, electrical conductivity; DO, dissolved oxygen; nd, not done; na, not applicable

The test data and results are verified correct.



Authorized by: G. Diaz, B.Sc., Quality Assurance Officer

Quality Assurance Information

Test Method: Trout 96h Static Acute Test. (LC50, five or more treatments plus a control)
Reference: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13. including May 1996 and December 2000 amendments.

Test Organism		Test Design	
test species	<i>Oncorhynchus mykiss</i>	vol. of test vessel (L)	22
culture source	Ackenberry Trout Farms	test volume depth	>15 cm
temperature (°C)	15 ± 1	replicates per treatment	1
dissolved oxygen	saturated	fingerlings per replicate	10
stock mortality (last 7d)	<2%	loading (g fish/L)	<0.5
		temperature (°C)	15 ± 1
		photoperiod	16h light: 8h dark
		light level (water surface)	100-500 lux
		control/dilution water	dechlorinated tap water

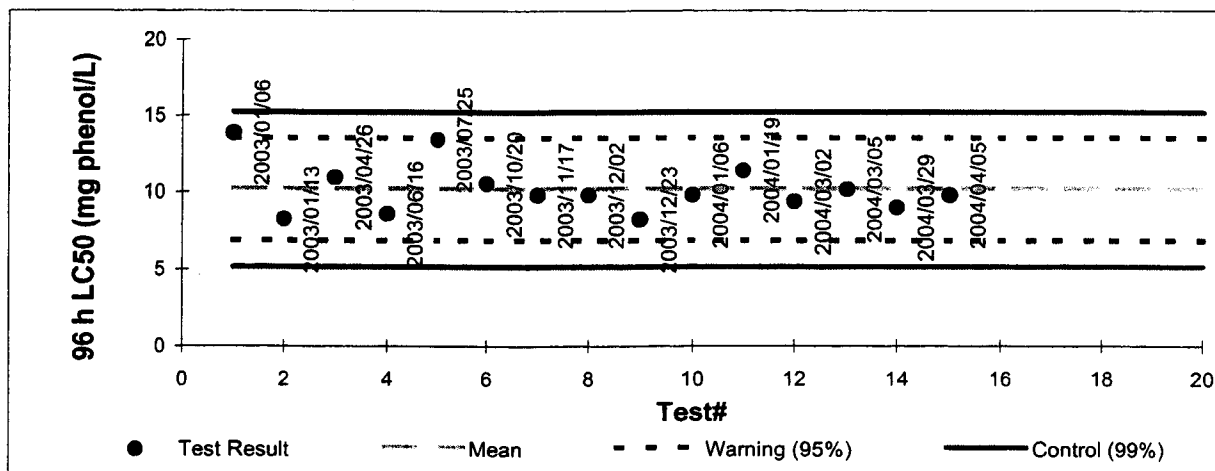
Quality Assurance Unit:

The test data and result are verified correct.

Gianmarco Diaz 2004/04/07
Authorized by: G. Diaz

Warning Chart (mortality LC50 at 96 h)

Toxicant:	Phenol (C ₆ H ₅ OH)
Current Test:	started: 2004/04/01 ended: 2004/04/05
Result (96 h LC50):	9.8 (8-12) mg/L 95% confidence limits are in brackets
Historical Mean:	10.2 std.dev: 1.7 CV(%): 16
Chart Limits:	warning: 6.8 13.6 control: 5.2 15.2
	95% , two standard deviations 99%, three standard deviations



Quality Assurance Information

Test Method: *Daphnia* Static Acute Test (LC50, five or more treatments plus a control)
Reference: Biological Test Method: Reference Method for Determining the Acute Lethality of Effluents to *Daphnia magna*, 1990. Environment Canada, EPS 1/RM/14.
including May 1996 and December 2000 ammendments.

Test Organism		Test Design	
test species	<i>Daphnia magna</i>	vol. of test vessel (mL)	500
culture source	in-house	test volume (mL)	150
original culture source	Environment Canada	replicates per treatment	1
days to first brood	12	neonates per replicate	10
mean brood size	20	volume per neonate (mL)	15
ehippia in stock culture	no	samples preaerated	no
age of test organisms	<24 hours old	hardness adjustment	no
		temperature (°C)	20
		photoperiod	16h light:8h dark
		light level (water surface)	400-800 lux
		control/dilution water	dechlorinated tap water

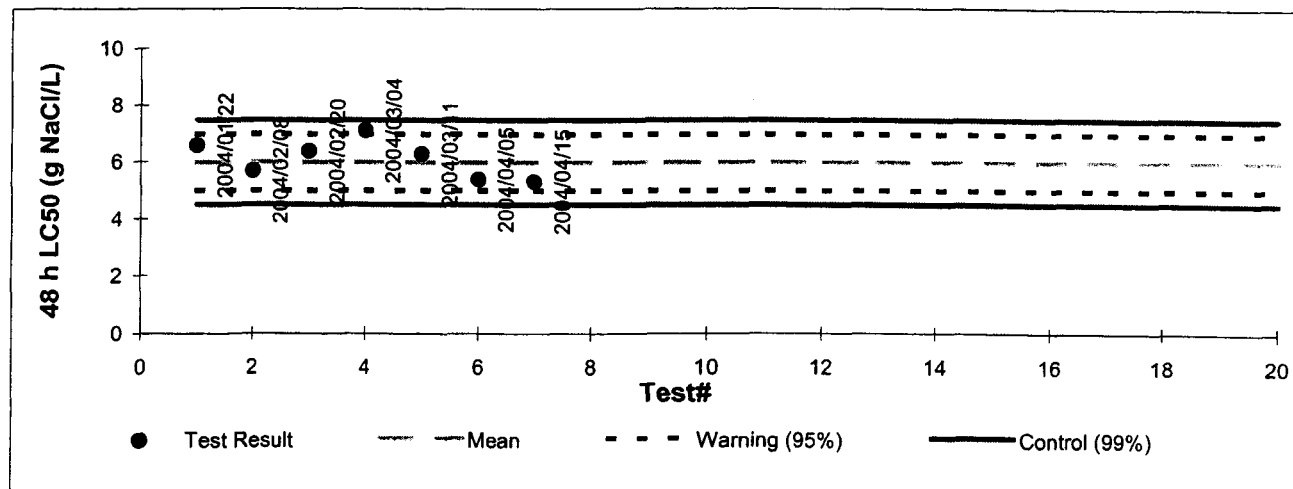
Quality Assurance Unit:

The test data and result are verified correct.

C. J. MacDonald 2004/04/15

Warning Chart (mortality LC50 at 48 h)

Toxicant: Sodium Chloride (NaCl)
Current Test: started : 2004/04/13 ended: 2004/04/15
Result (48 h LC50): 5.3 (4.8-5.7) g NaCl/L 95% confidence limits are in brackets
Historical Mean: 6.0 **std. dev:** 0.5 **cv (%):** 8
Chart Limits: **warning:** 5.0 7.0 **control:** 4.5 7.5
95% , two standard deviations 99% , three standard deviations





#3, 6125 12th Street SE Calgary, Alberta Canada T2H 2K1
Tel (403) 253-7121 Fax (403) 252-9363 www.hydroqual.ca

Transmittal

Date: 2004/10/14

From: Ingrid Carleton-Dodds, B.Sc.
Laboratory Supervisor

To: Marie Gauthier
Golder Associates

Tel: 613-224-5864

Fax: 613-224-9928

Subject: Testing Summary

Testing was conducted on a grab water sample submitted by Golder Associates Ltd. The sample, identified as S-1, was collected on August 20, 2004 and submitted to HydroQual Laboratories for toxicity testing. The sample arrived at the lab on August 23, 2004 and assigned HydroQual sample number 20040855.

The following tests were conducted:

1. Rainbow trout 96 hour LC₅₀
2. Rainbow trout 96 hour LC₅₀ – pH adjusted to 7.7
3. Rainbow trout 96 hour LC₅₀ for iron
4. *Daphnia magna* 48 hour pass/fail

Test reports for all four tests are included. The unadjusted effluent was not toxic to *Daphnia magna*. The results for the tests conducted on rainbow trout are summarized here.

Initial chemical measurements of pH, EC and dissolved oxygen were taken upon sample receipt, and are included on the test report. They were all found to be within the physiological tolerance ranges for rainbow trout.

The unadjusted sample was not toxic to rainbow trout (LC₅₀ > 100%). A concurrent test was conducted where the pH was controlled and maintained at 7.7 using bone-dry CO₂. The result of this test was also an LC₅₀ greater than 100%, although some sporadic mortality was observed in the treatments.



HydroQual
Laboratories Ltd.

#3, 6125 12th Street SE Calgary, Alberta Canada T2H 2K1
Tel (403) 253-7121 Fax (403) 252-9363 www.hydroqual.ca

Transmittal

For the third test, various concentrations of ferric chloride were added to the sample in order to generate the treatments (Fe^{3+}). The following amounts were added to 20L:

<u>Treatment</u>	<u>Ferric chloride</u>
1 mg Fe/L	0.058 g
3 mg Fe/L	0.174 g
10 mg Fe/L	0.581 g
30 mg Fe/L	1.74 g
100 mg Fe/L	5.81 g

The LC_{50} for iron in the sample was 49 mg Fe/L. There is very little data available for the toxicity of iron on rainbow trout. Two reference toxicant tests were conducted by HydroQual and the LC_{50} values were 17 and 23 mg Fe/L. Iron was less toxic to rainbow trout in the sample (S-1) than in laboratory dilution water.



#3, 6125 12th Street SE Calgary, Alberta Canada T2H 2K1
Tel (403) 253-7121 Fax (403) 252-9363 www.hydroqual.ca

Test Report

Client: GAL100	Sample: 20040855

Client

Client: Golder Associates Ltd.
Address: 1796 Courtwood Cres.
City: Ottawa
Country: Canada
Billing: 03-1120-718 / 5010
Tel: 613-224-5864

Operation: Ottawa

Prov./State: Ontario
Postal/ZIP Code: K2C 2B5
Contact: Marie Gauthier
Fax: 613-224-9928

Sample

SW6 (no pH control)

type: water; grab sample; Sample ID: S-1; Casselman

collected: 2004/08/20 at PM by T. Clark

shipped: 2004/08/20 by Manitoulin Transport

received: 2004/08/23 at not given by J. Douglas

signed-in by: J. Douglas

container: 10 x 20L carboys

seals: none initials no frozen no

storage: 4 ± 2 °C in darkness initial temperature (°C) not done

Samples are disposed following Supporting Work Instruction 4.3.1.4.3

Physical and Chemical Measurements at Sample Receipt

lab code	-1
client code	S-1

water/effluent/pore water

pH	7.7
EC (uS/cm)	1464
DO (mg/L)	5.0
temp (°C)	17
alkalinity	not done
hardness	492
NH4 (mg/L)	not done
TRC (mg/L)	not done
colour	orange/yellow
odour	odourless

soil/sediment

moisture (%)	na
sand:silt:clay	na
TOC (%)	na

Test Log

pH Adjusted Fe Adjusted

type	TR-D	TR-D	TR-D	DA-S
number	20042534	20042535	20042536	20042537
started	2004/08/26	2004/08/26	2004/09/30	2004/08/24
ended	2004/08/30	2004/08/30	2004/10/04	2004/08/26
reported	2004/09/28	2004/09/28	2004/10/05	2004/09/28
faxed	na	na	na	2004/08/26

Notes: D, definitive; S, single treatment; EC, electrical conductivity; DO, dissolved oxygen; TRC, total residual chlorine;
TOC, total organic carbon; na, not applicable

Test Report

Client: GAL100	Sample: 20040855	Test: 20042534

Method Trout 96h Static Acute Test (five treatments plus a control) (HQ 4.4.4.1)
Reference: Biological Test method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13. (amended 1996 and 2000)

Client: Golder Associates Ltd.

