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REPORT ON

2000 HYDROGEOLOGICAL INVESTIGATION AND GROUNDWATER AND SURFACE WATER MONITORING PROGRAM LIMOGES LANDFILL SITE CORPORATION OF THE NATION MUNICIPALITY, ONTARIO

Submitted to:

Corporation of the Nation Municipality
958 Road 500 West
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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: 2000 HYDROGEOLOGICAL INVESTIGATION AND GROUNDWATER AND SURFACE WATER MONITORING PROGRAM
LIMOGES LANDFILL SITE
CORPORATION OF THE NATION MUNICIPALITY, ONTARIO

Dear Madam:

Golder Associates Ltd. is pleased to present seven copies of our report on the 2000 Hydrogeological Investigation and Groundwater and Surface Water Monitoring Program at the Limoges Landfill Site. We have appreciated the opportunity to work with you on this project.

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

Patricia Edmond.

P.L. Edmond, P.Eng.
Geo-environmental Engineer

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Senior Hydrogeologist/Associate

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EXECUTIVE SUMMARY

This report summarizes the results of the 2000 groundwater and surface water monitoring program carried out at the Limoges Landfill Site. The landfill site is located east of Regional Road 5, between Concession Road 3 and the Canadian National Railway Line, on Part of Lot 29, Concession III, in the former Township of Cambridge in the Nation Municipality, Ontario.

Field investigation activities included the drilling of one borehole to characterize background water quality, water level measurements, sampling of groundwater monitors, and sampling of surface water locations during sampling sessions in July/August, October and December 2000.

Based on the borehole data, the overburden consists of silty clay overlain by sandy silt, sand, and topsoil in some areas. The direction of groundwater flow in the surficial granular layer at the site is interpreted to be in a north/northeasterly direction towards the South Indian Creek. The average linear groundwater velocity (seepage velocity) between boreholes P5 and P4 is estimated to be about 1 to 1.5 metres per year in the granular layer.

Based on an interpretation of the existing groundwater quality data and the site compliance assessment under MOE Guideline B-7 (the "Reasonable Use Concept"), it is concluded that the landfill site is likely in a state of compliance in terms of impact on off-site groundwater resources.

The impact of landfill leachate on the surface water quality in the South Indian Creek to the northeast of the fill area is not resulting in an increase in the level of any analytical parameter beyond the specified PWQO or in the violation of Policy 2 and, as such, the site is in compliance with MOEE Policy 2 along the northeast property boundary.

A site-specific surface water trigger mechanism in accordance with Section 4.1 of a Compliance Inspection Report dated February 23, 2000 was prepared and is presented in Section 10.0 of this report. In addition, a groundwater trigger mechanism was also prepared for the site and is discussed in the same section of the report.

Groundwater and surface water monitoring programs should be continued in order to evaluate site compliance on an ongoing basis and a proposed groundwater and surface water monitoring program for 2001 is presented in Section 10.4 of this report.

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1.0 INTRODUCTION

This report summarizes the 2000 hydrogeological investigation and groundwater and surface water monitoring program, carried out at the Limoges Landfill Site in the Nation Municipality, Ontario. The scope of work was originally described in the Golder Associates letter dated May 10, 2000 and was further revised in a letter dated July 25, 2000.

The site is located east of Regional Road 5, between Concession Road 3 and the Canadian National Railway Line, on Part of Lot 29, Concession III, in the former Township of Cambridge in the Nation Municipality (Key Plan, Figure 1), Ontario. Highway 417 is located approximately 500 metres south of the site. The site is accessible via Concession Road 3. The landfill is located in a rural setting approximately one kilometre southeast of the Village of Limoges. The site, which is owned and operated by the Corporation of the Nation Municipality, comprises an area of 15 hectares and currently operates under Provisional Certificate of Approval A471104, dated June 24, 1980. The landfill, which is licensed for the disposal of "domestic, commercial, and non-hazardous solid industrial wastes", currently occupies approximately 6.5 hectares of the approved 14.75 hectare approved fill area. The landfill, located in a former sand pit extraction operation, has accepted only 'dry' wastes since 1995 (Beatty Franz and Associates Ltd., 1998). The disposal area is located in the northeast section of the site and is bounded by a drainage ditch and wooded area to the north, a ravine and South Indian Creek to the east, and wooded areas to the south and west as shown on the Site Plan (Figure 2).

Surface water follows the site topography, flowing into the South Indian Creek immediately east of the landfill. Water from the drainage ditch to the north of the property flows east into the South Indian Creek, which flows northwards and ultimately discharges into the South Nation River. The nearest point of the Nation River is located about five kilometres east of the site.

Previous site investigations were performed by McNeely Engineering Consultants Ltd. (McNeely), StanCon Groundwater Engineering Ltd. (Stancon), Beatty Franz and Associates Ltd. (Beatty Franz) and Golder Associates Ltd. as summarized below:

Date	Consultant Involved	Investigation
1992	McNeely Engineering Consultants Ltd.	• *Site Development and Operations Plan*
1992	StanCon Groundwater Engineering Ltd.	• *Hydrogeological Study*: Overburden boreholes P2, P3, P4, P5, P6, P7 drilled; each completed with two monitoring wells; groundwater and surface water sampling
1998	Beatty Franz and Associates Ltd.	• *Hydrogeological Assessment*: Overburden boreholes P8, P9 drilled; completed with one and two monitoring wells, respectively; groundwater and surface water sampling
1999	Golder Associates Ltd.	• *Groundwater and Surface Water Monitoring*

2.0 PROJECT OBJECTIVES

The objectives of the 2000 hydrogeological investigation and monitoring program (as described in the Golder Associates letter dated July 25, 2000) are summarized as follows:

- Characterization of the background water quality in the silty clay by drilling one borehole located approximately 50 metres south/southwest of current borehole P5. This borehole should contain at least one piezometer screened in the silty clay deposit and one in the granular deposit and should be installed prior to any groundwater monitoring;

- Preparation of a site-specific surface water trigger mechanism as requested in the Ministry of Environment (MOE) Compliance Inspection Report dated February 23, 2000;

- Measurement of groundwater levels in October 2000;

- Collection of groundwater samples from all monitoring wells in October 2000;

- Collection of samples from surface water monitoring locations in July/August, October and December 2000; and

- Preparation of an annual monitoring report based on field and laboratory results.

The original scope of work proposed in the May 10, 2000 letter included the sampling of groundwater and surface water in April/May 2000. The scope of work was revised as outlined in the letter dated July 25, 2000 due to a delay in the authorization to proceed with the work plan.

3.0 INVESTIGATION AND MONITORING PROCEDURES

The various hydrogeological activities undertaken during 2000 are discussed in this section.

The locations of the monitoring wells and surface water sampling stations in the vicinity of the landfill site are shown on Figure 2.

3.1 Hydrogeological Investigation

The borehole drilling and monitoring well installation program was conducted on August 24, 2000 for the purpose of characterizing the background groundwater quality in the silty clay.

During the 2000 borehole drilling and monitoring well installation program, three monitoring wells were installed at one borehole location. The borehole is labeled G10-00 and its location is shown on Figure 2.

The borehole was drilled using a CME55 track mounted 200 millimetre outside diameter hollow stem auger/rotary drill rig supplied and operated by Marathon Drilling Co. of Gloucester, Ontario. All drilling activities were monitored in the field by a member of Golder Associates field technical staff.

The borehole was advanced to a depth of 10.7 metres below ground surface. Borehole G10-00 was completed in the overburden. Overburden samples were collected using a 50 millimetre diameter split spoon sampler in conjunction with performing the standard penetration test. The overburden lithology was logged by the Golder Associates technician at the drill rig during advancement of the augers. The soil samples recovered from the boreholes during the drilling program were visually described in the field and returned to the Golder Associates Ottawa Laboratory for further examination and classification.

After the completion of drilling, a deep monitoring well was installed at the bottom of the borehole within the silty clay deposit. Two more shallow monitoring wells were installed in an adjacent unsampled boring within the silty sand and sand unit, respectively.

The convention adopted in this report is that the deeper monitoring well at each borehole location is designated as monitoring well "1" and the shallower well at the same borehole location is referred to as monitoring well "2", and so on.

The monitoring wells were installed in the borehole to allow subsequent measurement of groundwater levels and groundwater sampling. All newly installed monitoring wells consist of a schedule 40 38- millimetre diameter, flush threaded, PVC riser pipe with a 1.5 metre length of #10 slot PVC screen at the bottom of the well. Filter sand or native backfill is present below,

around and above the screened intervals in the monitoring wells. Bentonite seals were placed at various locations in the boreholes to provide seals to prevent vertical migration of groundwater along the well bore and/or surface water intrusion.

All of the monitoring wells constructed during the borehole drilling and monitoring well installation program were provided with dedicated sampling devices consisting of a length of flexible low density polyethylene (LDPE) tubing and a Model D-25 foot valve manufactured by Waterra Pumps Ltd. of Toronto, Ontario.

Appendix A contains the Record of Borehole Sheets for the 2000 borehole as well as the boreholes previously drilled at the site. The ground surface and top of casing elevations at the 2000 borehole location was surveyed by Golder Associates relative to an existing monitoring well (geodetic elevation). A summary of the elevation data for all of the existing monitoring wells is presented in the following table.

Monitoring Well	Ground Surface Elevation (m)	Top of Casing Elevation (m)
P2-1	66.43	67.24
P2-2	66.43	66.94
P3-1	69.80	70.41
P3-2	69.80	70.04
P4-1	69.54	70.47
P4-2	69.54	70.18
P5-1	69.50	70.33*
P5-2	69.50	70.01*
P6-1	69.81	70.71
P6-2	69.81	70.47
P7-1	68.39	69.00
P7-2	68.39	68.84
P8-1	unknown	69.54
P8-2	unknown	69.55
P9-1	unknown	70.45
G10-1	69.87	70.61**
G10-2	69.87	70.64**
G10-3	69.87	70.66**

Notes: Top of casing elevations surveyed in 1998 by Beatty Franz and Associates Ltd.
* Top of casing elevations resurveyed in November 1999 by Stantec Consulting Ltd. due to broken piezometers
** Top of casing elevations surveyed in September 2000 by Golder Associates Ltd.

3.2 Groundwater Monitoring Session

The groundwater monitoring and sampling program was carried out at the Limoges Landfill Site in one session during November 2000 (fall session).

Prior to the sampling session, the depth to groundwater was measured in each monitoring well. These depths are recorded in Section 5.1. During the sampling session, groundwater samples were collected from pre-existing monitoring wells P2-1, P2-2, P3-1, P3-2, P4-1, P4-2, P5-1, P5-2, P6-1, P6-2, P7-1, P7-2, P8-1, P8-2 and P9-1 and newly installed monitoring wells G10-1, G10-2 and G10-3. 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. Groundwater samples could not be collected from P3-1 and P3-2 as they were found to be dry or contained an insufficient amount of water.

One field blank was prepared as part of the Quality Assurance/Quality Control (QA/QC) program during the fall sampling session.

The temperature, pH and conductivity of the groundwater samples were measured in the field at the time of sample collection. The field conductivity measurements were obtained using a conductivity meter that was calibrated in the field prior to use. All samples were entered on a Chain of Custody form and placed in coolers with ice packs until they were delivered in person to the private analytical laboratory.

The groundwater samples collected for the specific analyses were collected, prepared and preserved in the field using the following protocols:

Analytical Parameters	Preparation and Preservation Protocols
Hardness (calcium and magnesium) sodium, potassium, aluminum, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, silicon, silver, strontium, sulphur, thallium, tin, titanium, vanadium, zinc and total phosphorus	plastic bottle, field filtered to 0.45 microns and preserved to pH<2 with nitric acid
Total dissolved solids, alkalinity, sulphate, nitrate, nitrite, phosphate, chloride	plastic bottle, unfiltered and unpreserved
Phenols	amber glass bottle with foil lined cap, unfiltered and preserved to pH<4 with sulphuric acid
Volatile organic compounds by US EPA Method 624	40 millilitre amber glass vial with teflon septum, unfiltered and unpreserved with no headspace
Chemical oxygen demand, dissolved organic carbon, ammonia	plastic bottle, unfiltered and preserved to pH<2 with sulphuric acid

All laboratory chemical and physical analyses on groundwater samples were performed by Accutest Laboratories Ltd. in Nepean, Ontario. The Report of Analyses sheets from Accutest Laboratories Ltd. for the fall monitoring session are provided in Appendix B-II.

3.3 Surface Water Monitoring Sessions

The surface water monitoring and sampling program was carried out at the Limoges Landfill Site in three sessions: August 2000 (summer session), November 2000 (fall session) and December 2000 (winter session).

Surface water samples were collected from surface water monitoring locations SW1, SW2, SW3, SW4, SW5, SW6, SW7, as located on Figure 2. Surface water sampling stations SW1, SW2 and SW3 are along the South Indian Creek; stations SW4, SW5 and SW6 are associated with the north ditch; and SW7 is a groundwater seep along the bank of the South Indian Creek. Surface water was only collected from SW3 during the winter sampling session as all other sampling locations were found to be frozen.

One field blank was prepared as part of the Quality Assurance/Quality Control (QA/QC) program during the summer sampling session.

The temperature, pH, conductivity and dissolved oxygen of the surface water samples were measured in the field at the time of sample collection. The field conductivity measurements were obtained using a conductivity meter that was calibrated in the field prior to use. The field dissolved oxygen measurements were obtained using a YSI Model 51B Dissolved Oxygen Meter, which was calibrated in the field prior to use. All samples were entered on a Chain of Custody form and placed in coolers with ice packs until they were delivered in person to the private analytical laboratory.

The surface water samples collected for the specific analyses were collected, prepared and preserved in the field using the following protocols:

Analytical Parameters	Preparation and Preservation Protocols
Hardness (calcium and magnesium), sodium, potassium, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, silicon, silver, strontium, sulphur, thallium, tin, titanium, vanadium, zinc and total phosphorus	plastic bottle, unfiltered and preserved to pH<2 with nitric acid
Aluminum	plastic bottle, field filtered to 0.45 microns and preserved to pH<2 with nitric acid
Phenols	amber glass bottle with foil lined cap, unfiltered and preserved to pH<4 with sulphuric acid
Volatile organic compounds by US EPA Method 624	40 millilitre amber glass vial with teflon septum, unfiltered and unpreserved with no headspace
Total dissolved solids, alkalinity, sulphate, nitrate, nitrite, chloride and phosphate	plastic bottle, unfiltered and unpreserved
Chemical oxygen demand, dissolved organic carbon and ammonia	plastic bottle, unfiltered and preserved to pH<2 with sulphuric acid

All laboratory chemical and physical analyses on surface water samples were performed by Accutest Laboratories Ltd. in Nepean, Ontario. The Report of Analyses sheets from Accutest Laboratories Ltd. for all sampling sessions are provided in Appendix B-I, B-II and B-III for the summer, fall and winter sessions, respectively.

4.0 GEOLOGICAL CONDITIONS

One borehole was drilled during the 2000 investigation in addition to the eight boreholes drilled by other consultants during previous investigations at the Limoges Landfill Site. The logs detailing the geological conditions encountered in each borehole augered during the previous and 2000 investigation programs are given on the Record of Borehole Sheets in Appendix A.

It must be noted that the boundaries between strata on the Record of Borehole Sheets have been inferred from observations during drilling and non-continuous sampling and, as such, their positions should be considered as transitional in nature rather than an exact plane of geological change. Natural variations other than those encountered in the boreholes should also be expected to exist.

In general, the geological conditions encountered in the borehole drilled during 2000 are consistent with that reported in the 1991 and 1997 series of boreholes drilled by other consultants.

4.1 Fill Materials

Fill materials were not encountered at any of the boreholes, although 'some rubble' was encountered in borehole P8 in the first 0.3 metres of sand below ground surface. None of the boreholes are drilled within the waste footprint.

4.2 Native Overburden Deposits

Overburden deposits native to the site occur at all boreholes and are fairly consistent throughout the site. Organic topsoil was encountered at boreholes P6, P9 and G10-00 with an average thickness of 0.18 metres. An upper sand layer of varying thickness was encountered at all borehole locations. A layer of grey sandy silt was encountered at boreholes P2, P3, P4, P5, P6 and P7 with an average thickness of 4.5 metres. Silty sand underlain by silt was encountered at P8. In boreholes P9 and G10-00, the near surface was underlain by silty sand. Grey silty clay was encountered in all boreholes below the sand, sandy silt/silty sand at an average depth of 7.4 metres below ground surface. The thickness of the sand, sandy silt/silty sand over the silty clay ranges from about 5.5 metres at boreholes P2 and P8 to over 8 metres at boreholes P3, P7 and P9.

In the report, the sand, sandy silt/silty sand layers will be called the granular deposit and the silty clay deposit beneath it will be referred to as the silty clay deposit.

Ministry of Environment (MOE) water well records for nearby domestic wells indicate that clay or silty clay extends to a depth of about 30 to 50 metres below ground surface (Beatty Franz, 1998).

Regional surficial geological maps indicate that the near surface silty sand loam is a Champlain Sea deposit. The silty sands are deltaic or estuarine deposits developed as the water level of the Champlain Sea dropped forming residual lakes and streams.

4.3 Bedrock

Boreholes were terminated in the overburden at a maximum depth of 10.7 metres below ground surface. Bedrock was not encountered at any of the borehole locations.

MOE water well records for nearby domestic wells indicate the depth to bedrock in this region is between 30 and 50 metres below ground surface (Beatty Franz, 1998).

Regional geological maps indicate that the site is underlain by shale of the Carlsbad Formation.

5.0 PHYSICAL HYDROGEOLOGY

5.1 Water Level Data

The following table presents the groundwater elevation data collected between the fall of 1991 and November 2000.

Monitoring Well	Groundwater Elevation (m)						
	Oct./Nov. 1991	Dec. 3 1997	Apr. 21 1998	May 14 1999	Sep. 1 1999	Oct. 19 1999	Nov. 1 2000
P2-1	65.47	65.49	65.57	65.45	65.11	65.31	65.19
P2-2	65.51	65.50	65.59	65.52	65.14	65.78	65.24
P3-1	64.16	---	---	65.31	64.70	64.69	64.87
P3-2	64.33	64.38	65.07	dry	dry	dry	dry
P4-1	65.04	65.08	66.04	65.76	65.15	65.06	65.28
P4-2	65.05	65.11	66.11	65.82	65.19	65.09	65.32
P5-1	67.23	67.60	68.69	---	---	67.68	67.77
P5-2	67.21	67.57	---	---	---	67.65	67.76
P6-1	66.80	67.23	68.73	68.56	67.16	67.27	67.49
P6-2	66.80	67.19	68.73	68.58	67.17	67.26	67.49
P7-1	64.76	65.05	65.60	65.56	64.90	64.90	65.06
P7-2	66.80	64.87	65.58	65.48	64.82	64.80	64.97
P8-1	NI	65.80	66.00	66.05	65.38	65.30	65.54
P8-2	NI	65.72	66.58	66.46	65.69	65.70	65.91
P9-1	NI	64.54	65.00	64.95	64.95	64.45	64.57
G10-1	NI	NI	NI	NI	NI	NI	68.16
G10-2	NI	NI	NI	NI	NI	NI	68.20
G10-3	NI	NI	NI	NI	NI	NI	68.21

NOTES:
NI = Monitoring well not installed at time of monitoring session
"---" = No data available

5.2 Hydraulic Gradients

5.2.1 Horizontal Component

The horizontal hydraulic gradients for the granular deposit flow system at the site were estimated from the 2000 groundwater elevation data. The horizontal hydraulic gradient in the granular deposit groundwater flow system between boreholes P5 and P4 in a direction roughly parallel to the interpreted direction of groundwater flow (see Section 5.3) is estimated to be 0.017 metres per metre. This value is similar to that reported in Golder Associates (2000).

5.2.2 Vertical Component

Based on the groundwater elevation data from the monitoring wells in boreholes P2, P3, P4, P5, P6, P7, P8 and G10-00 the vertical hydraulic gradient at the site can be estimated.