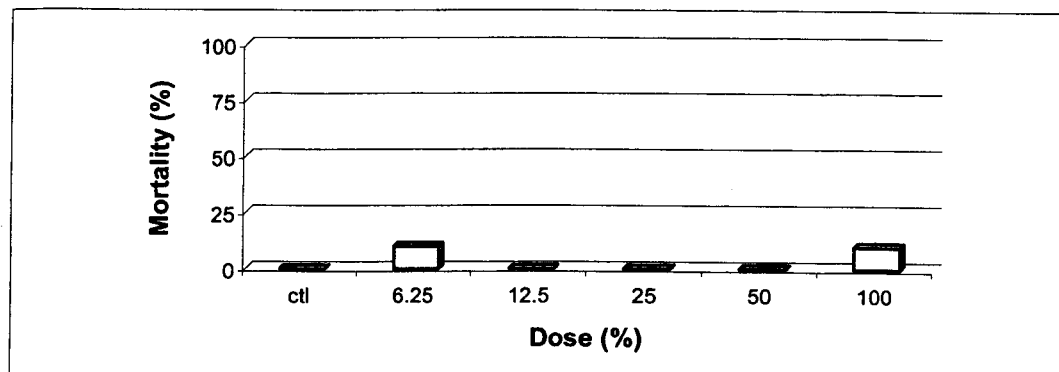
Sample:
 description: water; grab sample; Sample ID: S-1; Casselman
 collected: 2004/08/20 at PM by T. Clark
 received: 2004/08/23 at not given by J. Douglas

Test:
 started: 2004/08/26 at 1330 by A. Lung/J. Douglas
 ended: 2004/08/30 at 1330 by B. Crago/J. Douglas
 reported: 2004/09/28 by B. Armit

Result:

Endpoint	Value (%)	Confidence Limits (95%)		Method Calculated
		lower	upper	
LC50	>100			estimated
LC25	>100			estimated
NOEC	100			estimated
LOEC	>100			estimated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population
 NOEC, highest concentration tested that had no significant observed effect
 LOEC, lowest concentration tested that had an observed significant effect



Test Report

Test Data

Client:	GAL100	Sample:	20040855	Test:	20042534

Day	Time	Technician	Comment/Observation
0	1330	A. Lung/J. Douglas	test fish loaded at 1345 h
1	1210	A. Lung/J. Douglas	all test fish appear normal
2	1120	A. Lung/S. Goudey	all test fish appear normal
3	1120	A. Lung/S. Goudey	all test fish appear normal
4	1330	B. Crago/J. Douglas	all test fish appear normal

 Preaeration (6.5 mL/min/L)
 DO (mg/L)

0.5	1.0	1.5	2.0 (h)
7.8			

Dose(%)	ctl	6.25	12.5	25	50	100		

day	pH (units)								
0	8.0	8.0	8.0	8.0	7.9	8.0			
1	8.1	8.2	8.2	8.3	8.4	8.2			
2	8.0	8.1	8.2	8.3	8.4	8.2			
3	8.1	8.1	8.2	8.3	8.4	8.2			
4	8.0	8.1	8.1	8.3	8.4	8.3			

	EC (uS/cm)								
0	350	406	506	657	939	1492			
1	355	429	501	653	922	1415			
2	358	432	500	653	900	1336			
3	361	432	543	651	891	1273			
4	367	430	508	659	921	1239			

	DO (mg/L)								
0	8.7	8.6	8.6	8.4	8.1	7.8			
1	8.8	8.7	8.6	8.7	8.7	8.4			
2	8.8	8.6	8.6	8.7	8.7	8.6			
3	8.7	8.8	8.6	8.6	8.5	8.6			
4	8.5	8.6	8.7	8.7	8.8	8.7			

	Temperature (°C)								
0	15	15	15	15	16	16			
1	16	15	15	15	15	15			
2	16	16	15	15	16	16			
3	16	16	16	16	16	16			
4	16	16	16	16	16	16			

	Number Alive								
0	10	10	10	10	10	10			
1	10	10	10	10	10	9			
2	10	10	10	10	10	9			
3	10	10	10	10	10	9			
4	10	9	10	10	10	9			

	Mortality (%)								
	0	10	0	0	0	10			

Test Report

Test Data

Client:	GAL100	Sample:	20040855	Test:	20042534

Control Fish	Length (cm)	Weight (g)	Dose (%)	Group Weight (g)	Ammonium (mg NH ₄ ⁺ -N/L)	
					initial	final
1	4.0	0.5	ctl	5.4	na	na
2	4.2	0.6	6.25	4.5	na	na
3	3.8	0.4	12.5	5.9		
4	4.5	0.8	25	4.6		
5	3.7	0.4	50	5.4		
6	3.9	0.5	100	6.0		
7	3.9	0.5				
8	4.0	0.5				
9	4.1	0.6				
10	4.0	0.5				
average	4.0	0.5				
sd	0.2	0.1				
cv(%)	5.6	18.4				

Test Information

 organism: *Oncorhynchus mykiss* from Ackenberry Trout Farms

age and condition: The fish were held 13 days before testing (batch 20040813TR).

Conditions

The tests were conducted in 22 L plastic pails with polyethylene liners. The test volume was 20 L and there was one replicate per treatment. There were ten fish per replicate (loading density of <0.5 g per litre). All treatments aerated at 6.5 mL/min/L. The sample was not pH adjusted. Mortality of fish 7 days before test <2%.

Comments

Test fish were held less than 14 days prior to testing.

Notes: EC, electrical conductivity; DO, dissolved oxygen; nd, not done; na, not applicable; sd, standard deviation; cv(%), coefficient of variance

The test data and results are verified correct.


 Authorized by: K. Steele, B.Sc., Quality Assurance Officer

Test Report

Client: GAL100	Sample: 20040855	Test: 20042535

Method Trout 96h Static Acute Test (five treatments plus a control) (HQ 4.4.4.1)
Reference: Biological Test method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13. (amended 1996 and 2000)

Client: Golder Associates Ltd.

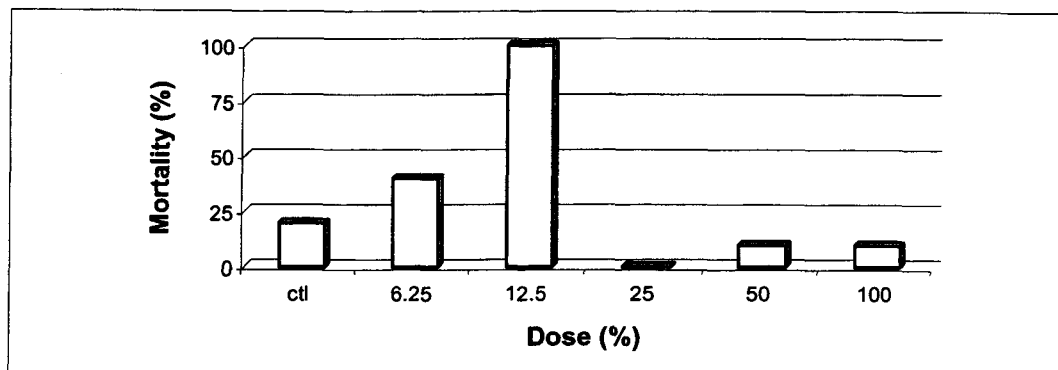
Sample: pH Adjusted *SW6 - with pH adjustment*
 description: water; grab sample; Sample ID: S-1; Casselman
 collected: 2004/08/20 at PM by T. Clark
 received: 2004/08/23 at not given by J. Douglas

Test:
 started: 2004/08/26 at 1330 by A. Lung/J. Douglas
 ended: 2004/08/30 at 1330 by B. Crago/J. Douglas
 reported: 2004/09/28 by B. Armit

Result:

Endpoint	Value (%)	Confidence Limits (95%) lower upper	Method Calculated
LC50	>100		estimated
LC25	>100		estimated
NOEC	100		estimated
LOEC	>100		estimated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population
 NOEC, highest concentration tested that had no significant observed effect
 LOEC, lowest concentration tested that had an observed significant effect



Test Report

Test Data

Client:	GAL100	Sample:	20040855	Test:	20042535

Day	Time	Technician	Comment/Observation
0	1330	A. Lung/J. Douglas	test fish loaded at 1345 h
1	1210	A. Lung/J. Douglas	all test fish appear normal
2	1120	A. Lung/S. Goudey	all test fish appear normal
3	1120	A. Lung/S. Goudey	all test fish appear normal
4	1330	B. Crago/J. Douglas	all test fish appear normal

 Preaeration (6.5 mL/min/L)
 DO (mg/L)

0.5	1.0	1.5	2.0 (h)
7.6			

Dose(%)	ctl	6.25	12.5	25	50	100		

day	pH (units)							
0	7.7	7.6	7.6	7.7	7.7	7.8		
1	7.6	7.5	7.4	7.7	7.8	7.7		
2	8.1	7.4		7.4	7.3	7.4		
3	8.2	7.4		7.3	7.3	7.4		
4	8.1	7.5		7.3	7.2	7.4		

	EC (uS/cm)							
0	345	420	506	660	948	1500		
1	355	437	512	657	940	1481		
2	350	422		657	947	1783		
3	347	443		656	941	1482		
4	343	440		660	953	1494		

	DO (mg/L)							
0	8.6	8.5	8.4	8.4	8.3	7.6		
1	8.8	8.8	8.8	8.8	8.7	8.0		
2	8.7	8.6		8.6	8.6	8.3		
3	8.8	8.7		8.6	8.7	8.4		
4	8.7	9.0		9.0	8.9	8.6		

	Temperature (°C)							
0	16	16	16	16	16	16		
1	16	15	15	15	15	16		
2	16	15		16	15	16		
3	16	16		16	16	16		
4	16	16		16	16	16		

0	10	10	10	10	10	10		
1	10	10	0	10	10	9		
2	9	9	0	10	10	9		
3	8	8	0	10	9	9		
4	8	8	0	10	9	9		

Mortality (%)								
20	20	100	0	10	10			



Test Report

Test Data

Client:	GAL100	Sample:	20040855	Test:	20042535

Control Fish	Length (cm)	Weight (g)	Dose (%)	Group Weight (g)	Ammonium (mg NH ₄ ⁺ -N/L)	
					initial	day 1
1	4.1	0.7	ctl	4.1	0.1	0.1
2	4.2	0.6	6.25	3.5	na	2.2
3	4.0	0.6	12.5	6.3	17	16
4	3.8	0.6	25	5.4		
5	3.7	0.4	50	4.2		
6	3.5	0.3	100	5.0		
7	4.0	0.5				
8	3.4	0.3				
9						
10						
average	3.8	0.5				
sd	0.3	0.1				
cv(%)	7.5	27.4				

Test Information

organism: *Oncorhynchus mykiss* from Ackenberry Trout Farms

age and condition: The fish were held 13 days before testing (batch 20040813TR).

Conditions

The tests were conducted in 22 L plastic pails with polyethylene liners. The test volume was 20 L and there was one replicate per treatment. There were ten fish per replicate (loading density of <0.5 g per litre). All treatments aerated at 6.5 mL/min/L.

Mortality of fish 7 days before test <2%.

Sample was pH adjusted with CO₂.

Comments

Test is invalid due to greater than 10% mortality in the control.

Test fish were held less than 14 days prior to testing.

Only eight control fish were weighed due to mortality.

Notes: EC, electrical conductivity; DO, dissolved oxygen; nd, not done; na, not applicable; sd, standard deviation; cv(%), coefficient of variance

The test data and results are verified correct.


Authorized by: K. Steele, B.Sc., Quality Assurance Officer

Test Report

Client: GAL100	Sample: 20040855	Test: 20042536

Method Trout 96h Static Acute Test (five treatments plus a control) (HQ 4.4.4.1)
Reference: Biological Test method: Acute Lethality Test Using Rainbow Trout, 1990
 Environment Canada, EPS 1/RM/9.

Client: Golder Associates Ltd.