At boreholes P2, P4, P8 and G10-00 recharge conditions dominate between the shallow and deep overburden monitoring wells. At borehole P7 discharge conditions dominate. Minor or no vertical gradients were observed at the remaining monitoring locations indicating that groundwater flow is essentially horizontal. Historically, vertical gradients at many of the monitors at this site have been variable.

5.3 Groundwater Flow Direction

The direction of flow within the granular deposit at the site was interpreted from the 2000 groundwater elevation data. Based on the groundwater elevations in the shallow monitoring wells, the interpreted direction of horizontal groundwater flow at the site is towards the north/northeast as illustrated on Figure 2. These findings are consistent with past hydrogeological investigations.

5.4 Horizontal Hydraulic Conductivity

Horizontal hydraulic conductivities were estimated by StanCon in 1992 based on grain size distributions of the sandy silt at borehole P2 and P5, and slug tests performed at each monitoring well. The geometric mean horizontal hydraulic conductivities (K) have been estimated considering slug test results from monitoring wells P2-1 through P7-1 and P2-2 through P7-2 representing the lower and upper parts of the granular deposit, respectively:

- lower: $K = 6.9 \times 10^{-5}$ centimetres per second
- upper: $K = 9.0 \times 10^{-5}$ centimetres per second

These values are considered representative of what would be expected for the sand and sandy silt/silty sand overburden which comprise the granular deposit in the area of the site.

5.5 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 a 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 v_s = groundwater flux in units of length per time
K = horizontal hydraulic conductivity in units of length per time
i = dimensionless horizontal hydraulic gradient in direction of v_s

Using a horizontal hydraulic gradient of 0.017 between boreholes P5 and P4 and a range of horizontal hydraulic conductivity for the granular deposit of 6.9×10^{-5} to 9.0×10^{-5} centimetres per second, the corresponding Darcy flux within the overburden is calculated to be 1.2×10^{-6} to 1.5×10^{-6} centimetres per second.

5.6 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 in units of length per time
n = dimensionless formation porosity
K = horizontal hydraulic conductivity in units of length per time
i = dimensionless horizontal hydraulic gradient in direction of $\bar{v}$

For unconsolidated deposits such as silts and sands, typical porosity values can range from 25 to 50 percent (Freeze and Cherry, 1979). An average porosity of 35 percent for the granular deposit is assumed for the determination of average linear groundwater velocities in the vicinity of the landfill site.

The average linear groundwater velocity within the granular deposit between boreholes P5 and P4 is estimated to be 1 to 1.5 metres per year. This velocity is similar to that presented in Golder Associates (2000).

6.0 GROUNDWATER QUALITY

The groundwater quality in the vicinity of the Limoges Landfill Site was assessed by collecting samples from the existing monitoring wells and submitting them for chemical and physical analyses. The results of the field and laboratory chemical and physical analyses conducted during the 2000 monitoring program are presented in Appendix C along with relevant Ontario Drinking Water Standards/Objectives (MOE, 2000) and the data from previous monitoring sessions.

Historical groundwater chemical data exists from sampling sessions in 1991, 1997, 1998 and 1999. Concentrations of metals from the 1991 sampling session are not comparable to more recent data due to different filtering and sample preservation methods.

Discussions relating to compliance with the Ontario Drinking Water Standards/Objectives (ODWS/O) relate 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) have been established.

6.1 Chemical and Physical (Inorganic) Analyses

6.1.1 Natural Background Inorganic Groundwater Quality

Historically for the purpose of this site assessment, background conditions were assumed to be represented by data collected from monitoring wells P6-1 and P6-2, located upgradient of and distant from the active landfill. These monitoring wells, both effectively screened in the granular deposit, were presumed to be unaffected by landfill leachate and were used to represent background conditions in the overburden.

Groundwater quality at monitoring well P6-1 is characterized by elevated concentrations of manganese (consistently exceeding the ODWO/S) and iron (occasionally exceeding the ODWO/S); slightly elevated concentrations of TDS and chloride; and low or non-detect concentrations of boron and nitrate. Existing chloride and TDS concentrations are likely the result of road salting on the access road or Concession Road 3 or possibly due to the screen being partially within the silty clay deposit.

Groundwater quality at monitoring well P6-2 is characterized by slightly elevated concentrations of chloride; and low or non-detect concentrations of nitrate, manganese and boron.

The groundwater quality in monitoring wells P6-1 and P6-2 is generally consistent over time with the exception that TDS levels are declining in monitoring P6-2.

In 2000, several new background monitoring wells were installed in the location of borehole G10-00. As previously discussed, the monitoring wells were screened in the silty clay, silty sand and sand deposits and were identified as G10-1, G10-2 and G10-3 respectively. The most significant difference between the monitors screened within the granular deposit at G10-00 and P6-1 and P6-2 was that chloride and TDS concentrations were lower within the new background monitors. This substantiated that the elevated levels of these parameters at P6-1 and P6-2 were from road salting activities. As such, it has been decided that P6-1 and P6-2 will no longer represent background groundwater quality for the site. Instead G10-2 and G10-3 will represent background groundwater quality within the granular deposit and G10-1 will represent background groundwater quality within the silty clay deposit.

The fall sampling session represents the first and only time the new background groundwater monitors have been sampled. Groundwater quality within G10-2 and G10-3 is characterized by elevated concentrations of iron (exceeding the ODWO/S) and manganese (exceeding ODWO/S only at G10-2). The groundwater quality at G10-1 is characterized by elevated concentrations of iron and manganese exceeding the ODWO/S; and slightly elevated chloride and TDS concentrations when compared to groundwater quality in monitoring wells G10-2 and G10-3. These elevated chloride and TDS concentrations are not as high as previously seen at P6-1 and P6-2 and are likely the influence of the native silty clay deposit in which the monitor is screened.

6.1.2 Impact Evaluation Monitoring Wells

The physical and chemical parameters with reported levels exceeding their respective ODWS/O; trends in groundwater quality (where applicable); a comparison of the groundwater quality to background conditions and, a hydrogeological interpretation of the groundwater quality data from the impact evaluation monitors are summarized in Table 1.

6.1.3 Interpreted Extent of Inorganic Groundwater Plume

Based on a review of the inorganic groundwater quality data, several parameters were identified as being useful groundwater quality indicator parameters with respect to the various anthropogenic (man-made) sources of contamination in the area of the landfill site. With respect to impact from the application of road de-icing agents on the access road or Concession Road 3, chloride is the most useful groundwater quality indicator parameters. With respect to impact from the landfill site, chloride, boron, DOC, sulphate, strontium and TDS appear to be the most useful groundwater quality indicator parameters. Therefore, the concentrations of these indicator parameters in groundwater along with the physical hydrogeological setting of the study area were used during the interpretation of the 2000 inorganic groundwater quality data.

Based on the analyses presented in Table 1, groundwater quality in monitors P5-1, P5-2, P6-1, P6-2, P7-2 and P9-1 are interpreted to not be impacted by landfill leachate. Groundwater quality in monitoring wells P4-1, P4-2 and P8-2 are interpreted to be impacted by landfill leachate. Groundwater quality at monitoring wells P2-1, P2-2, P7-1 and P8-1 are interpreted to exhibit a minor impact from landfill leachate.

6.2 Analyses of Volatile Organic Compounds

A summary of the volatile organic compounds (VOCs) detected in groundwater and surface water samples analyzed to date are presented in Table 2.

6.2.1 Natural Background Organic Groundwater Quality

It is not expected that the application of road de-icing agents along the access road would result in the presence of VOCs in groundwater. As such, the only sources of VOCs in the study area are inferred to be the waste disposal site. Therefore, for the purpose of defining background groundwater quality for VOCs, the 2000 data available from monitoring wells G10-1, G10-2 and G10-3 are used. Chloroform was detected at low concentrations in all three of these monitoring wells and tetrachloroethylene was also detected in one of the monitoring wells. The tetrachloroethylene concentration was at the laboratory method detection limit for this parameter.

6.2.2 Impact Evaluation Monitoring Wells

As noted in Section 3.0 volatile organic compounds (VOCs) were analyzed during 2000 in groundwater samples collected from impact evaluation monitoring wells P4-1 and P4-2.

None of the parameters (i.e., chloroform and tetrachloroethylene) detected in the background samples were detected in samples obtained from P4-1 or P4-2. Only benzene and cis-1,2-Dichloroethylene was detected in a sample from monitor P4-1. Of the VOCs detected in samples from impact evaluation monitoring wells (Table 1), only benzene has an ODWS/O. None of the concentration reported during 2000 exceeded the ODWS/O.

The occurrence of VOCs in groundwater at monitor location P4-1 is consistent with the interpretation of the inorganic groundwater quality data in Table 1, i.e., indicating that the monitoring location is impacted by landfill leachate.

7.0 GROUNDWATER COMPLIANCE ASSESSMENT

MOE Guideline B-7 (MOE, 1994a) 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 remedial measure(s) would be warranted.

Under MOE Guideline B-7 (the "Reasonable Use Guideline"), 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 of the difference between background concentrations and established water quality criteria for aesthetic related parameters, and twenty-five percent of the difference between background conditions and established water quality criteria for health related parameters.

For the purpose of this site evaluation under MOE Guideline B-7, the natural groundwater quality is assumed to be represented by the data available from monitoring wells G10-1, G10-2 and G10-3 where data from G10-1 represents background in the silty clay deposit and data from G10-2 and G10-3 represents background in the granular deposit.

MOE Guideline B-7 applies to groundwater quality impact at the existing site boundary and is therefore directly applicable to monitoring well P9-1 along the north boundary. Because the leading edge of leachate-impacted groundwater downgradient and north of the waste disposal area is contained within the landfill site boundaries (i.e., no landfill leachate at monitor P9-1), the Reasonable Use performance objectives are satisfied in 2000 for the Limoges Landfill Site. Given the presence of the South Indian Creek along the east part of the site, and the fact that the creek is eroded into the silty clay deposit, it is concluded that the MOE Guidelines B-7 would not apply to the east boundary of the site. The east boundary of the site is a surface water compliance issue.

For informational purposes and to evaluate the extent of the plume exceeding Reasonable Use within the property boundary, the groundwater compliance assessment under MOE Guideline B-7 for the site is applied to on-site downgradient monitoring wells P2-1, P2-2, P3-1, P3-2, P4-1, P4-2, P8-1 and P8-2.

The range in natural background groundwater quality in monitoring wells G10-1, G10-2 and G10-3 with respect to ODWS/O parameters for which a Maximum Acceptable Concentration (MAC), Interim Maximum Acceptable Concentration (IMAC) or Aesthetic Objective (AO) has been established and is provided below, along with their respective Reasonable Use Performance Objectives (RUPO). The RUPO were calculated using the highest concentration. Where concentrations were below the method detection limit an existing concentration of zero was used in the calculation of the RUPO.

Parameter	Units	ODWS/O (MOE, 2000)	Range in Background Concentration Based on Monitoring Wells G10-2 and G10-3	RUPO Based on Monitoring Wells G10-2 and G10-3	Range in Background Concentration Based on Monitoring Well G10-1	RUPO Based on Monitoring Well G10-1
Nitrate	mg/L	10 (MAC)	<0.1 – 3.02	4.77	<0.1	2.5
Sulphate	mg/L	500 (AO)	17 – 25	262.5	27	263.5
Chloride	mg/L	250 (AO)	4 – 5	127.5	16	133
Sodium	mg/L	200 (AO)	8 – 40	120	35	117.5
Barium	mg/L	1 (MAC)	0.03 – 0.04	0.28	0.04	0.28
Boron	mg/L	5 (IMAC)	<0.01	1.25	0.03	1.27
Iron	mg/L	0.30 (AO)	1.46 – 1.72	1.72	3.65	3.65
Manganese	mg/L	0.05 (AO)	0.04 – 0.09	0.09	0.12	0.12
TDS	mg/L	500 (AO)	144 – 180	340	256	378
DOC	mg/L	5.0 (AO)	1.1 – 1.7	3.35	1.8	3.4
Cadmium	mg/L	0.005 (MAC)	<0.0001	0.00125	<0.0001	0.00125
Copper	mg/L	1.0 (AO)	0.002 – 0.006	0.503	0.005	0.503
Lead	mg/L	0.01 (MAC)	<0.001	0.0025	0.001	0.0033
Nitrite	mg/L	1.0 (MAC)	<0.1	0.25	<0.1	0.25
Zinc	mg/L	5.0 (AO)	<0.01 – 0.01	2.5	0.01	2.5
Benzene	ug/L	5.0 (MAC)	<0.5	1.25	<0.5	1.25
PCE	ug/L	30 (MAC)	<0.30 – 0.30	7.725	<0.30	7.5

NOTES: mg/L – milligrams per Litre
ug/L – micrograms per Litre
ODWO/S - Ontario Drinking Water Standard/Objective

A summary of the parameters with concentrations exceeding the maximum allowable under MOE Guideline B-7 at each monitoring well location selected for use in the groundwater compliance assessment based on the results of the 2000 monitoring program and using monitoring wells G10-2 and G10-3 and monitoring well G10-1 where appropriate is provided in Table 3.

Based on the results of the compliance assessment, on-site leachate impact exceeding the Reasonable Use Performance Objectives exists at boreholes P2, P4 and P8 for one health related parameter (nitrate) and four aesthetic parameters (iron, manganese, DOC and TDS). Leachate-impacted groundwater downgradient of the landfill areas at monitoring locations P2, P4 and P8 is likely intercepted by the South Indian Creek as discussed previously. An assessment of surface water compliance is provided in Section 9.0.

8.0 SURFACE WATER QUALITY

Surface water enters the site from two sources. The first source is the drainage ditch at the north end of the site, flowing approximately west to east. This ditch empties into the South Indian Creek. The South Indian Creek is located on-site east of the fill area and flows from the south to the north across the site. The South Indian Creek is the major surface water body in the area of the site. Surface water sampling stations are located on Figure 2. Because of its location in the South Indian Creek at the downstream property boundary, SW3 is considered to represent the "point of compliance" for the surface water quality compliance assessment (refer to Section 9.0).

The results of the field and laboratory chemical and physical analyses conducted during the 2000 monitoring program are presented in Appendix C along with relevant Provincial Water Quality Objectives (MOE, 1994b) and the data from previous monitoring sessions for the creek and ditch.

8.1 Background Conditions

Background surface water quality in the north drainage ditch is represented by the data available from SW6 (west of the active landfill in the north drainage ditch). Surface water quality at this station is characterized by PWQO exceedances of total phosphorus, phenols and unionized ammonia on one occasion during 2000 sampling. Historic high concentrations for numerous parameters were observed in the August 2000 sampling session.

Background surface water quality in the South Indian Creek is represented by the data available from SW1 (upstream location on the site at Concession Road 3). Surface water quality at this station is characterized by PWQO exceedances of aluminum, iron and total phosphorus and phenols and silver, on one occasion.

8.2 Discussion

The physical and chemical parameters with reported levels exceeding their respective Provincial Water Quality Objectives (PWQO); trends in surface water quality; a comparison of the surface water quality to background conditions; and, an interpretation of the surface water quality data are summarized in Table 4.

8.2.1 Drainage Ditch

Minor increases in parameter concentrations are noted adjacent to the active landfill in the drainage ditch at SW4. Further downstream in the drainage ditch at SW5 increases in the concentrations of chloride, sodium, boron and iron, are observed, indicating leachate impacts from the landfill entering the drainage ditch.

8.2.2 South Indian Creek

With respect to 2000 surface water quality trends between stations SW1, SW2 and SW3 and in the South Indian Creek, the following comments are provided:

- Historic highs for alkalinity, boron, copper and phosphate were observed at station SW2 during 2000. Historic highs for aluminum, cobalt, phenols and phosphate were observed at station SW3 during 2000.

- The surface water quality at stations SW1, SW2 and SW3 were similar during the August and November 2000 monitoring sessions although the iron level was highest at SW2 in August 2000 and the aluminum and total phosphorus concentrations were highest at SW1 in November 2000.

- Peak concentrations and parameter trends at station SW3 generally mirror what is occurring at station SW2 during 2000 monitoring. Relatively no impact from the leachate-impacted water entering the creek was evident during 2000.

9.0 SURFACE WATER COMPLIANCE ASSESSMENT

This section provides an assessment of the impact of the landfill site on surface water quality in the South Indian Creek based on the results of the 2000 monitoring program.

Based on the available data on the surface water quality at station SW1, it is interpreted that the surface water at this location represents background surface water quality in the South Indian Creek. The parameter concentrations exceeding the PWQO at the background surface water quality monitoring location during the 2000 monitoring program were aluminum, iron, phenols, silver and total phosphorus. Therefore, it is assumed for the purpose of this assessment that the background surface water quality 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 (MOEE, 1994b) 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, the PWQO are being applied to surface water sampling station SW3 because this sampling station is located downstream at the "point of compliance" where the South Indian Creek flows off the landfill site.

The 2000 aluminum, iron and total phosphorus concentrations at station SW3 are within the historical range reported at station SW1 although they do exceed the PWQO. With respect to aluminum, iron and total phosphorus concentrations at station SW3, no distinct seasonal variation applicable to each of these three parameters is evident at this time. Additional monitoring data are required to define seasonal variations in surface water quality (if they exist) and to provide a comprehensive surface water impact assessment for the South Indian Creek.

10.0 SITE-SPECIFIC MONITORING PROGRAM AND TRIGGER MECHANISMS

10.1 Preamble

The results of the hydrogeological investigations and monitoring programs conducted to date have defined the extent and degree of impacts on overburden groundwater and surface water resources as a result of leachate migration from the Limoges Landfill Site. The work to date has identified ***Key Indicator Parameters*** which permit the differentiation between the water quality impacts associated with the landfill site (i.e., the "*leachate-impacted groundwater plume*") and other potential impacts including road salting activities.

10.2 Key Indicator Parameters

A ***Key Indicator Parameter*** for a landfill site is defined as being a parameter which is useful in determining the presence/absence of landfill leachate impact on water resources; assessing the degree of leachate impact on water resources; and, is useful in determining the extent of leachate impact near the landfill site.

For a parameter to be useful as a ***Key Indicator Parameter*** for a landfill site, the following characteristics are desirable:

- the parameter is present in relatively low concentrations in background (natural) water quality near the site and characterized by significantly higher concentrations in leachate generated at the landfill site;

- the concentration of a ***Key Indicator Parameter*** should not vary significantly over time at background monitoring locations (i.e., low variability is desirable) in order to be a reliable indicator of leachate impact;

- the trend in the parameter concentration must be relatively consistent over time (allowing for seasonal variations in quality) in terms of the persistence of elevated levels in landfill leachate relative to background conditions (i.e., parameter concentrations should not vary dramatically over short periods of time such that during one monitoring event the concentration is indicative of background conditions, whereas during another monitoring event the concentration at the same monitoring location is indicative of leachate impact);

- for natural attenuation landfill sites (such as the Limoges Landfill Site), conservative parameters which are relatively mobile in the groundwater flow system (e.g., in this case chloride, boron and sulphate) and are not subject to significant attenuation mechanisms (e.g., adsorption, biological uptake, precipitation, etc.) are most appropriate for characterizing the extent of leachate impact

from a landfill site on water resources; potential leachate constituents characterized by a lower mobility in the subsurface environment (e.g., heavy metals) are typically attenuated by the soil in close proximity to the fill area and thus the extent of impact on groundwater resources is minimal; and

- parameter concentrations in groundwater and surface water should exhibit spatial variations in concentration relative to the location of the fill area(s) and physical hydrogeological setting of the site (i.e., higher parameter concentrations immediately downgradient from the fill area with progressively lower concentrations with increasing distances downgradient from the fill area).

Based on the available data, the following table summarizes the ***Key Indicator Parameters*** for the *landfill leachate-impacted groundwater plume/surface water impact* (primary parameters) along with other secondary parameters which assist in the overall interpretation of water quality data and/or are relevant in terms of assessing the site compliance. Secondary parameters are characterized by variable concentrations over time which are not necessarily related to impacts from the landfill; as such, the concentrations of these secondary parameters must be evaluated in the context of the concentration trends for the primary parameters.

KEY INDICATOR PARAMETERS	
Primary Parameters	***Secondary Parameters***
Boron	DOC
Hardness	Iron
Chloride	Manganese
Strontium	
Sulphate	
TDS	
Total Phosphorus	

Collectively, the parameters listed above represent the ***Key Indicator Parameters*** in terms of groundwater and surface water conditions in the vicinity of the Limoges Landfill Site. As discussed in Sections 10.4.2 and 10.4.3, selected monitoring wells and surface water monitoring stations have been identified for the purpose of monitoring these ***Key Indicator Parameters*** in the area of the Limoges Landfill Site.

10.3 Surveillance Parameters

The site-specific ***Key Indicator Parameters*** should be evaluated on an annual basis based on the groundwater quality data available from selected sampling locations which are sampled on a regular basis for an more exhaustive list of ***Surveillance Parameters***. As discussed in Sections 10.4.2 and 10.4.3, selected monitoring wells and surface water sampling stations have been identified for the purpose of monitoring the groundwater and surface water concentrations of these ***Surveillance Parameters*** in the area of the Limoges Landfill Site.

Surveillance sampling locations are defined as monitoring locations where a more extensive suite of chemical and physical parameters are monitored on a routine basis for the purpose of providing a detailed data base pertaining to groundwater and surface water quality in the area of the landfill site. The designation of surveillance sampling locations at a landfill site is essential when the site monitoring program is aimed towards the monitoring of previously identified site-specific ***Key Indicator Parameters***. The inclusion of surveillance sampling locations in a landfill site monitoring program permits a comprehensive assessment of water quality to be completed on a routine basis. This is advantageous for the following reasons:

- changes in background water quality in the area of the site can be monitored over time;
- temporal changes in leachate quality can be monitored;
- the rationale for the selection of the site-specific ***Key Indicator Parameters*** can be validated on an ongoing basis thus permitting the justified addition or deletion of parameters, as required to adequately monitor the environmental performance of the landfill site;
- as moderately mobile leachate constituents potentially become more widespread over time within the plume, additional parameters can be added to the list of site-specific ***Key Indicator Parameters*** in order to ensure that the site monitoring program is adequate;
- in the event that chemical characteristics of the leachate change over time the list of site-specific ***Key Indicator Parameters*** could be modified to ensure that the site monitoring program is adequate; and
- in the event that there is a significant increase in the concentrations of the ***Key Indicator Parameters*** and there is a requirement for a more extensive assessment of water quality characteristics in the vicinity of the site, the data available from the surveillance sampling locations would permit the selection of the most appropriate parameters to be added to the site monitoring program based on factual information pertaining to leachate quality characteristics rather than the selection of additional parameters based solely on those parameters for which groundwater (or surface water) quality criteria have been established.

10.4 Proposed 2001 Monitoring Program

10.4.1 Objectives

A groundwater and surface water monitoring program forms an integral part of the management of a landfill during both the operational period and post-closure. The purpose of such a program is to enable the trends in the concentrations of various analytical parameters to be established and compared with both the background quality and the regulatory water quality standards, and from this

to determine the adequacy of any existing mitigation systems or the need to implement contingency/remedial measures to reduce impacts from the landfill site on off-site groundwater and/or surface water regimes to an acceptable level.

The objectives of the proposed 2001 groundwater and surface water monitoring program are to monitor background water quality; leachate quality; water quality within the areas affected by the *landfill leachate-impacted groundwater plume* and to build a larger data base of surface water data to enable a better understanding of any seasonal effects on water quality that may be occurring.

10.4.2 Groundwater Component

The proposed groundwater monitoring program for 2001 is summarized in Table 5.

It is proposed that the groundwater monitoring sessions be carried out in the vicinity of the landfill site during the spring (April/May) and fall (October) of 2001.

During each monitoring session, a complete set of groundwater levels should be measured in all existing monitors. The *Routine Sampling Locations* and *Surveillance Sampling Locations* which are proposed to be included in the groundwater monitoring program, along with the rationale for their inclusion are described below:

Rationale	Sampling Locations
Background Monitoring Locations	G10-1*, G10-2*, G10-3*
Impact Evaluation Monitors	P2-1, P2-2, P3-1*, P3-2*, P4-1*, P4-2*, P5-1, P5-2, P6-1, P6-2, P7-1, P7-2, P8-1, P8-2, P9-1*

NOTES: * Surveillance Sampling Location – all others are Routine Sampling Locations

An appropriate number of field duplicates (i.e., approximately one duplicate for every 10 samples collected) should be prepared during each monitoring session as part of the Quality Assurance/Quality Control (QA/QC) program.

The temperature, pH and conductivity of the groundwater samples should be measured in the field at the time of sample collection. The groundwater samples collected from the *Routine Sampling Locations* during the monitoring sessions should be submitted to a private laboratory for analysis of the site-specific ***Key Indicator Parameters***. The groundwater samples collected from the *Surveillance Sampling Locations* should be submitted to a private laboratory for analysis of the ***Surveillance Parameters***.

The groundwater sampling protocols followed during the 2000 monitoring program (refer to Sections 3.2 of this report) should be adhered to during subsequent groundwater monitoring sessions. All laboratory analyses on groundwater samples should 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 (MOEE, 1994b) or the Ontario Drinking Water Standards/Objectives (MOE, 2000), whichever is lower.

10.4.3 Surface Water Component

The proposed surface water monitoring program during 2001 is summarized in Table 6.

It is proposed that the surface water monitoring sessions be carried out in the vicinity of the landfill site during the spring (April/May), summer (July/August), fall (October) and winter (December) of 2001.

The *Routine Sampling Locations* and *Surveillance Sampling Locations* which are proposed to be included in the surface water monitoring program, along with the rationale for their inclusion are described below:

Rationale	Sampling Locations
Background Sampling Locations	SW1*, SW6*
Evaluation Sampling Locations	SW2, SW3*, SW4, SW5, SW7*

NOTES: * Surveillance Sampling Location – all others are Routine Sampling Locations

An appropriate number of field duplicates (i.e., approximately one duplicate for every 10 samples collected) should be prepared during each monitoring session as part of the Quality Assurance/Quality Control (QA/QC) program.

The temperature, pH, conductivity and dissolved oxygen content of the surface water samples should be measured in the field at the time of sample collection. The surface water samples collected from the *Routine Sampling Stations* during the monitoring sessions should be submitted to a private laboratory for analysis of the site-specific ***Key Indicator Parameters***. The surface water samples collected from the *Surveillance Sampling Locations* should be submitted to a private laboratory for analysis of the ***Surveillance Parameters***.

The surface water sampling protocols followed during the 2000 monitoring program (refer to Sections 3.3 of this report) should be adhered to during subsequent surface water monitoring sessions. All laboratory analyses on surface water samples should 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 (MOEE, 1994b) or the Ontario Drinking Water Standards/Objectives (MOE, 2000), whichever is lower.

10.4.4 Reporting

An annual monitoring report for the Limoges Landfill Site should be prepared. The annual monitoring report should provide a discussion of the general physical hydrogeological setting of the site and the groundwater and surface water geochemistry (including apparent trends over time) in the vicinity of the site. The report should also evaluate the landfill site's performance relative to the regulatory requirements.

Each annual monitoring report should also include a re-evaluation of the groundwater and surface water monitoring requirements at the Limoges Landfill Site. In the event that the monitoring program proposed in this report requires modification so as to adequately monitor the future performance of the site, the proposed modifications for the subsequent year should be discussed with the MOE in order to obtain their approval/concurrence for the changes prior to implementation.

10.5 Objectives and Introduction of Trigger Mechanisms

The objectives of trigger mechanisms at the Limoges Landfill Site are to utilize the results of the ongoing surface water and groundwater monitoring programs (with the main focus being the trends in the concentrations of the primary parameters as noted in Section 10.2) to assess site compliance and to trigger implementation of the contingency plans, when and if necessary. The purposes of the trigger mechanisms are to prevent leachate-impacted groundwater exceeding MOE Guideline B-7 from migrating beyond the site boundaries, and to prevent impact on surface water quality exceeding that permissible under MOE Policy 2 (should there be indications that this is likely to happen).

10.6 Compliance Evaluation Parameters and Trigger Concentrations

10.6.1 Preamble

Compliance Evaluation Parameters are defined as the site-specific ***Key Indicator Parameters*** which have established Provincial Water Quality Objectives (surface water) or Ontario Drinking Water Objectives/Standards (groundwater).

A Reasonable Use Performance Objective refers to the maximum allowable concentration for a ***Compliance Evaluation Parameter*** in groundwater at the point of compliance under MOE Guideline B-7. This value can also be referred to as the Groundwater Compliance Concentration.

A ***Surface Water Compliance Concentration*** refers to the higher of either the highest measured background or the Provincial Water Quality Objectives for each ***Compliance Evaluation Parameter*** based on the existing background data.

A ***Trigger Concentration*** is a ***Compliance Evaluation Parameter*** concentration which exceeds the Reasonable Use Performance Objective for groundwater or the compliance concentration for surface water, and thus could be indicative of adverse leachate impact on the groundwater or surface water.

It is noted that future ***Compliance Evaluation Parameters*** may differ from those discussed herein due to the addition or deletion of site-specific ***Key Indicator Parameters*** or changes to the ODWO/S and/or PWQO in the future.

10.6.2 Groundwater

The highest background concentration from the background groundwater quality data set are used to derive the Reasonable Use Performance Objectives and corresponding trigger concentrations for each of the seven ***Compliance Evaluation Parameters***. Where the background concentration is less than the detection limit for that parameter, a concentration of zero is used to derive the Reasonable Use Performance Objective and corresponding trigger concentration.

The background groundwater quality for each of the ***Key Indicator Parameters*** for background monitors, the Reasonable Use Performance Objectives and current trigger concentrations for the granular and silty clay deposits are presented below:

Key Indicator Parameters	ODWO/S (mg/L)	Background Range (mg/L)		Reasonable Use Performance Objective (mg/L)		Trigger Concentration (mg/L)	
		Granular Deposit[1]	Silty Clay Deposit[2]	Granular Deposit	Silty Clay Deposit	Granular Deposit	Silty Clay Deposit
Chloride (P)	250	4 – 5	16	127.5	133	>127.5	>133
Sulphate (P)	500	17 – 25	27	263	264	>263	>264
Strontium (P)	- -	0.027 – 0.063	0.079	- -	- -	- -	- -
Manganese (S)	0.05	0.04 – 0.09	0.12	0.09	0.12	>0.09	>0.12
Boron (P)	5	<0.01	0.03	1.25	1.27	>1.25	>1.27
Hardness (P)	- -	19 – 86	74	- -	- -	- -	- -
Iron (S)	0.3	1.46 – 1.72	3.65	1.72	3.65	>1.72	>3.65
DOC (S)	5.0	1.1 – 1.7	1.8	3.35	3.4	>3.35	>3.4
TDS (P)	500	144 – 180	256	340	378	>340	>378
Total Phosphorus (P)	--	0.15 – 0.3	0.18	--	--	--	--

Notes: mg/L - milligrams per Litre
ODWO/S - Ontario Drinking Water Objectives/Standards (2000)
[1] Background data obtained from monitors G10-2 and G10-3
[2] Background data obtained from monitor G10-1
[3] ODWO/S values presented relate specifically to non-health related parameters (i.e., aesthetic parameters) and health related parameters for which a maximum acceptable concentration (MAC) or interim maximum acceptable concentration (IMAC) has been established.
P – Primary Parameter
S – Secondary Parameter

The calculated maximum allowable boundary concentrations for these parameters under MOE Guideline B-7 will be modified, as required, based on additional background groundwater quality data which will be obtained during future monitoring programs.

10.6.3 Surface Water

The background surface water quality for each of the ***Key Indicator Parameters*** for background surface water station SW-1 compliance concentrations and current trigger concentrations are presented below:

Key Indicator Parameters P/S	PWQO (mg/L)	Background Range[1] SW1 (mg/L)	Compliance Concentration (mg/L)	Trigger Concentration (mg/L)
Chloride (P)	- -	22 – 185	- -	- -
Sulphate (P)	- -	10 – 60	- -	- -
Strontium (P)	- -	0.143 – 0.622	- -	- -
Boron (P)	0.2	<0.01 – 0.05	0.2	>0.2
Manganese (S)	- -	0.01 – 0.21	- -	- -
Iron (S)	0.3	0.18 – 0.84	0.84	>0.84
Hardness (P)	- -	108 – 344	- -	- -
DOC (S)	- -	4.7 – 14.9	- -	- -
TDS (P)	- -	168 – 560	- -	- -
Total Phosphorus (P)	0.03	0.04-0.20	0.20	>0.20

Notes: mg/L - milligrams per Litre
PWQO – Provincial Water Quality Objectives (1994b)
[1] background surface water quality based on SW-1 (1991-2000)
P – Primary Parameter
S – Secondary Parameter

The calculated trigger concentrations at surface water sampling station SW1 will be modified, as required, based on additional background surface water quality data which will be obtained during future monitoring programs.

10.7 Trigger Formats

10.7.1 Groundwater Trigger

The trigger parameters are chloride, sulphate, DOC, TDS, manganese, iron and boron. The trigger concentrations will be those calculated using MOE Guideline B-7 or the existing background if higher than ODWO/S. The calculated trigger concentrations will be based on all the background data which exists at the time of each comparison with the trigger criteria. These trigger concentrations may vary over time as background concentrations from future monitoring programs are added to the data base.

The groundwater trigger will be considered to have been exceeded when one or more of the above primary trigger parameters exceeds the maximum trigger concentration during two consecutive monitoring sessions (not including non-compliance verification re-sampling).

Any observed exceedances of the primary trigger concentrations will be verified by re-sampling for the parameter(s) of concern within one month of the original sampling session at which time non-compliance was measured. The time frame of one month is to allow time for the initial chemical analyses to be performed, received from the analytical laboratory and interpreted. If the non-compliance is not confirmed by the follow-up sample, then the initial non-compliance will be considered anomalous and will be discounted. The historical trends in the ***Compliance Evaluation Parameter*** concentrations at the points of compliance would also be used in concluding that monitoring results are anomalous.

If exceedances of the primary trigger parameter concentrations are confirmed at the trigger location (i.e., confirmed non-compliance during two consecutive monitoring sessions), a three-step process will be initiated for the purpose of determining whether implementation of the contingency plan is warranted. The three-step process is as follows:

Step 1 - assess whether the non-compliance is due to migration of the leachate plume as a whole, or whether it is partially or wholly explicable by other factors. This will be achieved by considering trends in ***Key Indicator Parameter*** concentrations at all relevant monitoring locations as well as data available from ***Surveillance Monitors/Stations*** or could include an expanded suite of monitoring parameters (if warranted depending on the ongoing monitoring results from the ***Surveillance Groundwater Monitors*** and ***Surveillance Surface Water Stations***) and/or an increased sampling frequency

Step 2 - discussion of the results of Step 1 between the Municipality and the MOE to decide whether implementation of the contingency plan is warranted

Step 3 - if the conclusion of Step 2 is affirmative, then the groundwater contingency plan would be implemented

10.7.2 Surface Water Trigger

The trigger parameters are boron, total phosphorus and iron. For station SW1 the trigger concentrations will be based on all background data and PWQO which exists at the time of each comparison with the trigger concentration. These trigger concentrations at station SW1 may vary over time as background concentrations from future monitoring programs are added to the data base.

The surface water trigger will be considered to have been exceeded when one or more of the above primary trigger parameters exceeds the maximum allowable concentration (i.e., trigger concentrations) during two consecutive monitoring sessions (not including non-compliance verification re-sampling).

Any observed non-compliance will be verified by re-sampling for the parameter(s) of concern within one month of the initial sampling session. The time frame of one month is to allow time for the initial chemical analyses to be performed, received from the analytical laboratory and interpreted. If the non-compliance is not confirmed by the follow-up sample, then the initial non-compliance will be considered anomalous and will be discounted. The historical trends in the ***Compliance Evaluation Parameter*** concentrations at the point of compliance would also be used in assuming whether or not these monitoring results are anomalous.

If non-compliance is confirmed at the trigger location (i.e., confirmed non-compliance during two consecutive monitoring sessions), a three-step process will be initiated for the purpose of determining whether implementation of the contingency plan is warranted. The three-step process is as follows:

Step 1 - assess whether the non-compliance is due to migration of the leachate plume as a whole, or whether it is partially or wholly explicable by other factors. This will be achieved by considering trends in ***Key Indicator Parameter*** concentrations at all relevant monitoring locations as well as data available from ***Surveillance Monitors/Stations*** or could include an expanded suite of monitoring parameters (if warranted depending on the ongoing monitoring results from the ***Surveillance Groundwater Monitors*** and ***Surveillance Surface Water Stations***) and/or an increased sampling frequency

Step 2 - discussion of the results of Step 1 between the Municipality and the MOE to decide whether implementation of the contingency plan is warranted

Step 3 - if the conclusion of Step 2 is affirmative, then the surface water contingency plan would be implemented

10.8 Trigger Locations

For the purpose of establishing distinct trigger mechanisms for this site, each of the four site boundaries are discussed separately in the following subsections. These site boundaries, together with their associated trigger mechanisms (when appropriate), are as follows, with rationale provided in subsections 10.8.1, 10.8.2 and 10.8.3.

- west boundary (no trigger required)
- north boundary (groundwater trigger)
- east boundary (surface water triggers)
- south boundary (no trigger required)

10.8.1 West and South Boundaries

Theoretically, the trigger mechanism for the west and south boundaries would likely be a groundwater trigger mechanism. Since the interpreted direction of groundwater flow and the direction of surface water flow via the creek and ditch are ultimately toward the north/northeast, north and east, respectively, no trigger mechanisms are required for these two boundaries.

10.8.2 North Boundary

The trigger mechanism for the north boundary is a groundwater trigger. There is potential that surface water could also be a trigger mechanism, however the ditch on the northern property boundary drains into the South Indian Creek and can be monitored via surface water sampling station SW3 at the property boundary.

The groundwater trigger monitoring location along this property boundary would be monitor P9-1.

10.8.3 East Boundary

The trigger mechanism for the east boundary is a surface water trigger. The trigger monitoring location along this property boundary is surface water sampling station SW3.

10.9 Modification to Trigger Mechanisms

If, depending on observations and ongoing site monitoring results, there is a need in the future to modify the trigger mechanisms, a formal application would be made by the Municipality to the MOE requesting the necessary changes.

11.0 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 Associates 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 Associates as described in this report, and in the previous reports prepared by Golder Associates (see *References* 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 Associates 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 practicing 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 Associates 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 Associates should be requested to re-evaluate the conclusions of this report, and to provide amendments as required. The groundwater monitors installed during the course of this investigation or previous investigations by Golder Associates have been left in place. These groundwater monitors are the property of The Corporation of the Nation Municipality and not Golder Associates.

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TABLE 1

INTERPRETATION OF 2000 INORGANIC GROUNDWATER QUALITY DATA
IMPACT EVALUATION MONITORING WELLS

Monitoring Well	Parameters Exceeding ODWO/S in 2000	Trend(s)	Parameters Exceeding Background Conditions in 2000	Hydrogeological Interpretation
P2-1 Granular Layer/ Silty Clay	- manganese - DOC - iron	- many parameters had historic high concentrations in 2000 including but not limited to: aluminum, alkalinity, boron, chloride, COD, DOC, magnesium, manganese, total phosphorus, strontium and TDS	ammonia, total phosphorus, aluminum, alkalinity, boron, calcium, strontium, chloride, COD, DOC, titanium, TDS, hardness, iron, magnesium, manganese, silicon, silver	• borehole P2 is located immediately northwest of the active landfilling area, south of the northern drainage ditch (see Figure 2). • groundwater quality at monitoring well P2-1 is interpreted to exhibit a minor impact from landfill leachate (based primarily on elevated levels of boron and DOC); the minor degree of impact is supported by the low chloride concentrations.
P2-2 Granular Layer	- manganese - iron - TDS	- increased hardness, alkalinity, TDS, strontium and manganese concentrations over time	alkalinity, ammonia, barium, boron, calcium, DOC, hardness, total phosphorus, potassium, strontium, sulphate, aluminum, chloride, magnesium, manganese, TDS	• borehole P2 is located immediately northwest of the active landfilling area, south of the northern drainage ditch (see Figure 2). • groundwater quality at monitoring well P2-2 is interpreted to exhibit a minor impact from landfill leachate (based primarily on elevated levels of boron, hardness and TDS).
P3-1 Granular Layer	[N/A, no sample collected in 2000]	- insufficient historic data	[N/A, no sample collected in 2000]	• borehole P3 is located immediately north (downgradient) of the active landfilling area (see Figure 2). P3-1 could be expected to represent leachate conditions at the site. • groundwater quality at monitoring well P3-1 could not be assessed in 2000 as the well was dry. In 1999, selected groundwater parameters at P3-1 were interpreted to be elevated relative to background levels (Golder Associates, 2000).