Additional testing for iron

Sample: Fe Adjusted

description: water; grab sample; Sample ID: S-1; Casselman

collected: 2004/08/20 at PM by T. Clark
 received: 2004/08/23 at not given by J. Douglas

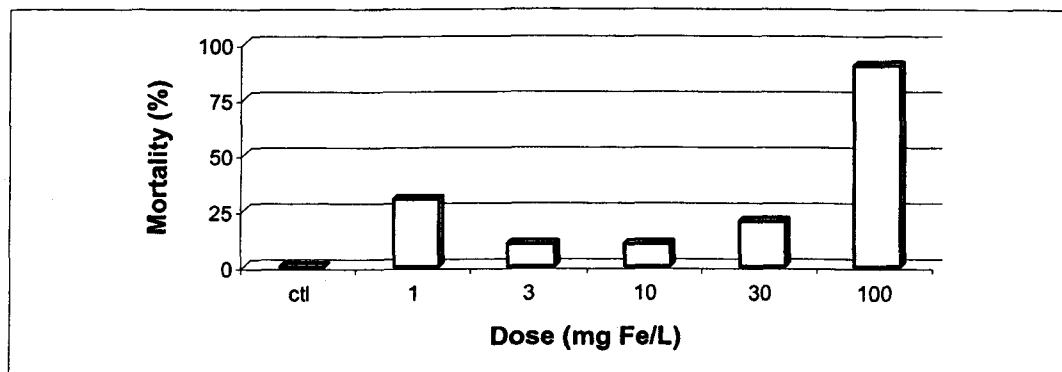
Test:

started: 2004/09/30 at 1400 by K. Steele/K. de Windt
 ended: 2004/10/04 at 1400 by K. de Windt/J. Vaughan
 reported: 2004/10/05 by B. Armit

Result:

Endpoint	Value (mg Fe/L)	Confidence Limits (95%) lower upper	Method Calculated
LC50	49	could not be calculated	Binomial
LC25	35	could not be calculated	Linear Interpolation
NOEC	30		estimated
LOEC	100		estimated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population
 NOEC, highest concentration tested that had no significant observed effect
 LOEC, lowest concentration tested that had an observed significant effect





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Test Report

Test Data

Client:	GAL100	Sample:	20040855	Test:	20042536

Day	Time	Technician	Comment/Observation
0	1400	K. Steele/K. de Windt	test fish loaded at 1450 h
1	1230	K. Steele/K. de Windt	all test fish appear normal
2	0900	K. Steele/A. Gratteri	all test fish appear normal
3	0900	K. Steele/A. Gratteri	all test fish appear normal
4	1400	K. de Windt/J. Vaughan	all test fish appear normal

Preaeration (6.5 mL/min/L)
DO (mg/L)

0.5	1.0	1.5	2.0 (h)
nd			

Dose(mg Fe/L)	ctl	1	3	10	30	100		

day

pH (units)

0	nd	nd	nd	nd	nd	nd		
1	nd	nd	nd	nd	nd	nd		
2	nd	nd	nd	nd	nd	nd		
3	nd	nd	nd	nd	nd	nd		
4	nd	nd	nd	nd	nd	nd		

EC (uS/cm)

0	nd	nd	nd	nd	nd	nd		
1	nd	nd	nd	nd	nd	nd		
2	nd	nd	nd	nd	nd	nd		
3	nd	nd	nd	nd	nd	nd		
4	nd	nd	nd	nd	nd	nd		

DO (mg/L)

0	nd	nd	nd	nd	nd	nd		
1	nd	nd	nd	nd	nd	nd		
2	nd	nd	nd	nd	nd	nd		
3	nd	nd	nd	nd	nd	nd		
4	nd	nd	nd	nd	nd	nd		

Temperature (°C)

0	nd	nd	nd	nd	nd	nd		
1	nd	nd	nd	nd	nd	nd		
2	nd	nd	nd	nd	nd	nd		
3	nd	nd	nd	nd	nd	nd		
4	nd	nd	nd	nd	nd	nd		

0	10	10	10	10	10	10		
1	10	10	10	10	7	1		
2	10	8	9	10	7	1		
3	10	8	9	10	7	1		
4	10	7	9	9	8	1		

Mortality (%)

0	30	10	10	20	90		



Test Report

Test Data

Client:	GAL100	Sample:	20040855	Test:	20042536

Control Fish	Length (cm)	Weight (g)	Dose (mg Fe/L)	Group Weight (g)	Number Weighed	Ammonium (mg NH ₄ ⁺ -N/L)		
						control	initial	final
1	3.3	0.3	ctl	2.5	10	100 mg Fe/L	0.4	nd
2	3.4	0.3	1	1.6	7		0.4	nd
3	2.8	0.2	3	2.5	9			
4	3.3	0.3	10	2.1	9			
5	3.1	0.3	30	2.2	8			
6	3.1	0.3	100	0.2	1			
7	3.0	0.2						
8	3.2	0.2						
9	2.9	0.2						
10	3.2	0.3						
average	3.1	0.2						
sd	0.2	0.0						
cv(%)	6.0	18.8						

Test Information

organism: *Oncorhynchus mykiss* from Ackenberry Trout Farms

age and condition: The fish were held 1 days before testing (batch 20040929TR).

Conditions

The tests were conducted in 22 L plastic pails with polyethylene liners. The test volume was 20 L and there was one replicate per treatment. There were ten fish per replicate (loading density of <0.5 g per litre). All treatments aerated at 6.5 mL/min/L.

Mortality of fish 7 days before test <2%.

Comments

Sample was spiked with various concentrations of ferric chloride to produce the treatments (100, 30, 10, 3, 1 mg Fe/L).

Test fish were held less than 14 days prior to testing.

Some dead fish were too deformed to weigh.

Notes: EC, electrical conductivity; DO, dissolved oxygen; nd, not done; na, not applicable; sd, standard deviation; cv(%), coefficient of variance

The test data and results are verified correct.

Authorized by: K. Steele, B.Sc., Quality Assurance Officer



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Test Report

Client: GAL100	Sample: 20040855	Test: 20042537

Method *Daphnia* 48h Static Acute Test (undiluted sample plus a control) (HQ 4.4.3.1)
Reference: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*, 1990. Environ. Can., EPS 1/RM/14. (amended 1996 and 2000)

Client: Golder Associates Ltd.

Sample:

description: water; grab sample; Sample ID: S-1; Casselman

collected: 2004/08/20 at PM by T. Clark
received: 2004/08/23 at not given by J. Douglas

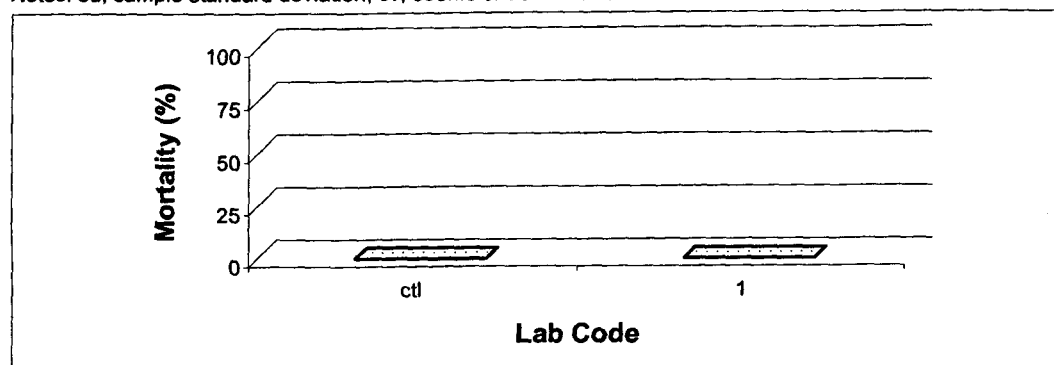
Test:

started: 2004/08/24 at 1330 by B. Crago
ended: 2004/08/26 at 1345 by I. Carleton-Dodds/J. Douglas
reported: 2004/09/28 by B. Armit

Result:

Lab Code	Client Code	Mortality (%)			Comment
		mean	sd	cv(%)	
1	lab control	0	0	0	not toxic as tested
	S-1	0	0	0	

Notes: sd, sample standard deviation; cv, coefficient of variance



Test Report

Test Data

Client:	GAL100	Sample:	20040855	Test:	20042537

Day	Time	Technician	Comment/Observation
0	1330	B. Crago	Test <i>Daphnia</i> appear normal.
1	1000	A. Lung	Test <i>Daphnia</i> appear normal.
2	1345	I. Carleton-Dodds/J. Douglas	Test <i>Daphnia</i> appear normal.

lab code	ctl	1						

day	pH (units)							
0	8.2	7.9						
1								
2	8.4	8.3						

	EC (uS/cm)							
0	364	1451						
1								
2	441	1211						

	DO (mg/L)							
0	8.2	7.8						
1								
2	7.8	7.5						

	Temperature (°C)							
0	19	22						
1								
2	20	20						

replicate	Number Alive - day 1 (F, floating; I, immobile; B, stuck on bubble; D, caught in debris)							
a	10	10						
b	10	10						
c	10	10						
	Number Alive - day 2							
a	10	10						
b	10	10						
c	10	10						

Comments: organism: <24 h old *Daphnia magna* from in-house cultures from culture jar: D3
 Cultures time to first brood (d): 10 brood size (neonates per brood): 17
 No adjustments were made to sample pH and hardness before testing. The sample was not aerated before testing. Lab dilution water hardness was (mg CaCO₃/L): 162 water pail: B
 The test was conducted in 385 mL plastic vessels containing 150 mL of test solution and ten daphnids (loading density of 15 mL per daphnid or neonate).
 There were no protocol deviations during the conduct of this test.

Notes: EC, electrical conductivity; DO, dissolved oxygen; nd, not done; na, not applicable

The test data and results are verified correct.


 Authorized by: K. Steele, B.Sc., Quality Assurance Officer

Quality Assurance Information

Test Method: Trout 96h Static Acute Test. (LC50, five or more treatments plus a control)
 HydroQual Test Method Manual, section: 4.4.4.1

Reference: Biological Test Method: Reference Method for Determining Acute Lethality of
 Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13.
 including May 1996 and December 2000 amendments.

Test Organism		Test Design	
test species	<i>Oncorhynchus mykiss</i>	vol. of test vessel (L)	22
culture source	Spring Valley Trout Farms	test volume depth	>15 cm
temperature (°C)	15 ± 1	replicates per treatment	1
dissolved oxygen	saturated	fingerlings per replicate	10
stock mortality (last 7d)	<2%	loading (g fish/L)	<0.5
batch number	20040828TR	temperature (°C)	15 ± 1
		photoperiod	16h light: 8h dark
		light level (water surface)	100-500 lux
		control/dilution water	dechlorinated tap water

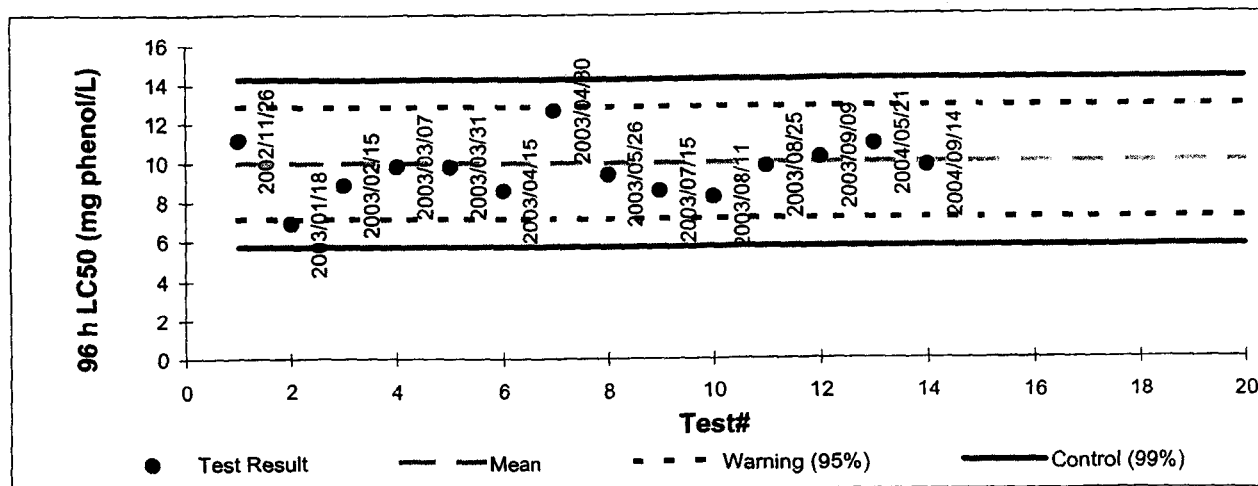
Quality Assurance Unit:

The test data and result are verified correct.