TABLE 1 - continued

Monitoring Well	Parameters Exceeding ODWO/S in 2000	Trend(s)	Parameters Exceeding Background Conditions in 2000	Hydrogeological Interpretation
P3-2 Granular Layer	[N/A, no sample collected in 2000]	- insufficient historic data	[N/A, no sample collected in 2000]	• borehole P3 is located immediately north (downgradient) of the active landfilling area (see Figure 2). P3-2 could be expected to represent leachate conditions at the site. • groundwater quality at monitoring well P3-2 could not be assessed in 2000 as the well was dry. In 1998, selected groundwater parameters at P3-2 were interpreted to be elevated relative to background levels (Beatty Franz, 1998).
P4-1 Granular Layer	- iron - manganese - TDS - DOC	- decreased chloride, sulphate and COD concentrations over time	alkalinity, barium, boron, calcium, chloride, COD, DOC, hardness, iron, magnesium, manganese, potassium, sodium, strontium, sulphate, TDS, cadmium, cobalt, nickel, total phosphorus, silicon	• borehole P4 is located immediately northeast (downgradient) of the active landfilling area, west of the South Indian Creek (see Figure 2). • monitoring well P4-1 is interpreted to be impacted by landfill leachate (based primarily on elevated concentrations of DOC, TDS, manganese, chloride, boron and sulphate).
P4-2 Granular Layer	- DOC - manganese - TDS	- no apparent trends	alkalinity, barium, boron, calcium, COD, copper, DOC, hardness, magnesium, manganese, total phosphorus, potassium, sodium, strontium, sulphate, TDS, cadmium, chloride, cobalt, molybdenum, nitrate	• borehole P4 is located immediately northeast (downgradient) of the active landfilling area, west of the South Indian Creek (see Figure 2). • monitoring well P4-2 is interpreted to be impacted by landfill leachate (based primarily on elevated concentrations of boron, DOC, TDS, chloride and manganese).
P5-1 Granular Layer	- iron	- decreasing hardness and alkalinity concentrations over time	ammonia, potassium, chloride, conductivity, DOC, zinc	• borehole P5 is located immediately south (upgradient) of the active landfilling area (see Figure 2). • groundwater quality at monitoring well P5-1 does not appear to be impacted by landfill leachate and is considered representative of natural groundwater quality in the granular layer.

TABLE 1 - continued

Monitoring Well	Parameters Exceeding ODWO/S in 2000	Trend(s)	Parameters Exceeding Background Conditions in 2000	Hydrogeological Interpretation
P5-2 Granular Layer	- iron - manganese	- increasing silicon concentrations over time - decreasing strontium concentrations over time	DOC, strontium, boron, silicon	• borehole P5 is located immediately south (upgradient) of the active landfilling area (see Figure 2). • in the absence of elevated concentrations of leachate indicator parameters (such as chloride, boron, sulphate and TDS and the physical hydrogeological setting of the site), groundwater quality at monitoring well P5-2 is interpreted not to be impacted by landfill leachate.
P6-1 Granular Layer/ Silty Clay	- iron - manganese	- no apparent trends	alkalinity, barium, calcium, chloride, DOC, hardness, magnesium, manganese, total phosphorus, silicon, strontium, TDS	• borehole P6 is located on the western side of the access road to the site and is approximately 150 metres south of the active landfill (see Figure 2) • groundwater quality at monitoring well P6-1 may be influenced by road salting activities and/or the screened interval partially within the silty clay layer
P6-2 Granular Layer		- no apparent trends	chloride, total phosphorus, strontium	• borehole P6 is located on the western side of the access road to the site and is approximately 150 metres south of the active landfill (see Figure 2) • groundwater quality at monitoring well P6-2 may be influenced by road salting activities
P7-1 Granular Layer/ Silty Clay	- iron - manganese	- several parameters had historic high concentrations in 2000 including barium, aluminum, cobalt, COD, magnesium, silicon, strontium, TDS, titanium and vanadium	aluminum, boron, DOC, phosphate, total phosphorus, potassium, sodium, alkalinity, chloride, cobalt, COD, copper, hardness, iron, lead, magnesium, manganese, silicon, strontium, TDS, titanium, vanadium	• borehole P7 is located immediately southeast of the active landfilling area, outside the downgradient groundwater flow path from the landfill (see Figure 2). • groundwater quality at monitoring well P7-1 is interpreted to exhibit a minor impact from landfill leachate (based primarily on elevated levels of boron, TDS and chloride) and/or effects of road salting on access road.
P7-2 Granular Layer	- iron	- several parameters had historic high concentrations in 2000 including ammonia, titanium and vandium	ammonia, total phosphorus	• borehole P7 is located immediately southeast of the active landfilling area, outside the downgradient groundwater flow path from the landfill (see Figure 2). • groundwater quality at monitoring well P7-2 does not appear to be impacted by landfill leachate and is considered representative of natural groundwater quality in the overburden.

TABLE 1 - continued

Monitoring Well	Parameters Exceeding ODWO/S in 2000	Trend(s)	Parameters Exceeding Background Conditions in 2000	Hydrogeological Interpretation
P8-1 Silty Clay	- iron	- decreased DOC concentrations over time	alkalinity, ammonia, boron, chloride, DOC, hardness, magnesium, manganese, nitrate, phosphate, total phosphorus, potassium, sodium, strontium, sulphate, TDS	• borehole P8 is located adjacent to the southeast part of the active landfilling area, west of the South Indian Creek (see Figure 2). • monitoring well P8-1 is screened in the silty clay • groundwater quality at monitoring well P8-1 is interpreted to exhibit a minor impact from landfill leachate (based primarily on elevated levels of chloride, boron and sulphate).
P8-2 Granular Layer	- DOC - manganese - TDS	- decreased sulphate and chloride concentrations over time	alkalinity, barium, boron, calcium, chloride, copper, DOC, hardness, magnesium, manganese, potassium, silicon, sodium, strontium, TDS, vanadium, cadmium, cobalt, COD, molybdenum, nickel, total phosphorus	• borehole P8 is located adjacent to the southeast part of the active landfilling area, west of the South Indian Creek (see Figure 2). • groundwater quality at monitoring well P8-2 is interpreted to be impacted by landfill leachate (based primarily on elevated concentrations of chloride, boron, barium, TDS, DOC and manganese).
P9-1 Granular Layer/ Silty Clay	- manganese - iron	- no apparent trends - high sulphate concentrations in October 1999 - variable iron concentrations over time	potassium, aluminum, barium, cobalt, COD, hardness, iron, lead, magnesium, manganese, titanium	• borehole P9 is located north of the active landfilling area along the northern site boundary (see Figure 2). • groundwater quality at monitoring well P9-1 does not appear to be impacted by landfill leachate (based primarily on low chloride concentrations) and is considered representative of natural groundwater quality in the granular layer.

TABLE 2
SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTED IN WATER SAMPLES, FALL 2000

CHEMICAL	ODWS/O[1] (mg/L)	PWQO[2] (µg/L)	Background Monitoring Wells			Impact Evaluation Monitoring Wells		Surface Water	
			G10-1	G10-2	G10-3	P4-1	P4-2	SW1	SW3
Benzene	5	100	ND	ND	ND	0.80	ND	ND	ND
cis-1,2-Dichloroethylene	---	200	ND	ND	ND	6.00	ND	ND	ND
Chloroform	---	---	1.00	1.30	0.70	ND	ND	2.10	ND
Tetrachloroethylene (PCE)	30	50	ND	0.30	ND	ND	ND	ND	ND

Notes
1 Ontario Drinking Water Standards/Objectives (MOE, 2000)
2 Provincial Water Quality Objectives (MOEE, 1994 (reprint 1999)
ND Not Detected
All units in parts per billion (micrograms per litre)

TABLE 3

SUMMARY OF PARAMETERS EXCEEDING REASONABLE USE PERFORMANCE OBJECTIVES BASED ON BACKGROUND CONDITIONS AT MONITORING LOCATION G10-00

Monitoring Well	Monitoring Session	
	November 2000	
	Parameter	Concentration (mg/L)
P2-1	Iron	2.03
	Manganese	0.11
	DOC	15.9
P2-2	Manganese	0.28
	TDS	880
P3-1	---	---
P3-2	---	---
P4-1	DOC	22.2
	Manganese	2.95
	TDS	848
	Iron	1.74
P4-2	Nitrate	4.88
	DOC	13.7
	Manganese	5.78
	TDS	668
P8-1	[None]	---
P8-2	DOC	31.7
	Manganese	4.11
	TDS	944

TABLE 4

INTERPRETATION OF 2000 SURFACE WATER QUALITY DATA

Surface Water Sampling Station	Parameters Exceeding PWQO in 2000	Trend(s)	Parameters Exceeding Background Conditions* in 2000	Interpretation
SW1 (South Indian Creek)	- aluminum - iron - total phosphorus - phenols - silver	- chloride, nitrate, sulphate sodium, strontium, COD and TDS variable over time	N/A	• surface water station SW1 is located in the South Indian Creek upstream of the active landfill at Concession Road 3 (See Figure 2). • SW1 is located greater than 200 metres upstream of the active landfill and is interpreted to not be impacted by the landfill. • surface water conditions at this location are used to represent background surface water quality for the South Indian Creek. • existing chloride concentrations are likely the result of road salting on Concession Road 3 or other upstream sources.
SW2 (South Indian Creek)	- aluminum - iron - total phosphorus	- chloride, nitrate, sulphate sodium, strontium, COD and TDS variable over time	copper	• surface water station SW2 is located in the South Indian Creek adjacent to the active landfill (See Figure 2). • historic slightly elevated concentrations of some parameters in surface water at this location may indicate minor effects from landfill leachate, however this was not evident in 2000
SW3 (South Indian Creek)	- aluminum - iron - total phosphorus	- chloride, nitrate, sodium, COD, TDS and strontium variable over time	cobalt	• surface water station SW3 is located in the South Indian Creek downstream of the active landfill (See Figure 2). This station is considered to represent a "point of compliance" for surface water quality compliance assessment. • historic slightly elevated concentrations of some parameters in surface water at this location may indicate minor effects from landfill leachate, however this was not evident in 2000
SW4 (Northern Drainage Ditch)	- unionized ammonia - iron - total phosphorus	- key leachate indicator parameters had been fairly constant with time however a slight increase in many parameters in 2000 was observed	boron, iron, chloride, vanadium	• surface water station SW4 is located adjacent to the active landfill in the northern drainage ditch (See Figure 2). • surface water quality at this location is interpreted to exhibit a minor impact from landfill leachate (based primarily on elevated levels of chloride and boron).

TABLE 4 – continued

Surface Water Sampling Station	Parameters Exceeding PWQO in 2000	Trend(s)	Parameters Exceeding Background Conditions* in 2000	Interpretation
SW5 (Northern Drainage Ditch)	- unionized ammonia - iron - total phosphorus	- during October 2000, concentrations of chloride, sodium, boron, iron, cobalt, copper and vanadium were higher compared to stations SW6 and SW4 - COD and cobalt concentrations have increased over time	boron, chloride, iron, sodium, cobalt, copper, vanadium	• surface water station SW5 is located downstream of the active landfill in the northern drainage ditch (See Figure 2). • surface water quality at this location is interpreted to be impacted by landfill leachate.
SW6 (Northern Drainage Ditch)	- phenols - total phosphorus - unionized ammonia	- historic high concentrations for numerous parameters observed in August 2000	N/A	• surface water station SW6 is located in the northern drainage ditch upstream (west) of the active landfill (See Figure 2). • surface water at this location is interpreted to not be impacted by the landfill and is used to represent background surface water quality for the northern drainage ditch.
SW7 (South Indian Creek)	- boron - iron - total phosphorus - cadmium - cobalt - copper - zinc	- insufficient historic data	alkalinity, boron, iron, total phosphorus, aluminum, cadmium, chromium, cobalt, copper, zinc	• surface water station SW7 is a leachate seep located along the west bank of the South Indian Creek near borehole P4. • surface water quality at this location is interpreted to be impacted by landfill leachate.

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

* Background conditions are represented by water quality at SW1 for surface water stations SW2, SW3 and SW7 in the South Indian Creek, and by SW6 for surface water stations SW4 and SW5 in the northern drainage ditch.

TABLE 5

PROPOSED 2001 GROUNDWATER MONITORING PROGRAM
LIMOGES LANDFILL SITE

1.0 MONITORING SESSIONS

1.1 Water Level and Quality Monitoring

Spring (April/May)
Fall (October)

2.0 GROUNDWATER SAMPLING LOCATIONS

2.1 Routine Sampling Locations
P2-1, P2-2, P6-1, P6-2, P7-1, P7-2, P8-1, P8-2

2.2 Surveillance Sampling Locations
P3-1, P3-2, P4-1, P4-2, P9-1, G10-1, G10-2, G10-3

2.3 Field Duplicates

3.0 FIELD MEASURED PARAMETERS

Groundwater levels in all accessible monitoring wells

temperature, conductivity, pH

4.0 LABORATORY MEASURED PARAMETERS

4.1 Routine Sampling Locations

Key Indicator Parameters
boron, strontium, sulphate, TDS, DOC, hardness, chloride, iron, manganese, total phosphorus

4.2 Surveillance Sampling Locations

Surveillance Parameters
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, zinc (ICP Scan)
hardness (calculated from laboratory calcium and magnesium analyses)
alkalinity, TDS, chloride, sulphate, nitrate, nitrite, ortho-phosphate
ammonia, DOC, COD
phenols

Special Note For Parameters with Established Ontario Drinking Water Standards/Objectives - 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 Provincial Water Quality Objectives or the Ontario Drinking Water Standards/Objectives, whichever is lower.

TABLE 6

PROPOSED 2001 SURFACE WATER SAMPLING PROGRAM
LIMOGES LANDFILL SITE

1.0 MONITORING SESSIONS

1.1 Water Quality Monitoring

Spring (April/May)
Summer (July/August)
Fall (October)
Winter (December)

2.0 SURFACE WATER SAMPLING STATIONS

2.1 Routine Sampling Stations

Creek to East of Site: SW2
Ditch to North of Site: SW4, SW5

2.2 Surveillance Sampling Locations

Creek to East of Site: SW1, SW3, SW7
Ditch to North of Site: SW6

2.3 Field Duplicate

3.0 FIELD MEASURED PARAMETERS

temperature, conductivity, pH, dissolved oxygen

4.0 LABORATORY MEASURED PARAMETERS

4.1 Routine Sampling Stations

Key Indicator Parameters
boron, strontium, sulphate, TDS, DOC, hardness, chloride, iron, manganese, total phosphorus

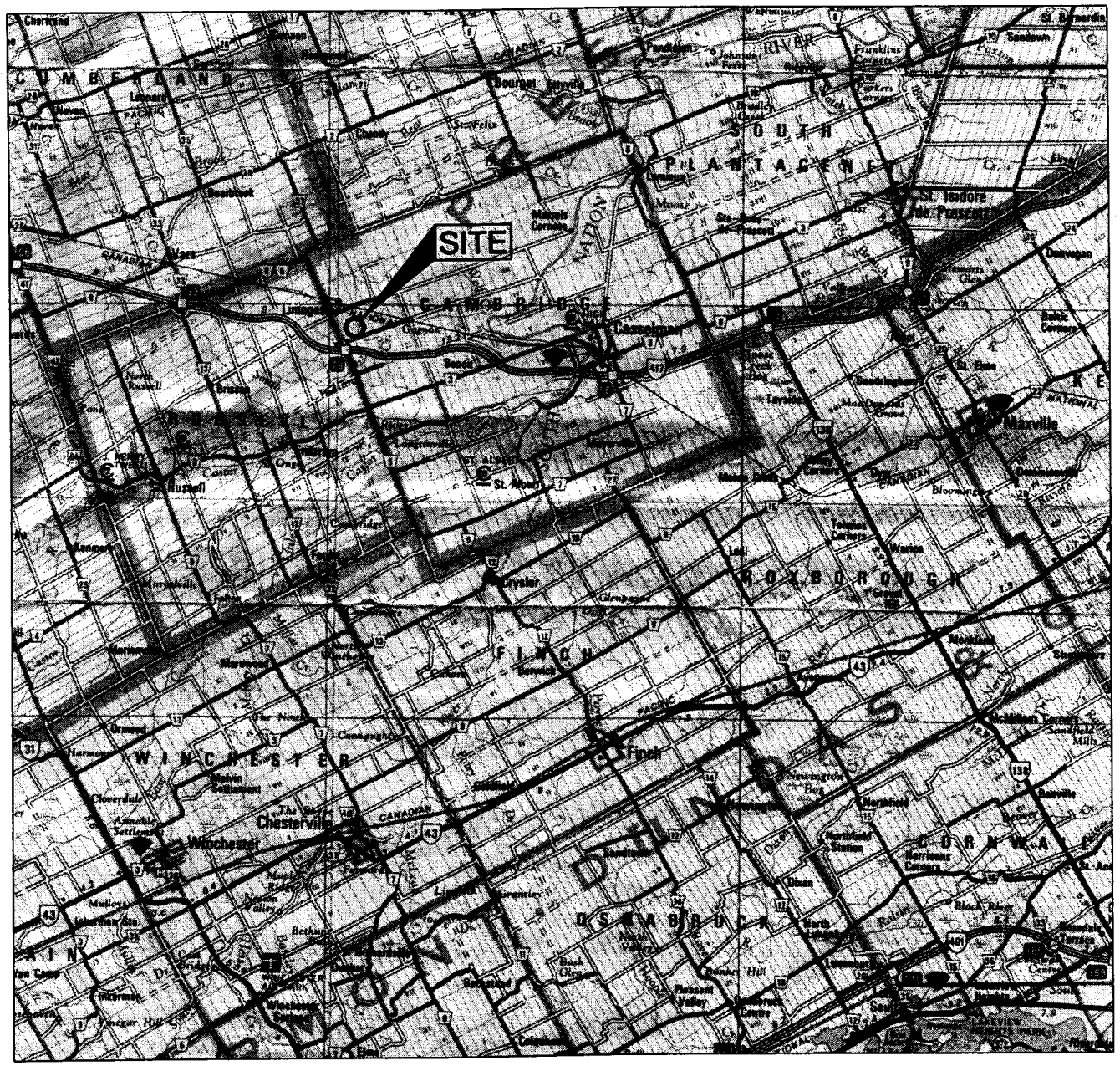
4.2 Surveillance Sampling Locations

Surveillance Parameters
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, zinc (ICP Scan)
hardness (calculated from laboratory calcium and magnesium analyses)
alkalinity, TDS, chloride, sulphate, nitrate, nitrite, ortho-phosphate
ammonia, DOC, COD
phenols
unionized ammonia (calculated from laboratory ammonia and field temperature and pH)

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 or the Ontario Drinking Water Standards/Objectives, whichever is lower.

KEY PLAN

FIGURE 1



SCALE 1 : 250,000

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

Date: Mar. 5, 2001

Project: 001-2782

Golder Associates

Drawn: S.L.

Chkd: RE

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_d:
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, 60^0 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

Peizo-Cone Penetration Test (CPT):
An electronic cone penetrometer with a 60^0 conical tip and a projected end area of 10 cm^2 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	$C_{u2}S_u$ 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 limited
w_l	liquid limit
C	consolidaiton (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 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 x 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 $= \sigma'_p / \sigma'_{vo}$

(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 δ
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

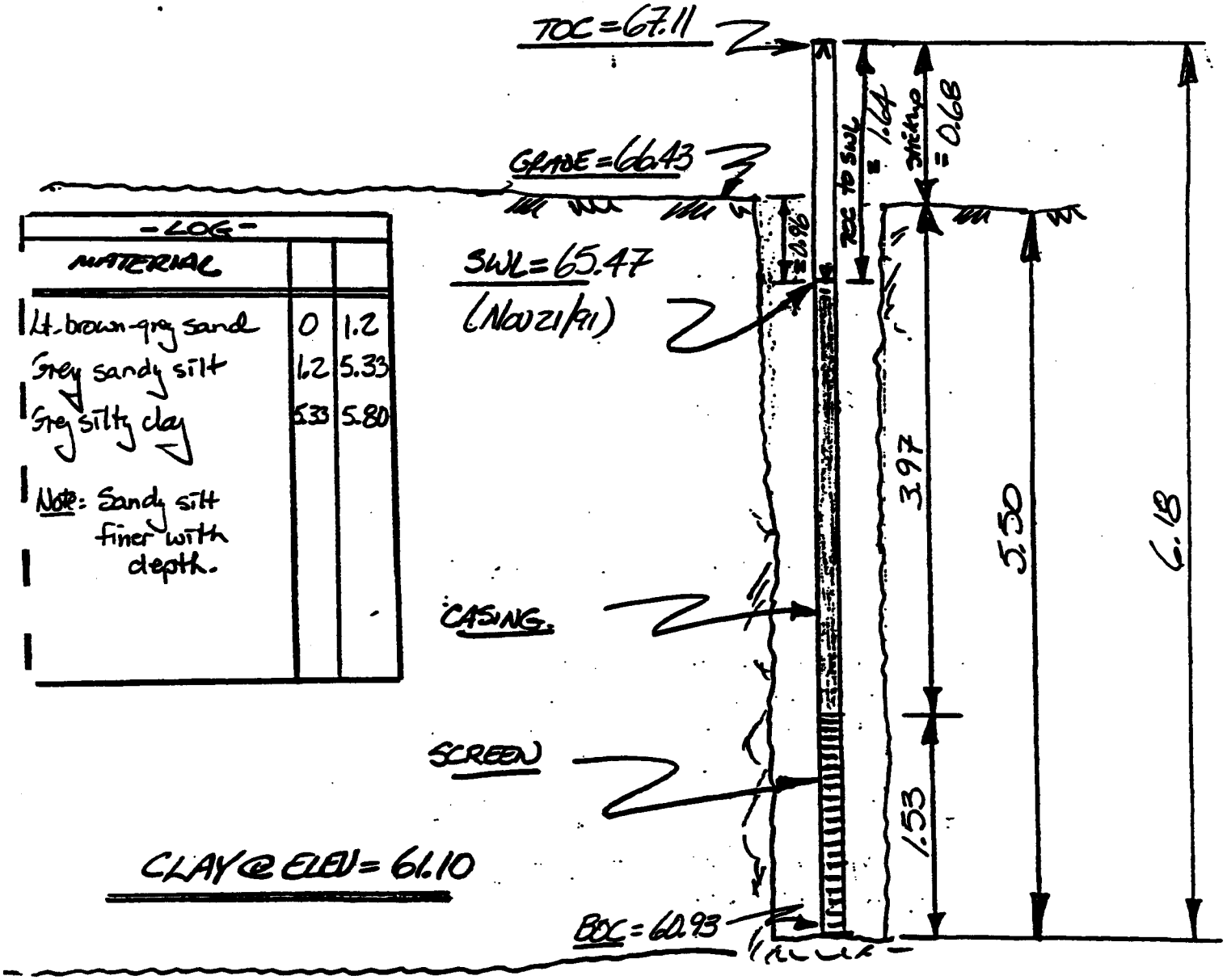
Notes: 1. $\tau = c' + \sigma' \tan \phi'$
2. Shear strength = (Compressive strength)/2

SPANCON 91-128

up of Cambridge - Limoges

Piezometer - as built + elevations for: PZ-1

-Drilled Oct 11/91.



LOG		
MATERIAL		
Lt. brown-grey sand	0	1.2
Grey sandy silt	1.2	5.33
Grey silty clay	5.33	5.80

Note: Sandy silt finer with depth.

TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

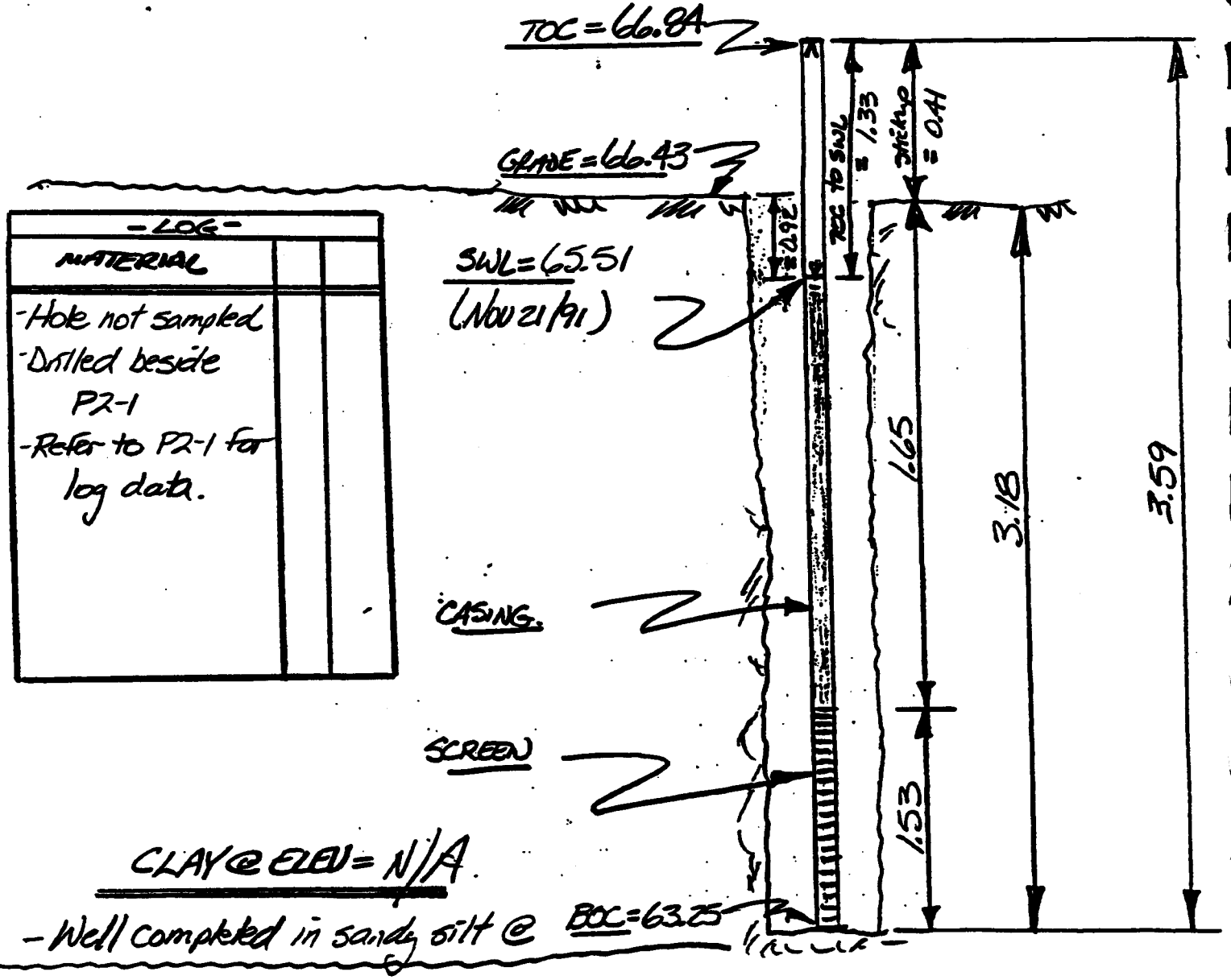
SWL = Static water level.

STANCON 91-128

Twp of Cambridge - Limoges

Piezometer - as built elevations for: P2-2

-Drilled Oct 11/91



TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

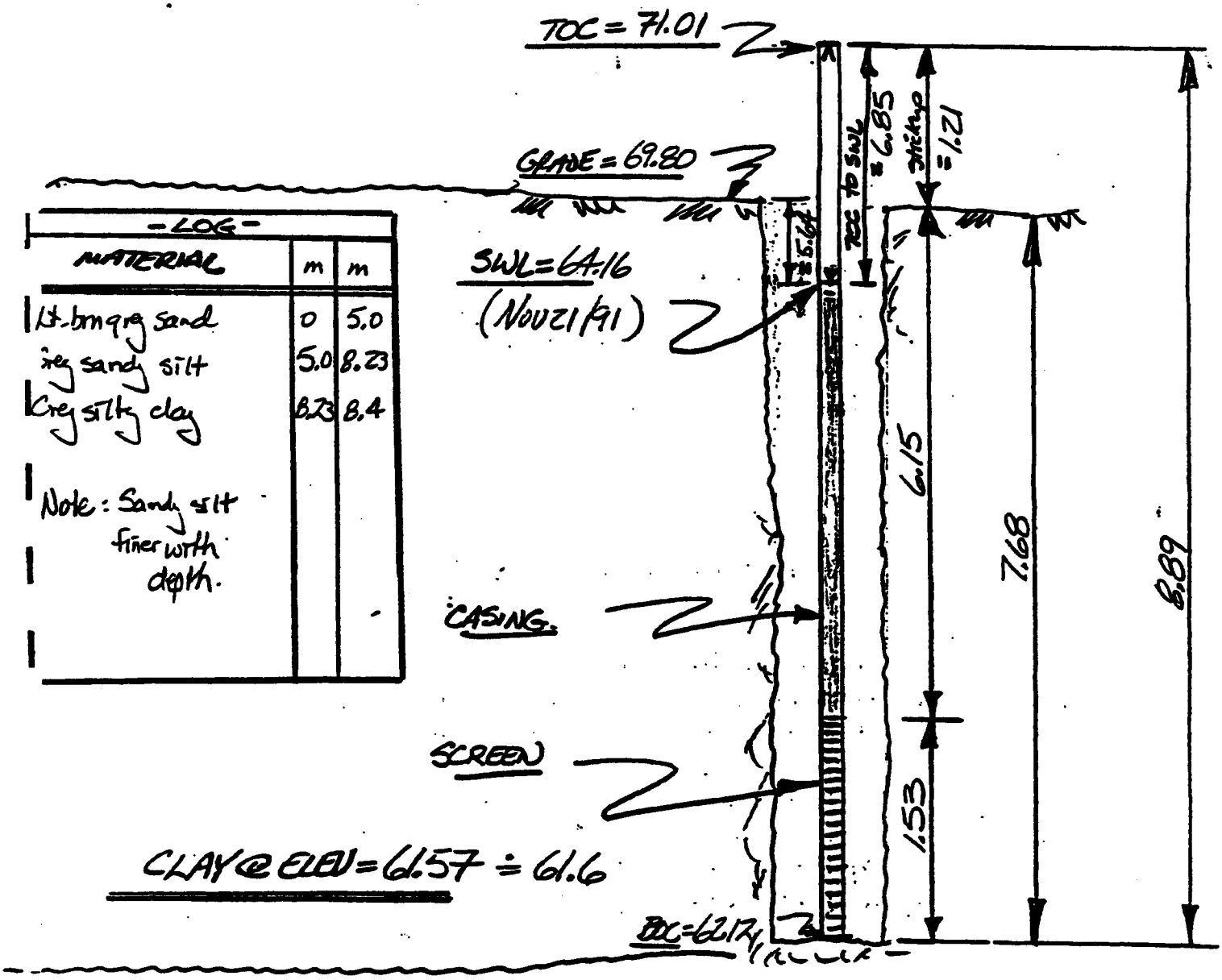
SWL = Static water level.

SPANCON 91-128

Lp of Cambridge - Limoges

Piezometer - as built elevations for: P3-1

-Drilled Oct 11/91.



TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

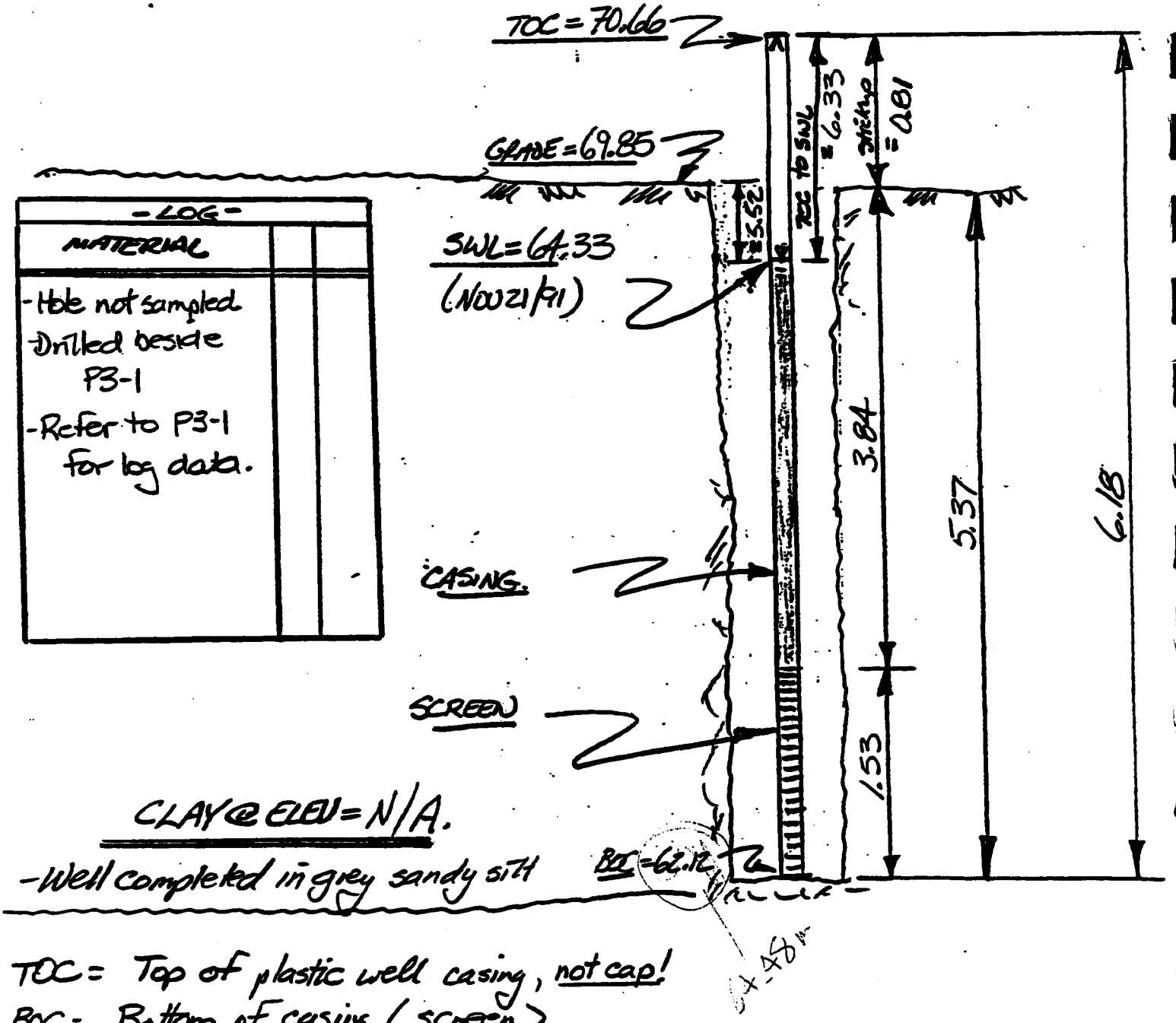
SWL = Static water level.

STANCON 91-128

Twp of Cambridge - Limoges

Piezometer - as built + elevations for: P3-2

-Drilled Oct 11/91



-LOG-		
MATERIAL		
-Hole not sampled. -Drilled beside P3-1 -Refer to P3-1 for log data.		

TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

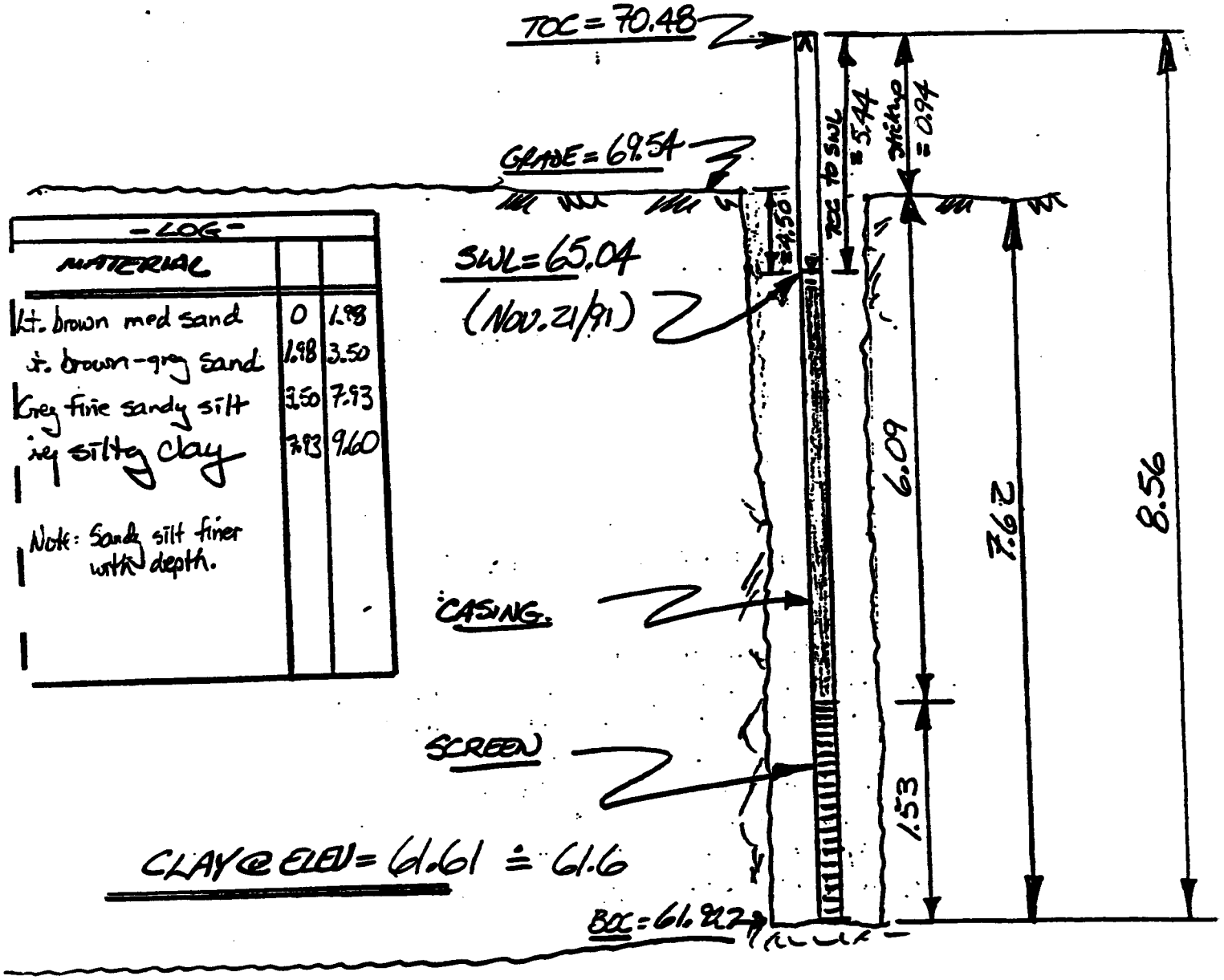
SWL = Static water level.