K. Steele 2004/09/14
 Authorized by K. Steele

Warning Chart (mortality LC50 at 96 h)

Toxicant:	Phenol (C ₆ H ₅ OH)
Current Test:	started: 2004/09/10 ended: 2004/09/14
Result (96 h LC50):	9.8 (8.5-11.2) mg/L
Historical Mean:	10.0 std.dev: 1.4
Chart Limits:	warning: 7.1 12.8 control: 5.7 14.3
	95%, two standard deviations 99%, three standard deviations





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Quality Assurance Information

Test Method: Trout 96h Static Acute Test. (LC50, five or more treatments plus a control)
HydroQual Test Method Manual, section: 4.4.4.1

Reference: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13. including May 1996 and December 2000 amendments.

Test Organism		Test Design	
test species	<i>Oncorhynchus mykiss</i>	vol. of test vessel (L)	22
culture source	Ackenberry Trout Farms	test volume depth	>15 cm
temperature (°C)	15 ± 1	replicates per treatment	1
dissolved oxygen	saturated	fingerlings per replicate	10
stock mortality (last 7d)	<2%	loading (g fish/L)	<0.5
batch number	20040929TR	temperature (°C)	15 ± 1
		photoperiod	16h light: 8h dark
		light level (water surface)	100-500 lux
		control/dilution water	dechlorinated tap water

Quality Assurance Unit:

The test data and result are verified correct.

K. Steele 2004/10/19
Authorized by: K. Steele

Warning Chart (mortality LC50 at 96 h)

Toxicant: Phenol (C₆H₅OH)

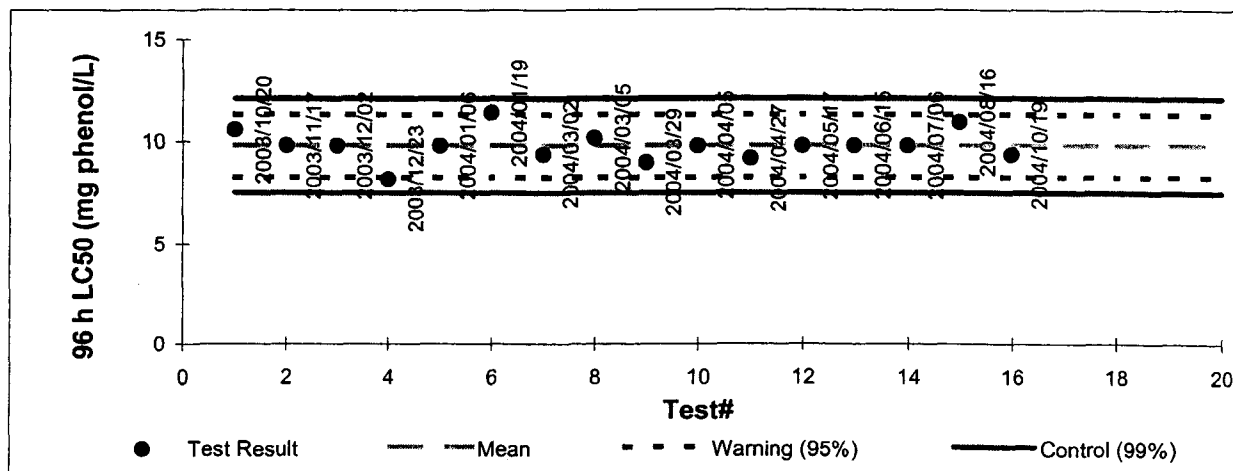
Current Test: started: 2004/10/15 ended: 2004/10/19

Result (96 h LC50): 9.4 could not be calc. mg/L 95% confidence limits are in brackets

Historical Mean: 9.8 **std.dev:** 0.8 **CV(%):** 8

Chart Limits: **warning:** 8.3 11.3 **control:** 7.5 12.1

95% , two standard deviations 99% , three standard deviations



Quality Assurance Information

Test Method: *Daphnia* Static Acute Test (LC50, five or more treatments plus a control)
 HydroQual Test Method Manual, section: 4.4.3.1

Reference: Biological Test Method: Reference Method for Determining the Acute Lethality of Effluents to *Daphnia magna*, 1990. Environment Canada, EPS 1/RM/14. including May 1996 and December 2000 amendments.

Test Organism		Test Design	
test species	<i>Daphnia magna</i>	vol. of test vessel (mL)	500
culture source	in-house	toxicant	sodium chloride
original culture source	Environment Canada	test volume (mL)	150
days to first brood	11	replicates per treatment	1
mean brood size	21	neonates per replicate	10
ephippia in stock culture	no	volume per neonate (mL)	15
age of test organisms	<24 hours old	samples preaerated	no
		hardness adjustment	no
		temperature (°C)	20
		photoperiod	16h light:8h dark
		light level (water surface)	400-800 lux
		control/dilution water	dechlorinated tap water

Quality Assurance Unit:

The test data and result are verified correct.

Authorized by K. Steele

Warning Chart (mortality LC50 at 48 h)

Toxicant: Sodium Chloride (NaCl)

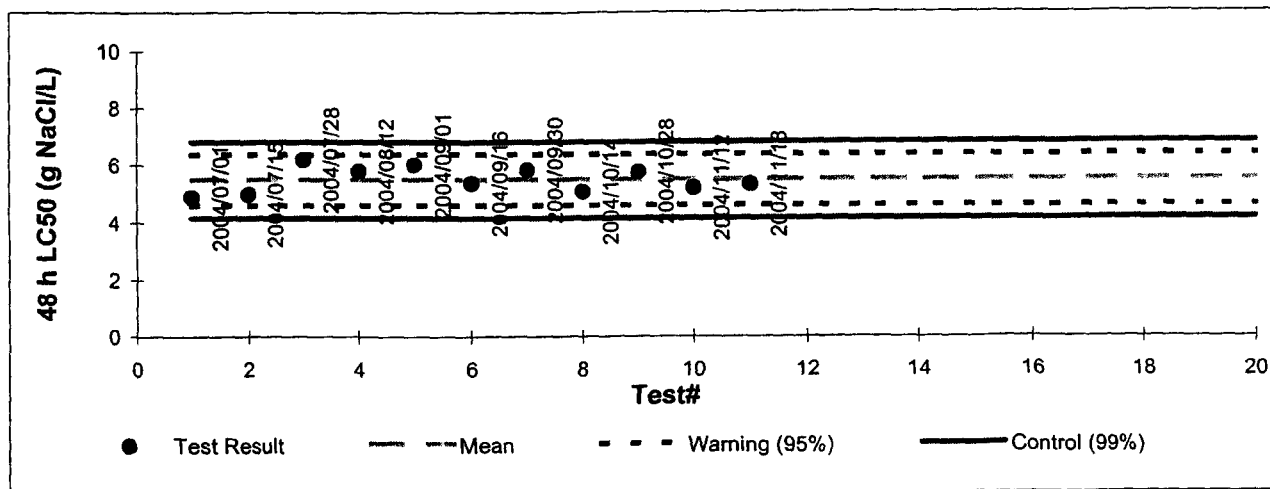
Current Test: started : 2004/11/16 ended: 2004/11/18