SPANCON 91-128

...p of Cambridge - Limoges

Piezometer - as built + elevations for: P4-1

- Drilled Oct 9/91.



LOG		
MATERIAL		
lt. brown med sand	0	1.98
lt. brown-grey sand	1.98	3.50
Grey fine sandy silt	3.50	7.93
grey silty clay	7.93	9.60
Note: Sandy silt finer with depth.		

- TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

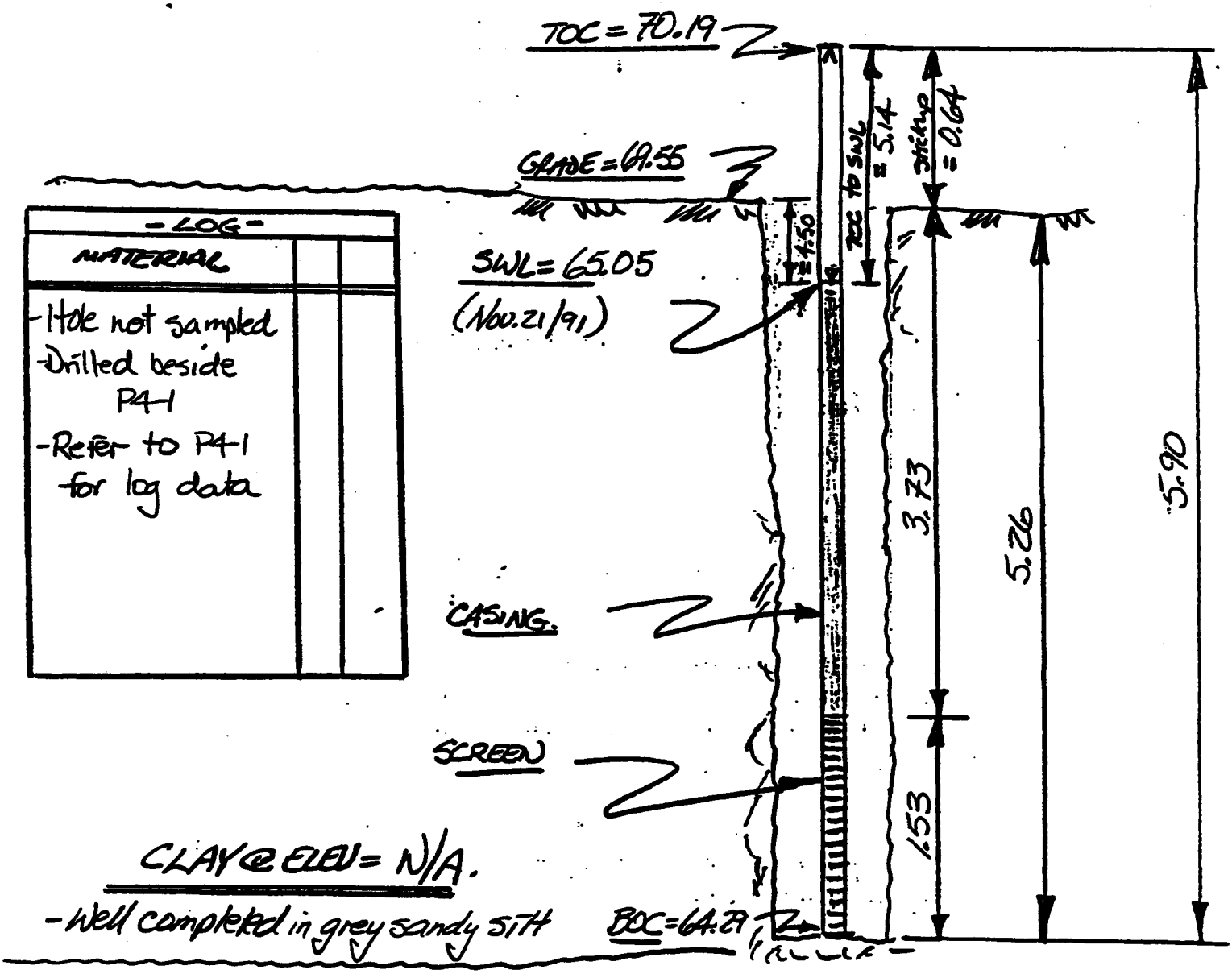
SWL = Static water level.

STANCON 91-128

Twp of Cambridge - Limoges

Piezometer - as built elevations for: P4-2

-Drilled Oct. 9/91.



TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

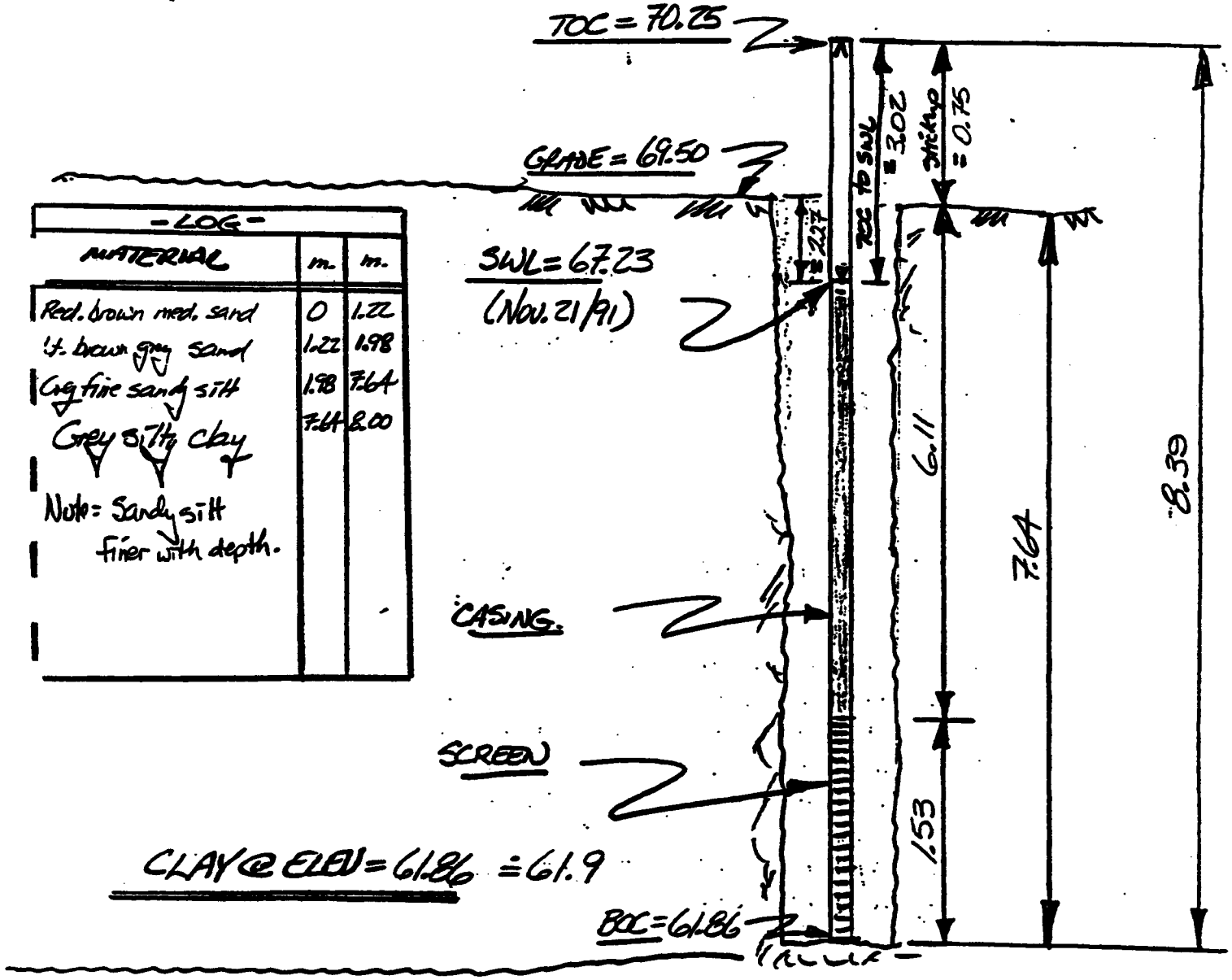
SWL = Static water level.

SPANCON 91-128

Twp of Cambridge - Limoges

Piezometer - as built + elevations for: P5-1

-Drilled Oct. 10/91.



-LOG-		
MATERIAL	m.	m.
Red. brown med. sand	0	1.22
Lt. brown grey sand	1.22	1.98
Cog fine sandy silt	1.98	7.64
Grey silty clay	7.64	8.00

Note: Sandy silt finer with depth.

TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

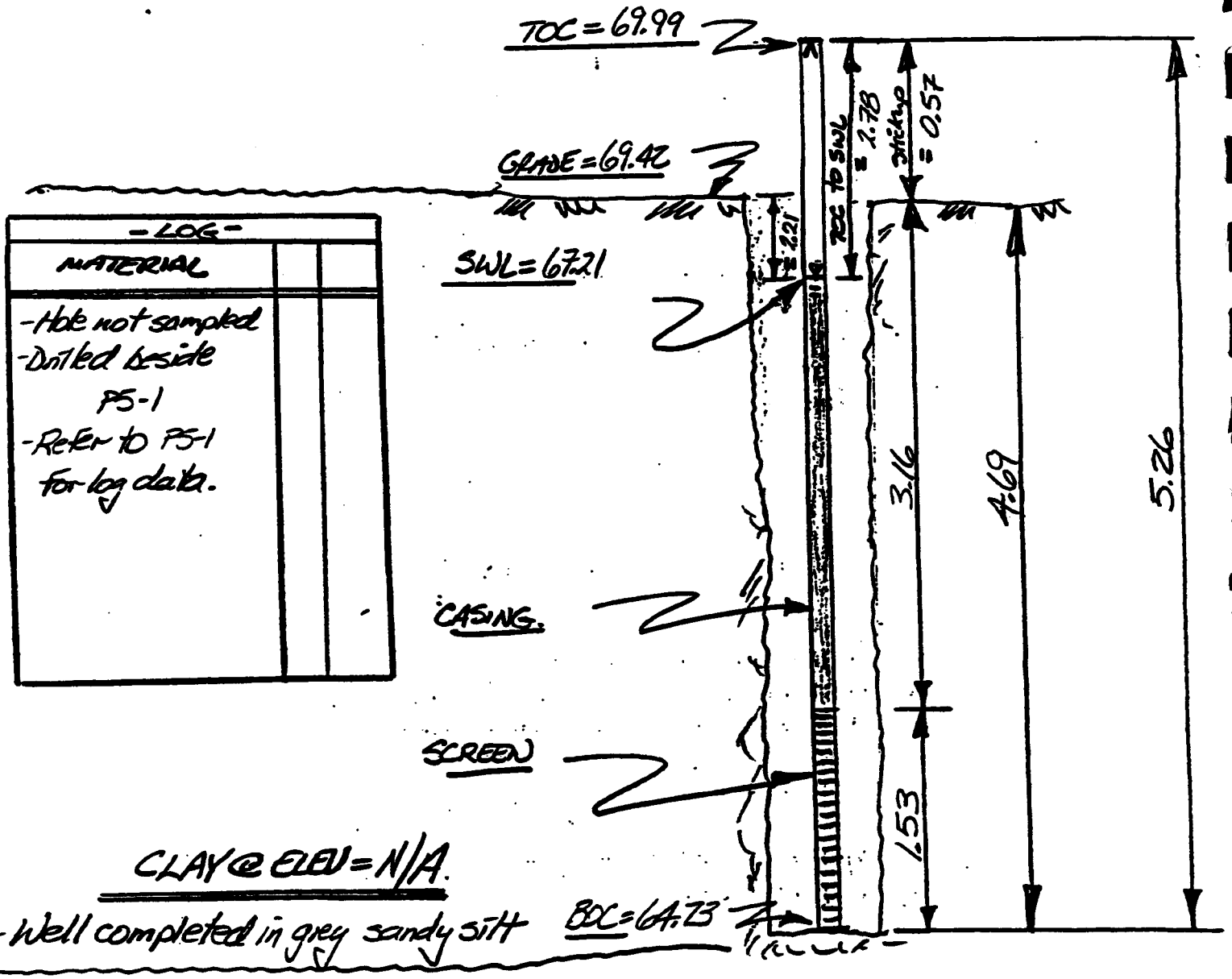
SWL = Static water level.

STANCON 91-128

Twp of Cambridge - Limoges

Piezometer - as built + elevations for: PS-2

- Drilled Oct. 10/91



TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

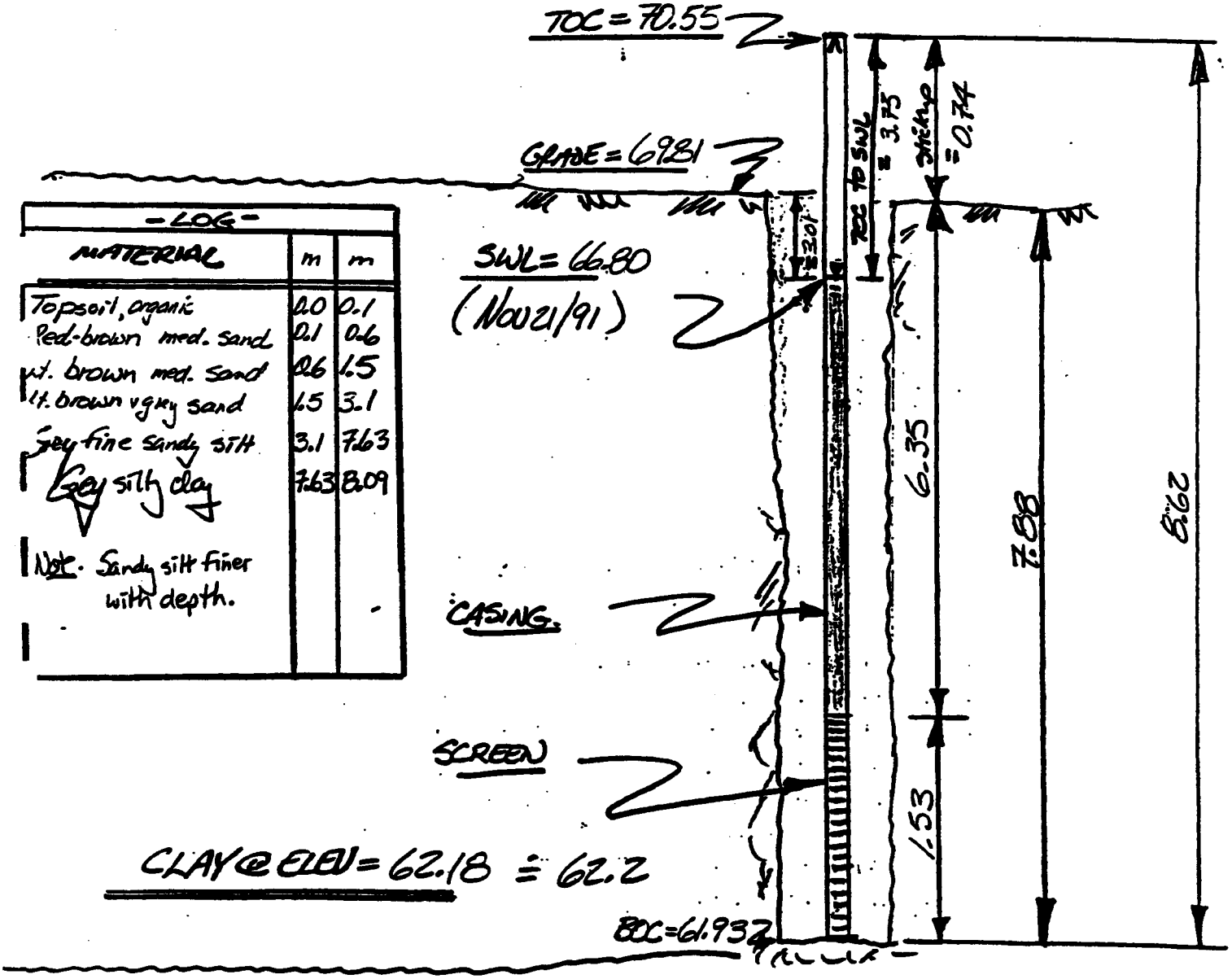
SWL = Static water level.

SPANCON 91-128

Twp of Cambridge - Limoges

Piezometer - as built elevations for: PG-1

Drilled Oct 9/91.



LOG		
MATERIAL	m	m
Topsoil, organic	0.0	0.1
Red-brown med. sand	0.1	0.6
lt. brown med. sand	0.6	1.5
lt. brown v gray sand	1.5	3.1
Grey fine sandy silt	3.1	7.63
Grey silty clay	7.63	8.09
Note. Sandy silt finer with depth.		

TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

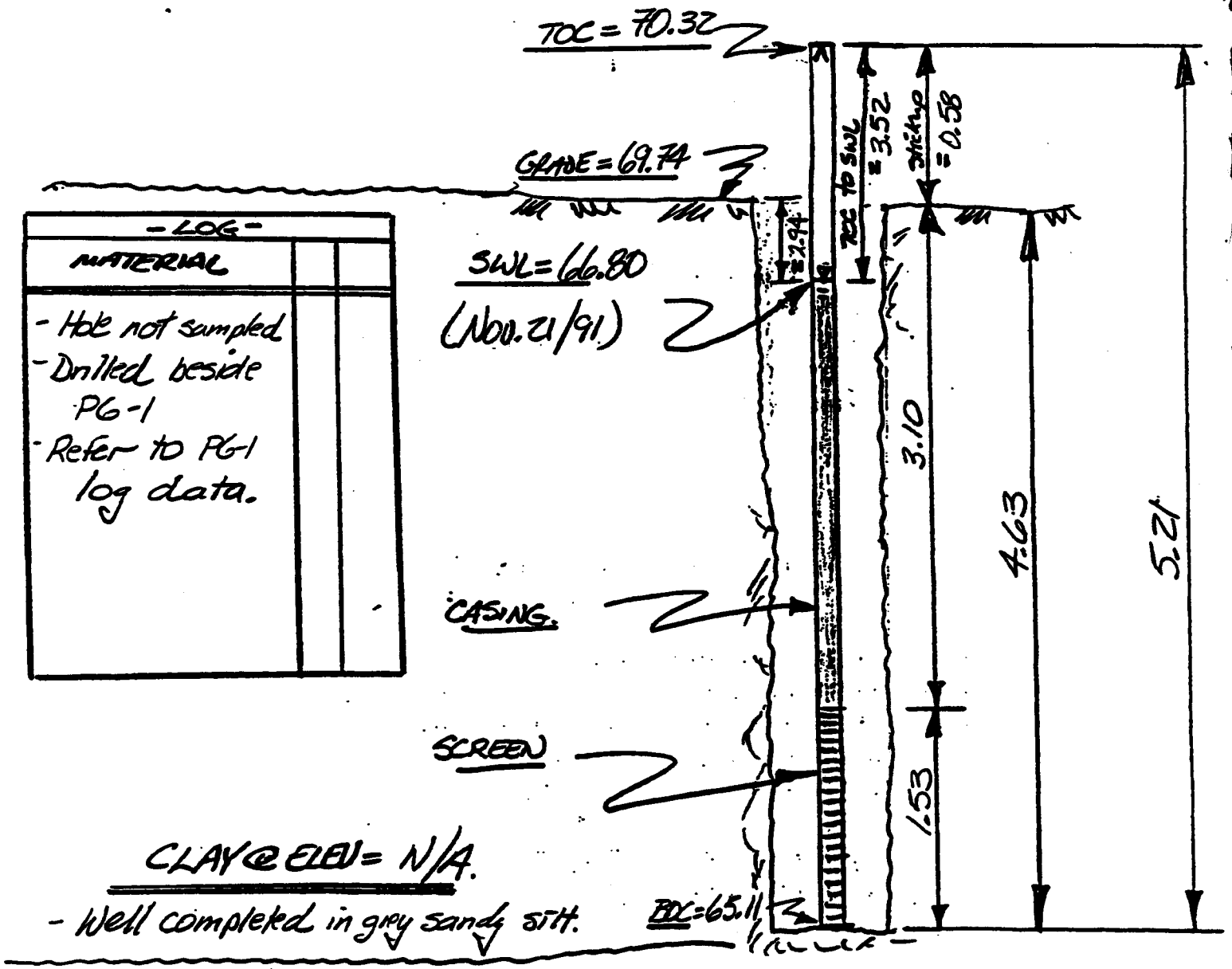
SWL = Static water level.