Result (48 h LC50): 5.3 (4.7-6.0) g NaCl/L 95% confidence limits are in brackets

Historical Mean: 5.5 std. dev: 0.4 cv (%): 8

Chart Limits: warning: 4.6 6.4 control: 4.2 6.8

95% , two standard deviations 99% , three standard deviations

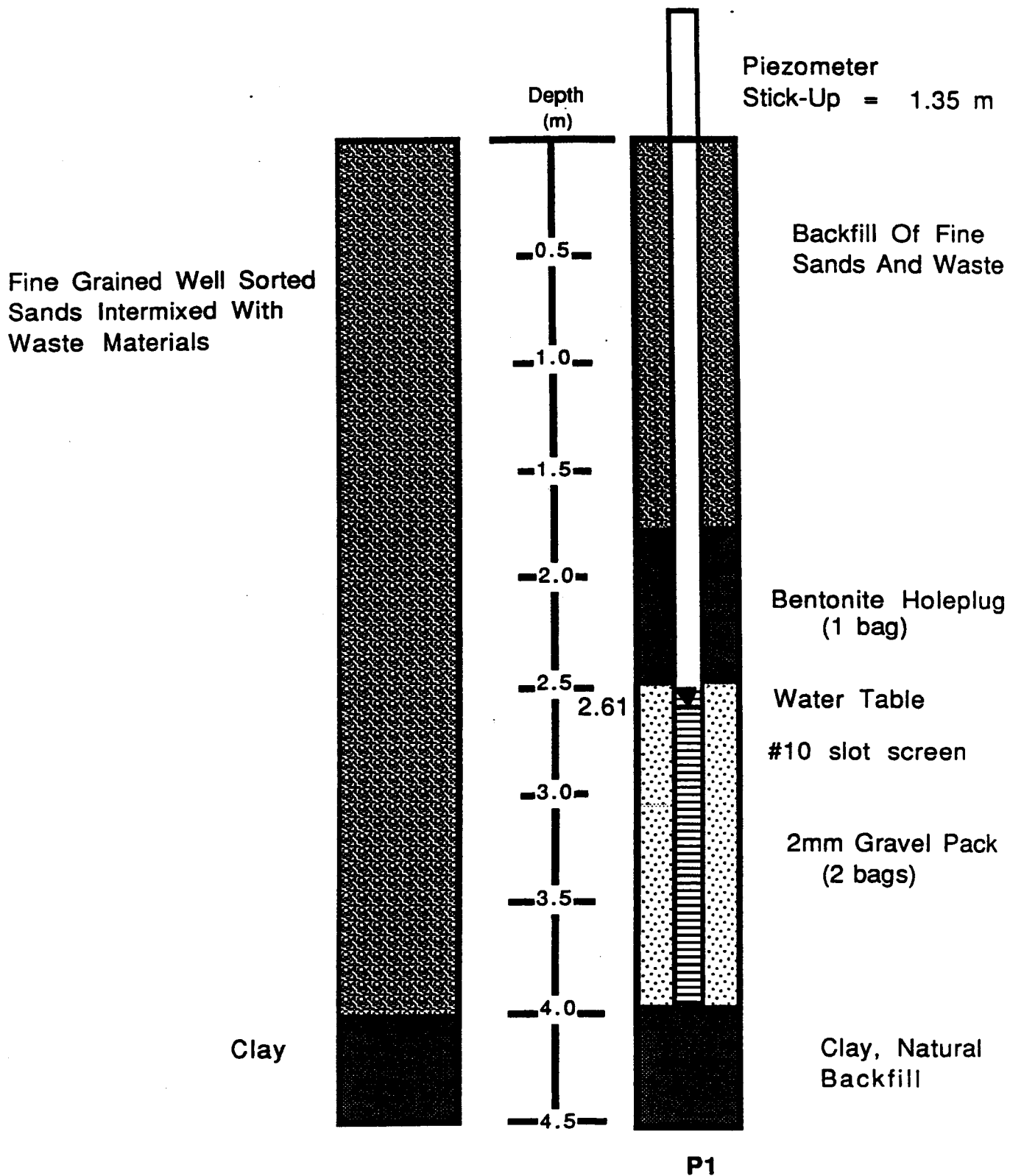


APPENDIX E

RECORD OF BOREHOLES

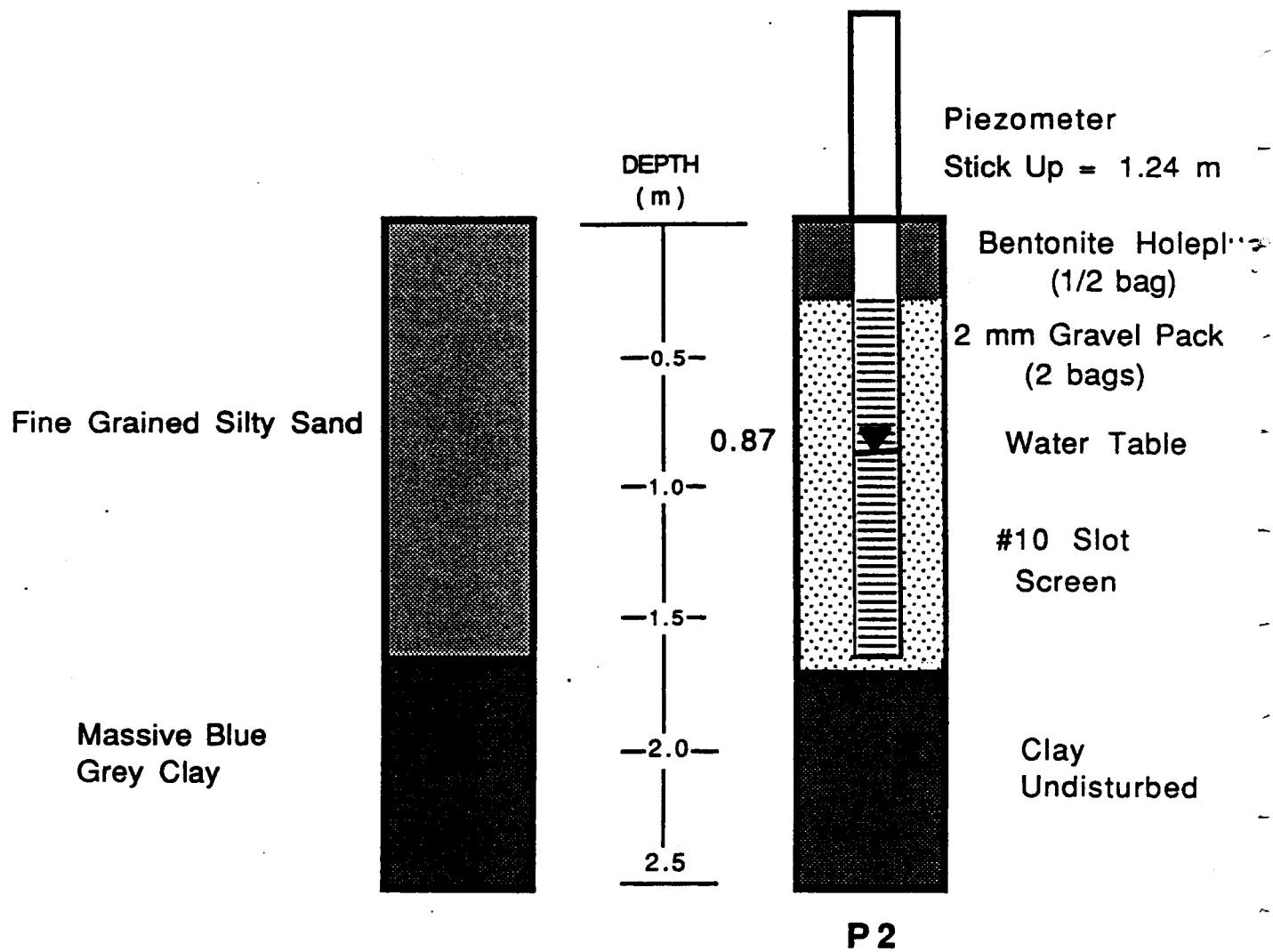
WELL LOG AND PIEZOMETER CONSTRUCTION DETAIL

CAMBRIDGE TOWNSHIP P1



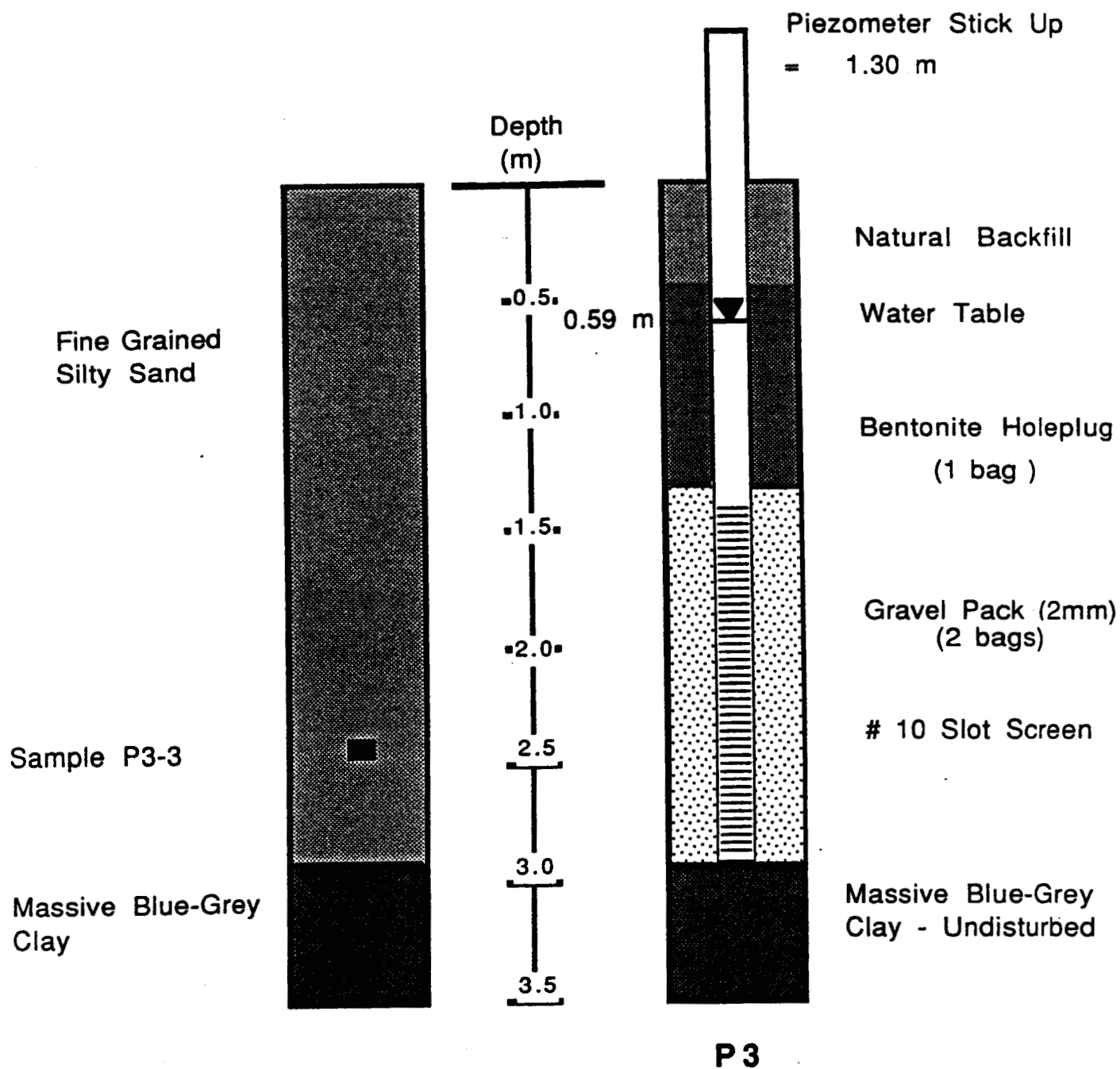
WELL LOG AND PIEZOMETER CONSTRUCTION DETAIL

CAMBRIDGE TOWNSHIP P2



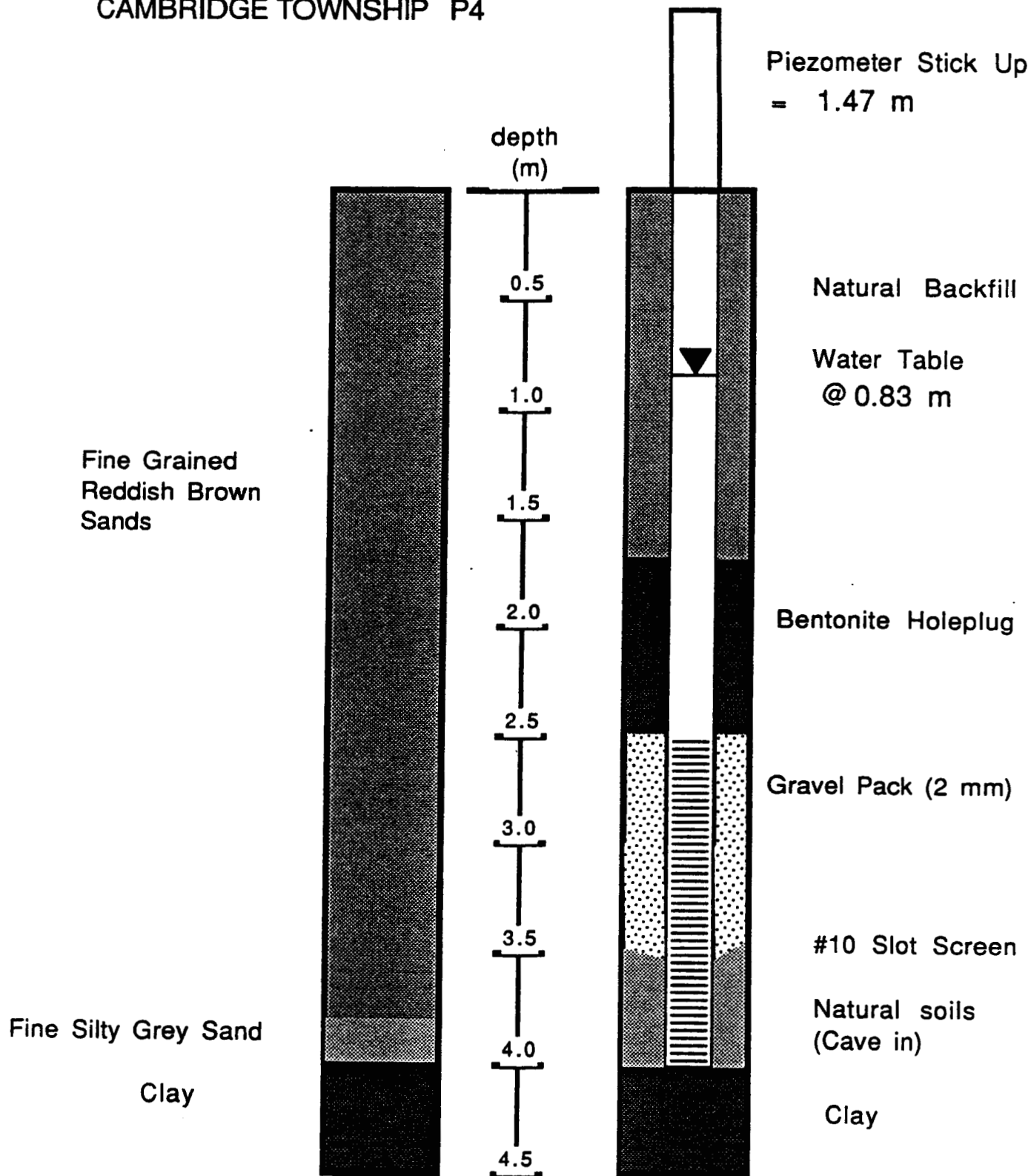
WELL LOG AND PIEZOMETER CONSTRUCTION DETAIL

CAMBRIDGE TOWNSHIP P3



WELL LOG AND PIEZOMETER CONSTRUCTION DETAIL

CAMBRIDGE TOWNSHIP P4



P4



BEATTY FRANZ &
ASSOCIATES

Observation Well BH1

PROJECT: CASSELMAN LANDFILL

PROJECT NO.: 147-961

DATE STARTED: NOVEMBER 15, 1996

DATE FINISHED: NOVEMBER 15, 1996

DRILLING METHOD: HOLLOW STEM AUGER

DRILLING COMPANY: DOWNING

LOCATION: CASSELMAN ONTARIO

GROUND SURFACE ELEVATION: 64.02 M.A.S.L.