STANCON 91-128

Twp of Cambridge - Limoges

Piezometer - as built + elevations for: PG-2

-Drilled Oct 9/91



TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

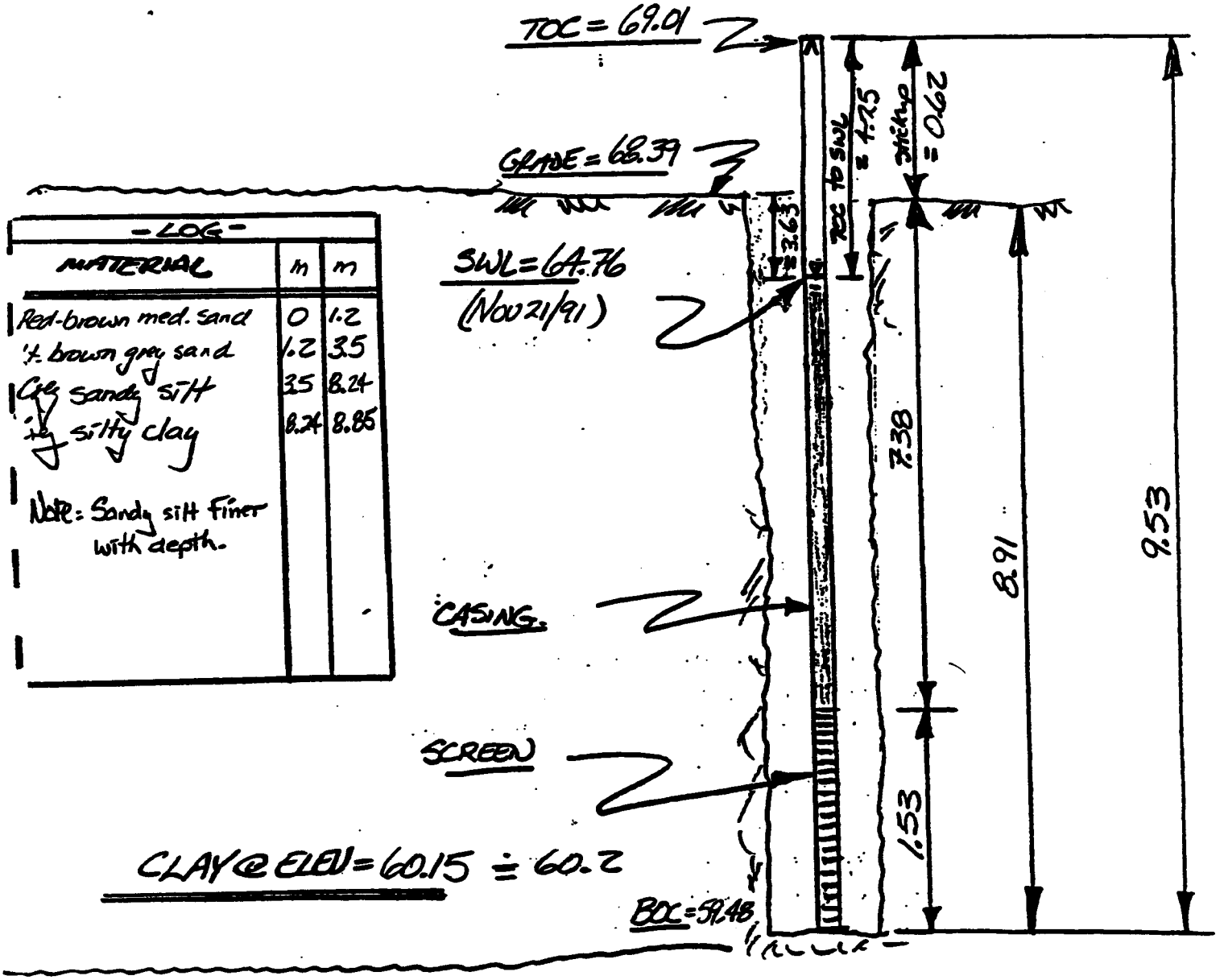
SWL = Static water level.

SPANCON 91-128

Twp of Cambridge - Limoges

Piezometer - as built + elevations for: P7-1

-Drilled Oct 11/91



TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

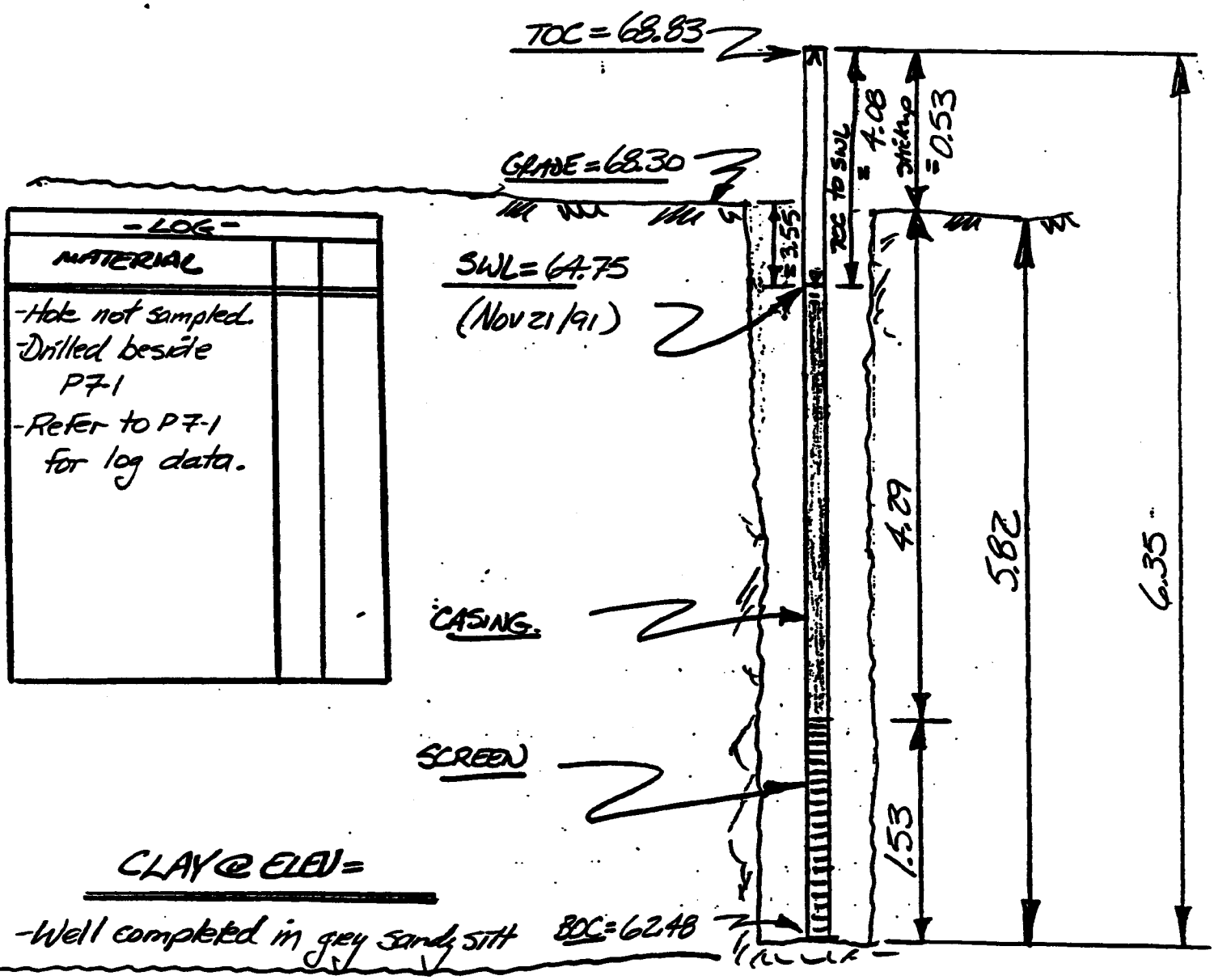
SWL = Static water level.

STANCON 91-128

Twp of Cambridge - Limoges

Piezometer - as built elevations for: P7-2

-Drilled Oct 11/91



TOC = Top of plastic well casing, not cap!

BOC = Bottom of casing (screen)

SWL = Static water level.

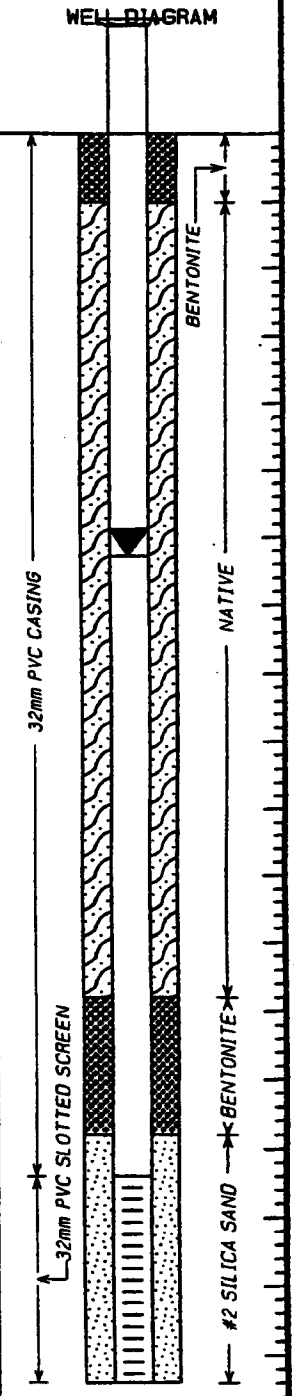
BEATTY FRANZ & ASSOCIATES

Observation Well P8-1

PROJECT: *TOWNSHIP OF CAMBRIDGE*	LOCATION: *LIMOGES LANDFILL*
PROJECT NO.: *178-971*	GROUND SURFACE ELEVATION: *NA*
DATE STARTED: *OCTOBER 2, 1997*	TOC ELEVATION: *NA*
DATE FINISHED: *OCTOBER 2, 1997*	WATER LEVEL: *3.731 m btoc*
DRILLING METHOD: *HOLLOW STEM AUGER*	TOTAL DEPTH: *9.20 metres*
DRILLING COMPANY: *DOWNING DRILLING*	LOGGED BY: *M.P.*

DEPTH metres	ELEVATION	SAMPLE NO.	Sample Interval	GRAPHIC LOG	GEOLOGIC DESCRIPTION
1		SS-1			SAND, some rubble up to 0.3m., beige-brown-grey laminations.
2		SS-2			SILTY SAND, moist, beige.
3		SS-3			Brown with gery and intermittent rusty laminations, saturated at 3.5m.
4					SILT, with some clay and fine sand, saturated, grey.
5		SS-4			
6		SS-5			SILTY CLAY, grey, homogeneous, saturated.
7					
8		SS-6			
9					END OF HOLE

WELL DIAGRAM



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.

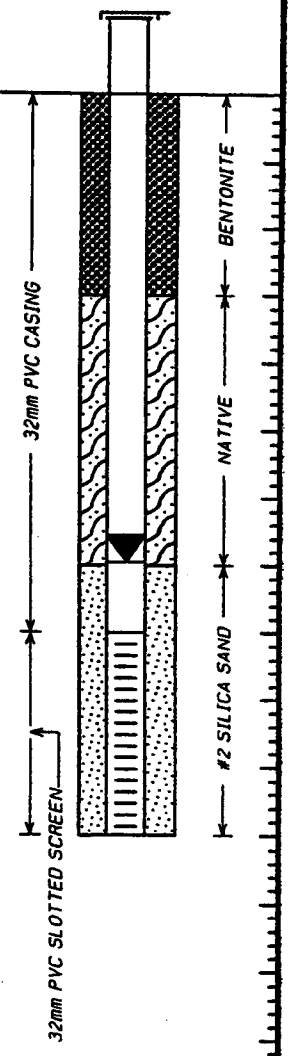
BEATTY FRANZ & ASSOCIATES

Observation Well P8-2

PROJECT: *TOWNSHIP OF CAMBRIDGE*	LOCATION: *LIMOGES LANDFILL*
PROJECT NO.: *178-971*	GROUND SURFACE ELEVATION: *NA*
DATE STARTED: *OCTOBER 2, 1997*	TOC ELEVATION: *NA*
DATE FINISHED: *OCTOBER 2, 1997*	WATER LEVEL: *3.826 m btoc*
DRILLING METHOD: *HOLLOW STEM AUGER*	TOTAL DEPTH: *5.50 metres*
DRILLING COMPANY: *DOWNING DRILLING*	LOGGED BY: *M.P.*

metres	ELEVATION	SAMPLE NO.	Sample Interval	GRAPHIC LOG	GEOLOGIC DESCRIPTION
		SS-1			SAND, some rubble up to 0.3m., beige-brown-grey laminations.
		SS-2			SILTY SAND, moist, beige.
		SS-3			Brown with grey and intermittent rusty laminations, saturated at 3.5m.
		SS-4			SILT, with some clay and fine sand, saturated, grey.
					END OF HOLE

WELL DIAGRAM



e: 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.

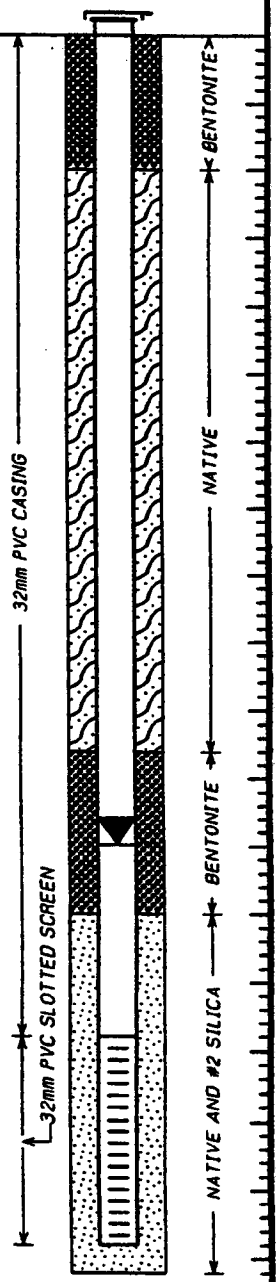
BEATTY FRANZ & ASSOCIATES

Observation Well P9-1

PROJECT: *TOWNSHIP OF CAMBRIDGE*	LOCATION: *LIMOGES LANDFILL*
PROJECT NO.: *178-971*	GROUND SURFACE ELEVATION: *NA*
DATE STARTED: *OCTOBER 2, 1997*	TOC ELEVATION: *NA*
DATE FINISHED: *OCTOBER 2, 1997*	WATER LEVEL: *5.902 m btoc*
DRILLING METHOD: *HOLLOW STEM AUGER*	TOTAL DEPTH: *9.10 metres*
DRILLING COMPANY: *DOWNING DRILLING*	LOGGED BY: *M.P.*

DEPTH metres	ELEVATION	SAMPLE NO.	Sample Interval	GRAPHIC LOG	GEOLOGIC DESCRIPTION
0					TOPSOIL, brown.
1					SAND, medium to fine grained, beige-brown.
2		SS-1			
3		SS-2			
4					SILTY SAND, beige to grey, moist.
5		SS-3			Saturated at 5.1m.
6		SS-4			
7					
8		SS-5			
9					SILTY CLAY, grey, saturated.
					END OF HOLE

WELL DIAGRAM



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.

PROJECT: 001-2782

RECORD OF BOREHOLE: G10-00

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: Aug. 24, 2000

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		69.87							
0	Power Auger 200mm Diam (Hollow Stem)	TOPSOIL		0.00							
		Very loose to compact brown to grey stratified fine SAND, trace to some silt		0.24	1	50 DO	11				Bentonite Seal
1											
					2	50 DO	11				
2											
					3	50 DO	3				
3											
					4	50 DO	3				
4				65.76							
		Loose grey SILTY fine SAND		4.11	5	50 DO	9				Native Backfill
5											
					6	50 DO	9				
					7	50 DO	7				
6											
					8	50 DO	WR				
7				62.55							
		Grey SILTY CLAY, occasional very thin clayey silt seam		7.32	9	50 DO	PM				Bentonite Seal
8											
											Granular Filter
9					10	50 DO	PM				
											38mm PVC #10 Slot Screen 1
10				59.20							
		END OF BOREHOLE		10.67							
11											
12											
13											
14											
15											

BOREHOLE 001-2782.GPJ GLDR_CAN.GDT 3 5 01

DEPTH SCALE
1 : 75

Golder Associates

LOGGED: D.J.S.

CHECKED: PLE

PROJECT: 001-2782

RECORD OF BOREHOLE: G10A-00

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: Aug. 24, 2000

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		69.87							
0	Power Auger 200mm Diam (Hollow Stem)	For Stratigraphy, refer to Record of Borehole G10-00		0.00							Bentonite Seal Native Backfill Bentonite Seal Native and Granular Filter 38mm PVC #10 Slot Screen 3 Bentonite Seal Native Backfill 38mm PVC #10 Slot Screen 2
7				62.55							
7		END OF BOREHOLE		7.32							

BOREHOLE 001-2782.GPJ GLDR_CAN.GDT 3 5 01

DEPTH SCALE
1 : 75

Golder Associates

LOGGED: D.J.S.

CHECKED: PLE

APPENDIX B

REPORT OF ANALYSES
ACCUTEST LABORATORIES LTD.