TOC ELEVATION: 64.726 M.A.S.L.

WATER LEVEL: 62.796 M.A.S.L. (18-NOV-96)

TOTAL DEPTH: 3.81 metres

LOGGED BY: D.B.

DEPTH metres	ELEVATION	SAMPLE NO.	Sample Interval	HNU (ppm)		GRAPHIC LOG	GEOLOGIC DESCRIPTION	WELL DIAGRAM
				VALUES	PROFILE			
0.4	64	SS-1					LANDFILL WASTE.	
1	63.5							
	63	SS-2					Box spring pulled up in auger.	
2	62.5							
	62	SS-3						
	61.5						SILTY SAND, grey-green, wet.	
3	61							
	60.5	SS-5					SILTY CLAY, strong odour, saturated.	
4	60						END OF HOLE	
5	59.5							
6	59							
	58.5							
	58							

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by Beatty Franz and Associates personnel before use by others.



BEATTY FRANZ &
ASSOCIATES

Observation Well BH2 (I)

PROJECT: CASSELMAN LANDFILL

LOCATION: CASSELMAN ONTARIO

PROJECT NO.: 147-961

GROUND SURFACE ELEVATION: 63.71 M.A.S.L.

DATE STARTED: NOVEMBER 16, 1996

TOC ELEVATION: 64.567 M.A.S.L.

DATE FINISHED: NOVEMBER 16, 1996

WATER LEVEL: 64.187 M.A.S.L. (18-NOV-96)

DRILLING METHOD: HOLLOW STEM AUGER

TOTAL DEPTH: 3.81 metres

DRILLING COMPANY: DOWNING

LOGGED BY: D.B.

DEPTH metres	ELEVATION	SAMPLE NO.	Sample Interval	HNU (ppm)		GRAPHIC LOG	GEOLOGIC DESCRIPTION	WELL DIAGRAM
				VALUES	PROFILE			
63.5		SS-1					SILTY SAND, moist, light brown.	
63							Moist to wet.	
62.5		SS-2						
62							Wet	
61.5		SS-3						
61		SS-4					SILTY CLAY, wet, light grey.	
60.5								
60		SS-5						
59.5							END OF HOLE	
59								
58.5								
58								

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by Beatty Franz and Associates personnel before use by others.



BEATTY FRANZ &
ASSOCIATES

Observation Well BH2 (II)

PROJECT: CASSELMAN LANDFILL

PROJECT NO.: 147-961

DATE STARTED: NOVEMBER 16, 1996

DATE FINISHED: NOVEMBER 16, 1996

DRILLING METHOD: HOLLOW STEM AUGER

DRILLING COMPANY: DOWNING

LOCATION: CASSELMAN ONTARIO

GROUND SURFACE ELEVATION: 63.71 M.A.S.L.

TOC ELEVATION: 65.01 M.A.S.L.

WATER LEVEL: 63.35 M.A.S.L. (18-NOV-96)

TOTAL DEPTH: 1.97 metres

LOGGED BY: D.B.

DEPTH metres	ELEVATION	SAMPLE NO.	Sample Interval	HNU (ppm)		GRAPHIC LOG	GEOLOGIC DESCRIPTION	WELL DIAGRAM
				VALUES	PROFILE			
				0	100			
63.5		SS-1					SILTY SAND, light brown, moist.	
63							Moist to wet.	
62.5		SS-2						
62		SS-3						
61.5							SILTY CLAY	
61							END OF HOLE	
60.5								
60								
59.5								
59								
58.5								
58								

Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by Beatty Franz and Associates personnel before use by others.



BEATTY FRANZ &
ASSOCIATES

Observation Well BH3

PROJECT: CASSELMAN LANDFILL

LOCATION: CASSELMAN ONTARIO

PROJECT NO.: 147-961

GROUND SURFACE ELEVATION: 61.61 M.A.S.L.

DATE STARTED: NOVEMBER 16, 1996

TOC ELEVATION: 62.586 M.A.S.L.

DATE FINISHED: NOVEMBER 16, 1996

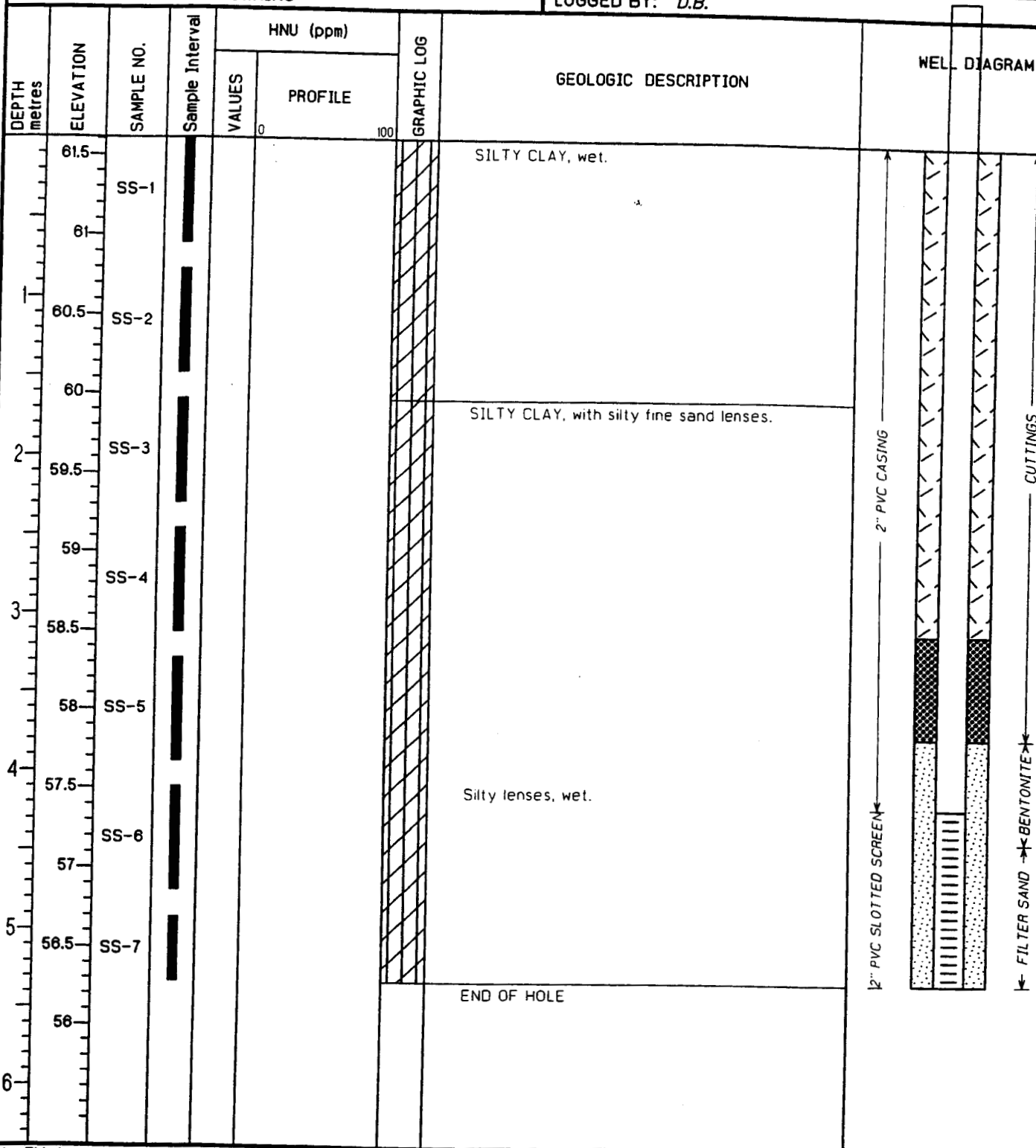
WATER LEVEL: 61.356 M.A.S.L. (18-NOV-96)

DRILLING METHOD: HOLLOW STEM AUGER

TOTAL DEPTH: 5.33 metres

DRILLING COMPANY: DOWNING

LOGGED BY: D.B.



Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by Beatty Franz and Associates personnel before use by others.



BEATTY FRANZ &
ASSOCIATES

Observation Well BH4

PROJECT: CASSELMAN LANDFILL

LOCATION: CASSELMAN ONTARIO

PROJECT NO.: 147-961

GROUND SURFACE ELEVATION: 64.67 M.A.S.L.

DATE STARTED: NOVEMBER 16, 1996

TOC ELEVATION: 65.623 M.A.S.L.

DATE FINISHED: NOVEMBER 16, 1996

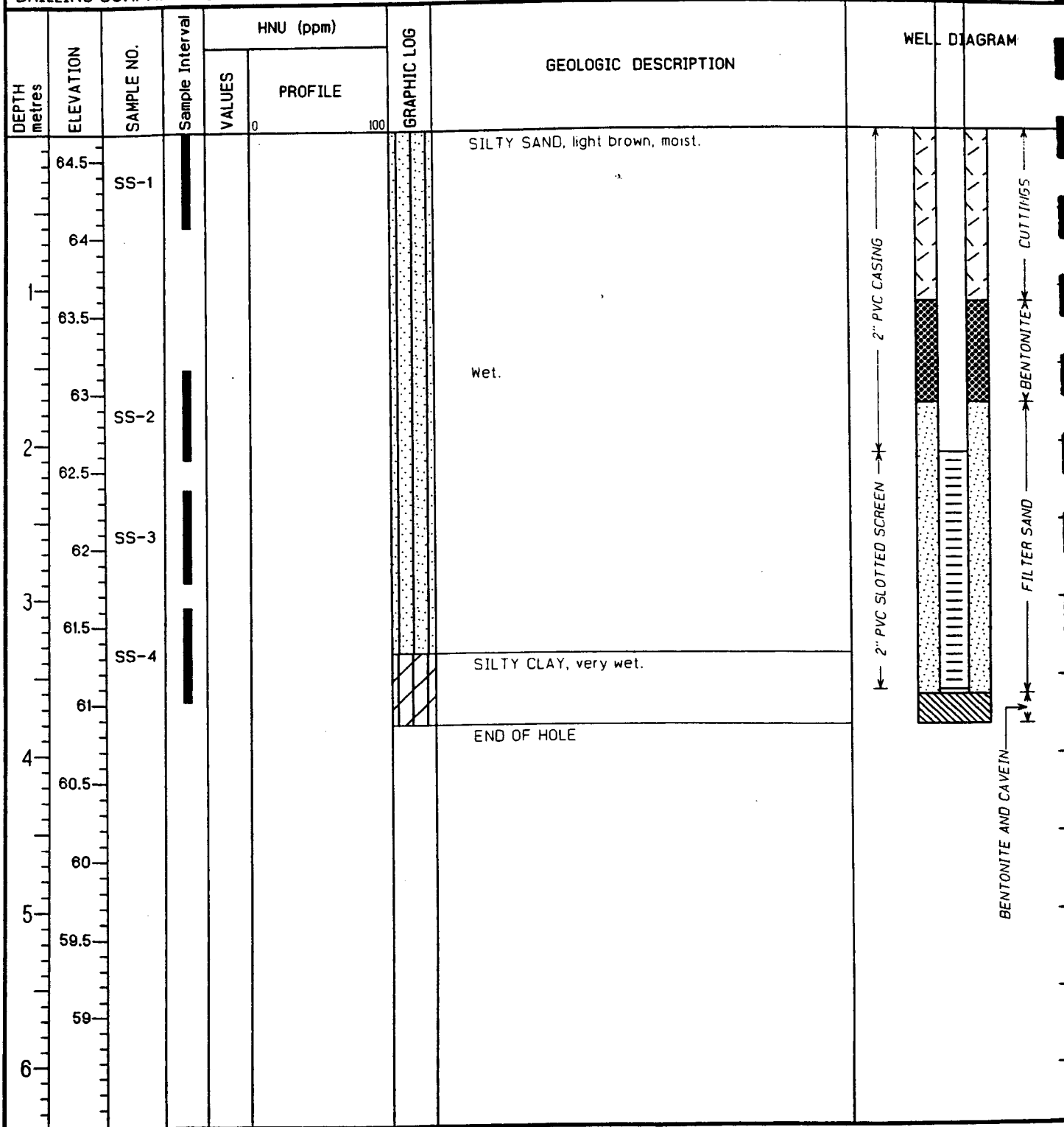
WATER LEVEL: 63.683 M.A.S.L. (18-NOV-96)

DRILLING METHOD: HOLLOW STEM AUGER

TOTAL DEPTH: 3.81 metres

DRILLING COMPANY: DOWNING

LOGGED BY: D.B.



Note: This borehole log was prepared for hydrogeological and/or environmental assessment purposes and does not necessarily contain information suitable for a geotechnical assessment of the subsurface conditions. Borehole data requires interpretation by Beatty Franz and Associates personnel before use by others.

LIST OF ABBREVIATIONS

The abbreviations commonly employed on Records of Boreholes, on figures and in the text of the report are as follows:

I SAMPLE TYPE

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Denison type sample
FS	Foil sample
RC	Rock core
SC	Soil core
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

II PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg. (140 lb.) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) drive open sampler for a distance of 300 mm (12 in.).

Dynamic Penetration Resistance; N_6 :

The number of blows by a 63.5 kg (140 lb.) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH:	Sampler advanced by hydraulic pressure
PM:	Sampler advanced by manual pressure
WH:	Sampler advanced by static weight of hammer
WR:	Sampler advanced by weight of sampler and rod

Piezo-Cone Penetration Test (CPT):

An electronic cone penetrometer with a 60° conical tip and a projected end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

III SOIL DESCRIPTION

(a) Cohesionless Soils

Density Index (Relative Density)	N Blows/300 mm or Blows/ft.
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

(b) Cohesive Soils

Consistency	c_u, s_u kPa	psf
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1,000
Stiff	50 to 100	1,000 to 2,000
Very stiff	100 to 200	2,000 to 4,000
Hard	over 200	over 4,000

IV. SOIL TESTS

w	water content
w_p	plastic limit
w_l	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test ¹
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement ¹
D_r	relative density (specific gravity, G_s)
DS	direct shear test
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO ₄	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V	field vane test (LV-laboratory vane test)
γ	unit weight

Note:

1. Tests which are anisotropically consolidated prior to shear are shown as CAD, CAU.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I GENERAL

π	= 3.1416
$\ln x$	natural logarithm of x
$\log_{10} x$ or $\log x$	logarithm of x to base 10
g	acceleration due to gravity
t	time
F	factor of safety
V	volume
W	weight

II STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta \sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
ν	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stresses (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress = $(\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight*)
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation
*	Density symbol is ρ . Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density $\times$ acceleration due to gravity)

(a) Index Properties (con't.)

w	water content
w_l	liquid limit
w_p	plastic limit
I_p	plasticity Index = $(w_l - w_p)$
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(c) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(d) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (overconsolidated range)
C_s	swelling index
C_α	coefficient of secondary consolidation
m_v	coefficient of volume change
c_v	coefficient of consolidation
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation pressure
OCR	Overconsolidation ratio = σ'_p / σ'_{vo}

(e) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = $\tan \delta$
c'	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p'	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1. $\tau = c' + \sigma' \tan \phi'$

2. Shear strength = (Compressive strength)/2

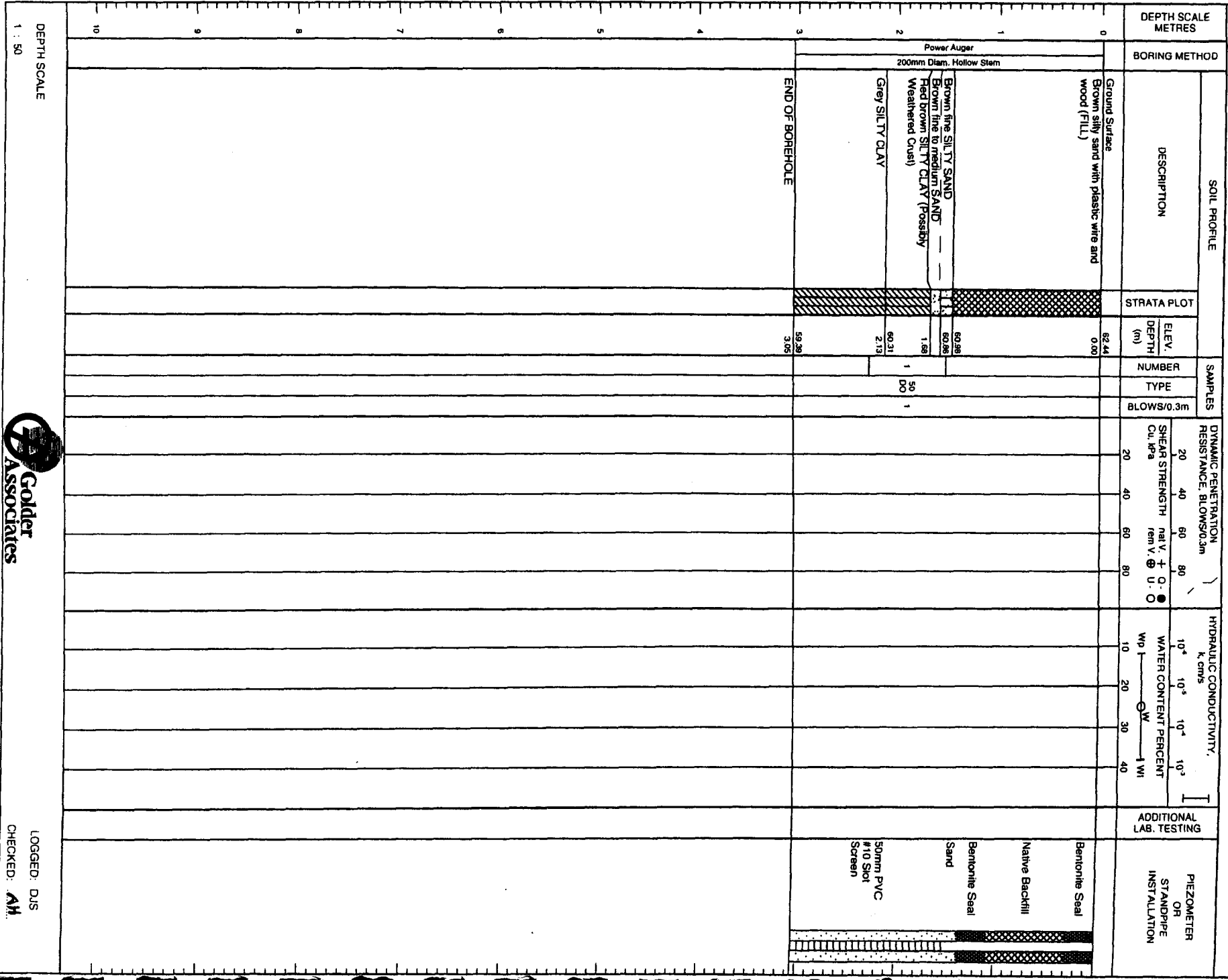
PROJECT: 991-2837
LOCATION: See Site Plan
SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: G 99-5

BORING DATE: May 4, 1999

SHEET 1 OF 1
DATUM: Geodetic
PENETRATION TEST HAMMER, 64kg; DROP, 760mm

BOREHOLE 991-2837.GPJ HYDROGEO.GDT 4 27 00



DEPTH SCALE
1 : 50



LOGGED: DJS
CHECKED: AH

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: May 4, 1999

DATUM: Geodetic

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

1 : 50

BOREHOLE 991-2837.GPJ HYDROGEO.GDT 4 27 00

PROJECT: 991-2837

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: G 99-7

SHEET 1 OF 1

BORING DATE: May 4, 1999

DATUM: Geodetic

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m		HYDRAULIC CONDUCTIVITY, k, cm/s		ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa	nat. V. rem. V. $\oplus$ $\ominus$ $\bullet$ $\circ$ U - $\circ$			WATER CONTENT PERCENT wp $\longleftarrow$ $\circ$ $\longrightarrow$ W
0	Power Auger 200mm Diam. Hollow Stem	Ground Surface		61.82								
1		Loose brown to grey fine SAND, some silt										
2												
3		Grey SILTY CLAY, occasional red brown layer		60.60 1.22	1	DO	4				100mm x 100mm Protective Casing Bentonite Seal	
4											Native Backfill	
5					2	DO	1				Sand	
6											50mm PVC #10 Slot Screen	
7		END OF BOREHOLE		58.02 3.20								
8												
9												
10												

DEPTH SCALE

1 : 50



LOGGED: DJS

CHECKED: AH

PROJECT: 991-2891-5004

RECORD OF BOREHOLE: G00-1

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: May 19, 2000

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴	10 ⁻³
0		GROUND SURFACE		63.32													
		Compact to loose, brown fine SAND, trace to some silt, occasional fine to medium sand seam		0.00													
1					1	50 DO	16										
					2	50 DO	4										
2		Stiff grey brown SILTY CLAY, occasional thin silty sand seam		61.19													
				2.13	3	50 DO	3										
3					4	73 TP	PM										
4	Power Auger 100mm Diam. Hollow Stem	Firm grey SILTY CLAY, occasional thin silty sand seam		59.05													
				4.27	5	73 TP	PM										
5																	
6						6	73 TP	PM									
7																	
8						7	73 TP	PM									
9		END OF BOREHOLE		54.48													
				8.84													
10																	
11																	
12																	
13																	
14																	
15																	

DEPTH SCALE

1 : 75


 LOGGED: DM
 CHECKED: *Kc*

BOREHOLE 991-2891.GPJ HYDROGEO.GDT 2 13.01

PROJECT: 991-2891-5004

RECORD OF BOREHOLE: G00-2

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: May 19, 2000

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION				
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT							
								Cu, kPa		nat V. + rem V.		C - U				Wp — W — Wi			
								20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴	10 ⁻³	10	20
0		GROUND SURFACE		65.00															
		Loose to compact brown fine SAND, trace to some silt		0.00															
1					1	50 DO	7												
2					2	50 DO	4												
3					3	50 DO	8												
4					4	50 DO	10												
				61.19															
4		Very loose grey fine to medium SAND, some silt		3.81	5	50 DO	2												
				60.59															
5		Firm grey to mottled brown SILTY CLAY, occasional thin silty sand seam		4.41	6	50 DO	2												
6	Power Auger 100mm Diam. Hollow Stem							⊕		+									
								⊕		+									
7					7	50 DO	PM												
								⊕		+									
8					8	50 DO	WR												
								⊕		+									
9								⊕		+									
					9	50 DO	WR												
10								⊕		+									
				54.64				⊕		+									
		END OF BOREHOLE		10.36															
11																			
12																			
13																			
14																			
15																			

DEPTH SCALE

1 : 75



LOGGED: DM

CHECKED: KC

BOREHOLE 991-2891.GPJ HYDROGEO.GDT 2 13 01

PROJECT: 991-2891-5004

RECORD OF BOREHOLE: G00-3

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: May 23, 2000

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION				
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH		nat V.		+ Q - ● rem V. ⊕ U - ○				WATER CONTENT PERCENT			
								Cu, kPa								Wp — W — Wi			
								20	40	60	80	10 ⁻⁴	10 ⁻⁵			10 ⁻⁶	10 ⁻⁷	10	20
0		GROUND SURFACE		64.80															
		TOPSOIL		0.15															
		Loose brown yellow SILTY fine SAND																	
				64.04															
1		Loose grey brown fine SAND and SANDY SILT		0.76	1	50 DO	6							MH	Bentonite Seal				
2					2	50 DO	5								Sand				
					3	50 DO	4							MH	50mm PVC #10 Slot Screen				
3				61.75															
		Loose grey fine to medium SAND, trace silt		3.05	4	50 DO	4								Sand				
		Grey SILTY CLAY, occasional to frequent silty sand seams		61.30															
				3.50	5	50 DO	2								Bentonite Seal				
4																			
					6	50 DO	1												
5				59.62															
		END OF BOREHOLE		5.18															
6															Top of Riser Pipe at Elev. 65.680m				
7															W.L. in Screen at Elev. 63.34 m July 25, 2000				
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			

DEPTH SCALE

1 : 75



LOGGED: DM

CHECKED: KC

BOREHOLE 991-2891.GPJ HYDROGEO.GDT 2 14 01

RECORD OF BOREHOLE: G00-4A

SHEET 1 OF 1

PROJECT: 001-2771

LOCATION: See Site Plan

BORING DATE: May 23, 2000

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

[illegible]

DEPTH SCALE

1 : 75



LOGGED: DM

CHECKED: KC

BOREHOLE 001-2771.GPJ HYDROGEO.GDT 2 14 01

PROJECT: 001-2771

RECORD OF BOREHOLE: G00-4B & G00-4C

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: May 23, 2000

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION				
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT							
								Cu, kPa		nat V. + rem V. ⊕		Q - ● U - ○				Wp — W — Wi			
								20	40	60	80	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴	10 ⁻³	10	20
0	Power Auger 100mm Diam. Hollow Stem	GROUND SURFACE		63.48															
		TOPSOIL		0.12															
		Compact brown fine SAND, trace silt																	
1				1	50 DO	15													
2			Grey SILTY CLAY, occasional silty sand seams, occasional black streaking		61.81 1.67	2	50 DO	2											
						3	50 DO	PM											
3																			
						4	50 DO	PM											
4																			
					5	50 DO	WR												
				59.06															
		END OF BOREHOLE		4.42															
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			

Bentonite Seal

32mm PVC
#10 Slot
Screen C

Native Backfill

Bentonite Seal

Granular Filter

32mm PVC
#10 Slot
Screen B

W.L.in
Screen 4B at
Elev. 62.40 m
Screen 4C at
Elev. 62.26 m
July 25, 2000

Bentonite Seal

32mm PVC
#10 Slot
Screen C

Native Backfill

Bentonite Seal
Granular Filter32mm PVC
#10 Slot
Screen BW.L. in
Screen 4B at
Elev. 62.40 m
Screen 4C at
Elev. 62.26 m
July 25, 2000

DEPTH SCALE

1 : 75



LOGGED: DM

CHECKED: KC

BOREHOLE 001-2771.GPJ HYDROGEO.GDT 2 14 01

PROJECT: 021-2768

RECORD OF BOREHOLE: G02-1

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: June 14, 2002

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
							20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴			10 ⁻³
0		GROUND SURFACE	60.88													
		Brown SILTY SAND	0.00													
			60.09													
1		Grey brown SILTY CLAY (Weathered Crust)	0.79	1	50 DO	1										
		Grey SILTY CLAY, occasional red brown layer and sandy silt seam, scattered trace black organic matter	59.72													
			1.16													
2	Power Auger 200mm Diam (Hollow Stem)			2	50 DO	WH										
				3	50 DO	PM										
3				4	50 DO	PM										
4																
		END OF BOREHOLE	56.61													
			4.27													
5																
6																
7																
8																
9																
10																



BOREHOLE 021-2768 GPJ GLDR CAN GDT 15/03

DEPTH SCALE

1 : 50



LOGGED: D.J.S.

CHECKED: MG

PROJECT: 021-2768

RECORD OF BOREHOLE: G02-2

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: June 13, 2002

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m		HYDRAULIC CONDUCTIVITY, k, cm/s		ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH		WATER CONTENT PERCENT			
								Cu, kPa	nat V. rem V.	+ ⊕			- ⊙
0		GROUND SURFACE		60.97				20	40	60	80		
		Brown SILTY SAND, some roots		0.00									
		Grey brown SILTY CLAY, occasional sandy silt seam (Weathered Crust)		60.73 0.24									
1		Grey SILTY CLAY, occasional red brown layer and sandy silt seam		60.09 0.88	1	50 DO	1						
2	Power Auger 200mm Diam (Hollow Stem)				2	50 DO	WH						
3					3	50 DO	1						
4					4	50 DO	PM						
		END OF BOREHOLE		57.31 3.66									
5													
6													
7													
8													
9													
10													

Bentonite Seal

32mm Diam PVC
#10 Slot Screen
with Filter SockSilica Sand
Bentonite Seal

Native Backfill

BOREHOLE 021-2768.GPJ GLDR CAN.GDT 1/503

DEPTH SCALE

1 : 50



LOGGED: D.J.S.

CHECKED: *MG*

PROJECT: 021-2768

RECORD OF BOREHOLE: G02-3

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: June 13, 2002

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		nat V. + Q - rem V. ⊕ U - ⊙							
								20	40	60	80	20	40	60	80		
		GROUND SURFACE		61.04													
0		Brown SILTY SAND		0.00													
				60.58													
		Grey brown SILTY CLAY (Weathered Crust)		0.46													
				60.25													
1		Grey SILTY CLAY, occasional red brown layer, occasional sandy silt seam		0.79	1	50 DO	WH										
2	Power Auger 200mm Diam (Hollow Stem)				2	50 DO	WH										
					3	50 DO	PM										
3																	
					4	50 DO	PM										
		END OF BOREHOLE		57.38 3.66													
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Bentonite Seal
Silica Sand

32mm Diam PVC
#10 Slot Screen
with Filter Sock

Bentonite Seal

Native Backfill

21-2768.GPJ GLDR CAN GDT 1/503

BOREHOLE 021-2768.GPJ GLDR CAN.GDT 1/5/03

DEPTH SCALE

1:50



LOGGED: D.J.S.

CHECKED: MC

PROJECT: 021-2768

RECORD OF BOREHOLE: G02-4

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: June 13, 2002

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		nat V. + Q - rem V. ⊕ U -		Wp ——— W ——— WI					
								20	40	60	80	10 ⁻⁵	10 ⁻⁴	10 ⁻³			
0		GROUND SURFACE		61.28													
		Brown SILTY fine SAND, with trace roots		0.00													
				60.91													
		Grey brown SILTY CLAY (Weathered Crust)		0.37													
				60.55													
1		Grey SILTY CLAY, occasional red brown layer and thin sandy silt seams		0.73													
	Power Auger 200mm Diam (Hollow Stem)				1	50 DO	1										
					2	50 DO	WH										
					3	50 DO	PM										
					4	50 DO	PM										
4		END OF BOREHOLE		57.32 3.96													
5																	
6																	
7																	
8																	
9																	
10																	

Bentonite Seal

32mm Diam PVC #10 Slot Screen (B) with Filter Sock

Silica Sand

Bentonite Seal

Silica Sand

32mm Diam PVC #10 Slot Screen (A) with Filter Sock

Bentonite Seal

32mm Diam PVC
#10 Slot Screen
(B) with Filter
Sock

Silica Sand

Bentonite Seal

Silica Sand

32mm Diam PVC
#10 Slot Screen
(A) with Filter
Sock

BOREHOLE 021-2768.GPJ CLDR CAN.GDT 1/5/03

DEPTH SCALE

1 : 50



LOGGED: D.J.S.

CHECKED: *MG*

APPENDIX F
SITE PHOTOGRAPHS



Photo 1 – Impoundment in Ravine No. 1, looking northwest (May 2003).



Photo 2 – Discharge from Ravine No. 1 to South Nation River (May 2003).

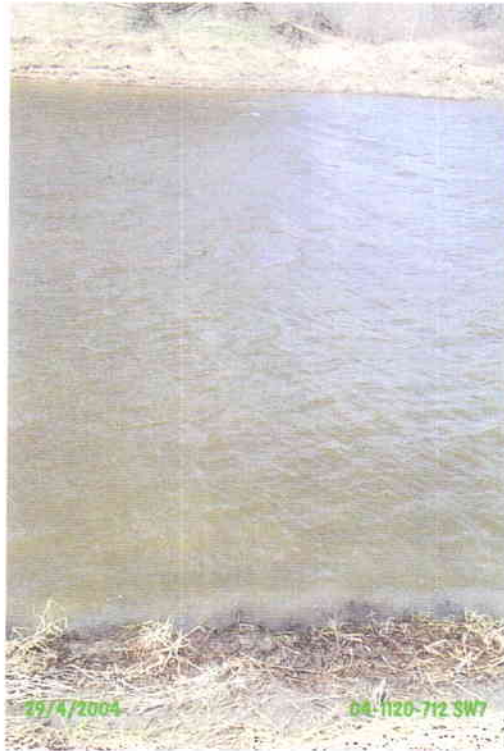


Photo 3 – Sampling station SW7 (April 2004).

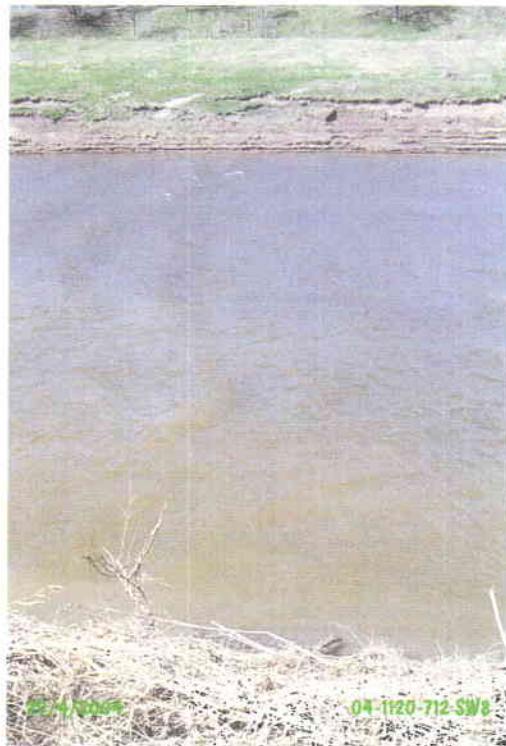


Photo 4 – Sampling station SW8 (April 2004).



Photo 5 – Sampling station SW9 (April 2004).



Photo 6 – Sampling station SW10 (April 2004).



Photo 7 – Sampling station SW6 (May 2004).



Photo 8 – Sampling station CSW-1 (May 2004).



Photo 9 – Uncovered wastes at Casselman Landfill, before reshaping works (July 2004).



Photo 10 – Reshaping and covering works in progress, Casselman Landfill (August 2004).



Photo 11 –Surrounding area of former east drainage ditch was levelled and ditch was filled in; monitoring well G99-7 in the background (September 2004).



Photo 12 – Access to impoundment; wastes that were protruding through soil cover on eastern edge of Ravine No. 1 were covered; monitoring well G99-5 in the background (September 2004).



Photo 13 – Erosion channels, western edge of Ravine No. 3 (October 2004).



Photo 14 – Uncovered construction debris on Central Landfill property, east of CSW-1 (October 2004).



Photo 15 – Vegetation is growing on reshaped areas in the northern portion of Central Landfill property, looking east from monitoring well G99-5 (October 2004).



Photo 16 – Location of flow measurement station in Ravine No. 1, slightly upstream from station SW6 (October 2004).



Photo 17 – Re-initiation of flow from Casselman Landfill at station CSW-1 (October 2004).



Photo 18 – Seepage of shallow groundwater at ground surface near the outlet of Ravine No. 2 to South Nation River (October 2004).