APPENDIX B-I - SUMMER MONITORING SESSION
APPENDIX B-II - FALL MONITORING SESSION
APPENDIX B-III – WINTER MONITORING SESSION

APPENDIX B-I

SUMMER MONITORING SESSION

NOTES:
SW8 = BLANK SAMPLE

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008804
Date: 2000-09-12
Date Submitted: 2000-08-09
Date Collected: 2000-08-08
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	82549 SW-1	82550 SW-2	82551 SW-3	82552 SW-4	82553 SW-5
Alkalinity as CaCO3	mg/L	5	141	139	136	187	191
COD	mg/L	4	38	38	35	30	28
Ag	mg/L	0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Al	mg/L	0.05	0.13	0.11	0.11	<0.05	<0.05
B	mg/L	0.01	0.05	0.04	0.05	0.04	0.05
Ba	mg/L	0.01	0.04	0.05	0.04	0.05	0.05
Be	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ca	mg/L	1	42	40	39	51	53
Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cl	mg/L	1	52	49	50	12	13
Co	mg/L	0.0001	0.0003	0.0003	0.0004	0.0006	0.0006
Cr	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	mg/L	0.001	0.002	0.003	0.002	<0.001	0.001
DOC	mg/L	0.4	11.4	11.3	11.6	8.9	8.7
Fe	mg/L	0.01	0.18	0.54	0.14	0.39	0.41
Hardness as CaCO3	mg/L	1	150	145	143	173	182
Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mg	mg/L	1	11	11	11	11	12
Mn	mg/L	0.01	0.03	0.04	0.03	0.28	0.22
Mo	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ni	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
N-NH3	mg/L	0.02	0.08	0.05	0.11	5.95	5.47
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	1.90	1.75	1.83	0.27	0.38
Phenols	mg/L	0.001	0.002	0.001	0.001	0.001	<0.001
K	mg/L	1	5	5	5	5	6
Si	mg/L	0.01	3.55	4.27	3.33	7.42	7.52
Na	mg/L	2	42	42	39	11	13
Sr	mg/L	0.005	0.249	0.250	0.239	0.132	0.145
S	mg/L	1	9	9	9	11	12

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008804
Date: 2000-09-12
Date Submitted: 2000-08-09
Date Collected: 2000-08-08
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	82549 SW-1	82550 SW-2	82551 SW-3	82552 SW-4	82553 SW-5
SO4	mg/L	3	22	21	21	27	30
Tl	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ti	mg/L	0.01	<0.01	0.02	<0.01	<0.01	<0.01
TDS	mg/L	2	272	288	308	232	256
Total P	mg/L	0.01	0.17	0.19	0.20	0.56	0.51
V	mg/L	0.001	0.003	0.002	0.002	0.001	0.001
Zn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
O-PO4	mg/L	0.01	0.24	0.26	0.30	1.56	1.18

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008804
Date: 2000-09-12
Date Submitted: 2000-08-09
Date Collected: 2000-08-08
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	82554 SW-6	82555 SW-7	82556 SW-8		
Alkalinity as CaCO3	mg/L	5	204	514	7		
COD	mg/L	4	38	68	10		
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001		
Al	mg/L	0.05	<0.05	<0.05	<0.05		
B	mg/L	0.01	0.02	0.57	<0.01		
Ba	mg/L	0.01	0.04	0.12	<0.01		
Be	mg/L	0.002	<0.002	<0.002	<0.002		
Ca	mg/L	1	53	136	<1		
Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001		
Cl	mg/L	1	11	40	<1		
Co	mg/L	0.0001	0.0006	0.0004	<0.0001		
Cr	mg/L	0.01	<0.01	<0.01	<0.01		
Cu	mg/L	0.001	<0.001	<0.001	<0.001		
DOC	mg/L	0.4	10.4	25.3	<0.4		
Fe	mg/L	0.01	0.21	4.15	0.03		
Hardness as CaCO3	mg/L	1	186	463	<1		
Pb	mg/L	0.001	<0.001	<0.001	<0.001		
Mg	mg/L	1	13	30	<1		
Mn	mg/L	0.01	0.43	1.88	<0.01		
Mo	mg/L	0.01	<0.01	<0.01	<0.01		
Ni	mg/L	0.01	<0.01	<0.01	<0.01		
N-NH3	mg/L	0.02	7.07	0.34	0.15		
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10		
N-NO3	mg/L	0.10	0.33	0.14	<0.10		
Phenols	mg/L	0.001	0.002	<0.001	<0.001		
K	mg/L	1	4	9	<1		
Si	mg/L	0.01	8.25	10.2	<0.01		
Na	mg/L	2	11	59	<2		
Sr	mg/L	0.005	0.135	0.667	<0.005		
S	mg/L	1	9	10	<1		

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. John Miller

Report Number: 2008804
Date: 2000-09-12
Date Submitted: 2000-08-09
Date Collected: 2000-08-08
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	82554 SW-6	82555 SW-7	82556 SW-8		
SO4	mg/L	3	22	22	<3		
Tl	mg/L	0.001	<0.001	<0.001	<0.001		
Sn	mg/L	0.01	<0.01	<0.01	<0.01		
Ti	mg/L	0.01	<0.01	<0.01	<0.01		
TDS	mg/L	2	260	668	<2		
Total P	mg/L	0.01	0.73	0.32	<0.01		
V	mg/L	0.001	0.002	0.001	<0.001		
Zn	mg/L	0.01	<0.01	<0.01	<0.01		
O-PO4	mg/L	0.01	2.16	<0.01	<0.01		

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

APPENDIX B-II

FALL MONITORING SESSION

NOTES:

GW1 = P6-1
GW2 = P6-2
GW3 = P7-1
GW4 = P7-2
GW5 = P8-1
GW6 = P8-2
GW7 = P4-1
GW8 = P4-2
GW9 = P9-1
GW10 = P2-1
GW11 = P2-2
GW12 = P5-1
GW13 = P5-2
GW14 = G10-3
GW15 = G10-2
GW16 = G10-1
P20 = BLANK SAMPLE
SW1 = SW6
SW2 = SW4
SW3 = SW5
SW4 = SW1
SW5 = SW2
SW6 = SW3
SW7 = SW7

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012879
Date: 2000-11-22
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97702 GW1 P6-1	97703 GW2 P6-2	97704 Gw3 P7-1	97705 GW4 P7-2	97706 GW5 P8-1
Alkalinity as CaCO3	mg/L	5	153	18	170	60	168
COD	mg/L	4	11	11	19	5	11
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Al	mg/L	0.05	0.36	0.20	4.59	1.45	0.64
B	mg/L	0.01	<0.01	<0.01	0.08	<0.01	0.10
Ba	mg/L	0.01	0.05	<0.01	0.04	0.03	0.01
Be	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ca	mg/L	2	50	9	16	17	17
Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cl	mg/L	1	20	24	41	2	31
Co	mg/L	0.0002	0.0004	0.0002	0.0029	0.0010	0.0005
Cr	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	mg/L	0.001	<0.001	<0.001	0.007	0.004	0.002
DOC	mg/L	0.3	1.8	1.5	2.9	0.6	3.2
Fe	mg/L	0.01	1.17	0.20	4.78	1.30	0.74
Hardness as CaCO3	mg/L	1	179	35	89	67	100
Pb	mg/L	0.001	<0.001	<0.001	0.002	<0.001	<0.001
Mg	mg/L	1	13	3	12	6	14
Mn	mg/L	0.01	0.22	<0.01	0.12	0.03	0.02
Mo	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	0.02
Ni	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
N-NH3	mg/L	0.02	0.06	<0.02	<0.02	0.45	0.29
N-NO2	mg/L	0.1000	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	<0.10	<0.10	0.73	<0.10	0.43
Phenols	mg/L	0.00	<0.001	<0.001	<0.001	<0.001	<0.001
PO4	mg/L	0.03	<0.03	<0.03	0.54	0.05	0.46
K	mg/L	1.00	1	<1	5	2	6
Si	mg/L	0.01	12.0	4.04	9.52	8.05	6.13
Na	mg/L	2	10	13	69	<2	80
Sr	mg/L	0.003	0.092	0.090	0.138	0.038	0.129

MDL = Method Detection Limit INC = Incomplete

Comment:

This is a correction certificate and supercedes all previous copies of the report.
Total P and PO4 results have been changed.

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012879
Date: 2000-11-22
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97702 GW1	97703 GW2	97704 Gw3	97705 GW4	97706 GW5
SO4	mg/L	1	25	14	6	13	46
Tl	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ti	mg/L	0.01	0.02	0.01	0.08	0.05	0.03
TDS	mg/L	2	252	88	316	112	328
Total P	mg/L	0.01	1.24	1.72	2.05	7.96	0.21
V	mg/L	0.001	0.001	<0.001	0.011	0.004	0.004
Zn	mg/L	0.01	<0.01	<0.01	0.01	<0.01	<0.01
O-PO4	mg/L	0.03	<0.03	<0.03	0.54	0.05	0.46

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012879
Date: 2000-11-22
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97707 GW6 P8-2	97708 GW7 P4-1	97709 GW8 P4-2	97710 GW9 P9-1	97711 GW10 P2-1
Alkalinity as CaCO3	mg/L	5	745	628	430	64	140
COD	mg/L	4	68	57	38	16	46
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<<0.0001
Al	mg/L	0.05	0.17	0.43	0.05	3.89	2.02
B	mg/L	0.01	0.60	0.57	1.17	<0.01	0.02
Ba	mg/L	0.01	0.23	0.25	0.06	0.07	0.04
Be	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ca	mg/L	2	238	185	154	21	29
Cd	mg/L	0.0001	0.0001	0.0001	0.0001	<0.0001	<0.0001
Cl	mg/L	1	41	41	43	2	9
Co	mg/L	0.0002	0.0068	0.0051	0.0020	0.0022	0.0012
Cr	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	mg/L	0.001	0.082	0.006	0.009	0.005	0.001
DOC	mg/L	0.3	31.7	22.2	13.7	1.5	15.9
Fe	mg/L	0.01	0.19	1.74	0.08	3.93	2.03
Hardness as CaCO3	mg/L	1	743	623	476	90	122
Pb	mg/L	0.001	<0.001	<0.001	<0.001	0.002	<0.001
Mg	mg/L	1	36	39	22	9	12
Mn	mg/L	0.01	4.11	2.95	5.78	0.11	0.11
Mo	mg/L	0.01	0.01	<0.01	0.01	<0.01	<0.01
Ni	mg/L	0.01	0.02	0.01	<0.01	<0.01	<0.01
N-NH3	mg/L	0.02	0.03	0.12	0.04	0.12	0.37
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	<0.10	<0.10	4.88	<0.10	<0.10
Phenols	mg/L	0.00	<0.001	<0.001	<0.001	<0.001	<0.001
K	mg/L	1.00	6	7	4	3	2
Si	mg/L	0.01	20.2	10.5	2.38	8.94	10.1
Na	mg/L	2	52	68	44	5	19
Sr	mg/L	0.003	1.18	0.806	0.682	0.055	0.105
SO4	mg/L	1	19	63	68	17	12

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012879
Date: 2000-11-22
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97707 GW6	97708 GW7	97709 GW8	97710 GW9	97711 GW10
Tl	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ti	mg/L	0.01	<0.01	0.02	<0.01	0.10	0.07
TDS	mg/L	2	944	848	668	120	184
Total P	mg/L	0.01	10.9	16.3	4.84	0.06	10.1
V	mg/L	0.001	0.020	0.007	0.002	0.007	0.004
Zn	mg/L	0.01	<0.01	<0.01	<0.01	0.01	<0.01
O-PO4	mg/L	0.03	<0.03	<0.03	<0.03	0.18	0.11

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012879
Date: 2000-11-22
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97712 GW11 P2-2	97713 GW12 PS-1			
Alkalinity as CaCO3	mg/L	5	594	86			
COD	mg/L	4	11	8			
Ag	mg/L	0.0001	<0.0001	<0.0001			
Al	mg/L	0.05	0.40	0.48			
B	mg/L	0.01	0.19	<0.01			
Ba	mg/L	0.01	0.23	0.01			
Be	mg/L	0.002	<0.002	<0.002			
Ca	mg/L	2	215	19			
Cd	mg/L	0.0001	<0.0001	<0.0001			
Cl	mg/L	1	14	7			
Co	mg/L	0.0002	0.0007	0.0004			
Cr	mg/L	0.01	<0.01	<0.01			
Cu	mg/L	0.001	<0.001	0.002			
DOC	mg/L	0.3	2.3	2.0			
Fe	mg/L	0.01	0.97	0.51			
Hardness as CaCO3	mg/L	1	760	76			
Pb	mg/L	0.001	<0.001	<0.001			
Mg	mg/L	1	54	7			
Mn	mg/L	0.01	0.28	<0.01			
Mo	mg/L	0.01	<0.01	<0.01			
Ni	mg/L	0.01	<0.01	<0.01			
N-NH3	mg/L	0.02	0.36	0.37			
N-NO2	mg/L	0.1	<0.10	<0.10			
N-NO3	mg/L	0.10	<0.10	<0.10			
Phenols	mg/L	0.00	<0.001	<0.001			
K	mg/L	1.00	4	3			
Si	mg/L	0.01	6.82	7.73			
Na	mg/L	2	10	22			
Sr	mg/L	0.003	0.621	0.058			
SO4	mg/L	1	174	19			

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL: _____

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012879
Date: 2000-11-22
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97712 GW11	97713 GW12			
Tl	mg/L	0.001	<0.001	<0.001			
Sn	mg/L	0.01	<0.01	<0.01			
Ti	mg/L	0.01	0.03	0.02			
TDS	mg/L	2	880	160			
Total P	mg/L	0.01	15.6	0.27			
V	mg/L	0.001	0.007	0.002			
Zn	mg/L	0.01	<0.01	0.04			
O-PO4	mg/L	0.03	<0.03	0.10			

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012879
Date: 2000-11-17
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97708 GW7	97709 GW8			
BTEX / 624 / PURGEABLE HYDROCARBONS							
Benzene	µg/L	0.5	0.8	<0.5			
Toluene	µg/L	0.5	<0.5	<0.5			
Ethylbenzene	µg/L	0.5	<0.5	<0.5			
m/p-Xylene	µg/L	1.0	<1.0	<1.0			
o-Xylene	µg/L	0.5	<0.5	<0.5			
Bromodichloromethane	µg/L	0.3	<0.3	<0.3			
Bromoform	µg/L	0.4	<0.4	<0.4			
Bromomethane	µg/L	0.5	<0.5	<0.5			
Carbon Tetrachloride	µg/L	0.9	<0.9	<0.9			
Monochlorobenzene	µg/L	0.2	<0.2	<0.2			
Chloroethane	µg/L	1.0	<1.0	<1.0			
Chloroform	µg/L	0.5	<0.5	<0.5			
Chloromethane	µg/L	1.0	<1.0	<1.0			
Dibromochloromethane	µg/L	0.3	<0.3	<0.3			
1,2-Dibromoethane	µg/L	1.0	<1.0	<1.0			
1,2-Dichlorobenzene	µg/L	0.4	<0.4	<0.4			
1,3-Dichlorobenzene	µg/L	0.4	<0.4	<0.4			
1,4-Dichlorobenzene	µg/L	0.4	<0.4	<0.4			
1,1-Dichloroethane	µg/L	0.4	<0.4	<0.4			
1,2-Dichloroethane	µg/L	0.7	<0.7	<0.7			
1,1-Dichloroethylene	µg/L	0.5	<0.5	<0.5			
c-1,2-Dichloroethylene	µg/L	0.4	6.0	<0.4			
t-1,2-Dichloroethylene	µg/L	0.4	<0.4	<0.4			
1,2-Dichloropropane	µg/L	0.7	<0.7	<0.7			
c-1,3-Dichloropropylene	µg/L	0.2	<0.2	<0.2			
t-1,3-Dichloropropylene	µg/L	0.2	<0.2	<0.2			
Dichloromethane	µg/L	4.0	<4.0	<4.0			
Styrene	µg/L	0.5	<0.5	<0.5			
1,1,1,2-Tetrachloroethane	µg/L	0.6	<0.6	<0.6			

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012879
Date: 2000-11-17
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97708 GW7	97709 GW8			
1,1,2,2-Tetrachloroethane	µg/L	0.6	<0.6	<0.6			
Tetrachloroethylene	µg/L	0.3	<0.3	<0.3			
1,1,1-Trichloroethane	µg/L	0.4	<0.4	<0.4			
1,1,2-Trichloroethane	µg/L	0.4	<0.4	<0.4			
Trichlorethylene	µg/L	0.3	<0.3	<0.3			
Trichlorofluoromethane	µg/L	0.5	<0.5	<0.5			
1,3,5-Trimethylbenzene	µg/L	0.3	<0.3	<0.3			
Vinyl Chloride	µg/L	0.5	<0.5	<0.5			
BTEX / 624 Surrogate Recoveries							
Toluene-d8	%		88	89			
1,2-Dichloroethane-d4	%		113	117			
4-Bromofluorobenzene	%		110	110			

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012880
Date: 2000-11-17
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97715 GW 14	97716 GW 15	97717 GW 16		
BTEX / 624 / PURGEABLE HYDROCARBONS							
Benzene	µg/L	0.5	<0.5	<0.5	<0.5		
Toluene	µg/L	0.5	<0.5	<0.5	<0.5		
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5		
m/p-Xylene	µg/L	1.0	<0.5	<0.5	<0.5		
o-Xylene	µg/L	0.5	<0.5	<0.5	<0.5		
Bromodichloromethane	µg/L	0.3	<0.3	<0.3	<0.3		
Bromoform	µg/L	0.4	<0.4	<0.4	<0.4		
Bromomethane	µg/L	0.5	<0.5	<0.5	<0.5		
Carbon Tetrachloride	µg/L	0.9	<0.9	<0.9	<0.9		
Monochlorobenzene	µg/L	0.2	<0.2	<0.2	<0.2		
Chloroethane	µg/L	1.0	<1.0	<1.0	<1.0		
Chloroform	µg/L	0.5	0.7	1.3	1.0		
Chloromethane	µg/L	1.0	<1.0	<1.0	<1.0		
Dibromochloromethane	µg/L	0.3	<0.3	<0.3	<0.3		
1,2-Dibromoethane	µg/L	1.0	<0.5	<0.5	<0.5		
1,2-Dichlorobenzene	µg/L	0.4	<0.4	<0.4	<0.4		
1,3-Dichlorobenzene	µg/L	0.4	<0.4	<0.4	<0.4		
1,4-Dichlorobenzene	µg/L	0.4	<0.4	<0.4	<0.4		
1,1-Dichloroethane	µg/L	0.4	<0.4	<0.4	<0.4		
1,2-Dichloroethane	µg/L	0.7	<0.7	<0.7	<0.7		
1,1-Dichloroethylene	µg/L	0.5	<0.5	<0.5	<0.5		
c-1,2-Dichloroethylene	µg/L	0.4	<0.4	<0.4	<0.4		
t-1,2-Dichloroethylene	µg/L	0.4	<0.4	<0.4	<0.4		
1,2-Dichloropropane	µg/L	0.7	<0.7	<0.7	<0.7		
c-1,3-Dichloropropylene	µg/L	0.2	<0.2	<0.2	<0.2		
t-1,3-Dichloropropylene	µg/L	0.2	<0.2	<0.2	<0.2		
Dichloromethane	µg/L	4.0	<4.0	<4.0	<4.0		
Styrene	µg/L	0.5	<0.5	<0.5	<0.5		
1,1,1,2-Tetrachloroethane	µg/L	0.6	<0.6	<0.6	<0.6		

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012880
Date: 2000-11-17
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97715 GW 14	97716 GW 15	97717 GW 16		
1,1,2,2-Tetrachloroethane	µg/L	0.6	<0.6	<0.6	<0.6		
Tetrachloroethylene	µg/L	0.3	<0.3	0.3	<0.3		
1,1,1-Trichloroethane	µg/L	0.4	<0.4	<0.4	<0.4		
1,1,2-Trichloroethane	µg/L	0.4	<0.4	<0.4	<0.4		
Trichlorethylene	µg/L	0.3	<0.3	<0.3	<0.3		
Trichlorofluoromethane	µg/L	0.5	<0.5	<0.5	<0.5		
1,3,5-Trimethylbenzene	µg/L	0.3	<0.3	<0.3	<0.3		
Vinyl Chloride	µg/L	0.5	<0.5	<0.5	<0.5		
BTEX / 624 Surrogate Recoveries							
Toluene-d8	%		89	89	88		
1,2-Dichloroethane-d4	%		120	120	124		
4-Bromofluorobenzene	%		109	109	109		

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012880
Date: 2000-11-21
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97714 GW13 P5-2	97715 GW 14 G10-00-3	97716 GW 15 G10-00-2	97717 GW 16 G10-00-1	97718 P20 blank
Alkalinity as CaCO3	mg/L	5	31	95	80	100	<5
COD	mg/L	4	11	8	11	11	5
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Al	mg/L	0.05	1.37	1.78	1.78	3.56	<0.05
B	mg/L	0.01	0.02	<0.01	<0.01	0.03	<0.01
Ba	mg/L	0.01	0.02	0.03	0.04	0.04	<0.01
Be	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Ca	mg/L	2	12	6	23	18	<2
Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cl	mg/L	1	<1	5	4	16	<1
Co	mg/L	0.0002	0.0008	0.0014	0.0011	0.0022	<0.0002
Cr	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	mg/L	0.001	<0.001	0.006	0.002	0.005	<0.001
DOC	mg/L	0.3	3.2	1.7	1.1	1.8	<0.3
Fe	mg/L	0.01	1.42	1.46	1.72	3.65	<0.01
Hardness as CaCO3	mg/L	1	42	19	86	74	<1
Pb	mg/L	0.001	<0.001	0.001	<0.001	0.001	<0.001
Mg	mg/L	1	3	1	7	7	<1
Mn	mg/L	0	0.07	0.04	0.09	0.12	<0.01
Mo	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ni	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
N-NH3	mg/L	0.02	0.03	0.18	0.24	0.21	0.04
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	2.15	3.02	<0.10	<0.10	<0.10
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
K	mg/L	1	2	1	2	4	<1
Si	mg/L	0.01	9.78	6.41	9.49	9.97	<0.01
Na	mg/L	2	5	40	8	35	<2
Sr	mg/L	0.003	0.071	0.027	0.063	0.079	<0.003
SO4	mg/L	1	9	17	25	27	<1

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012880
Date: 2000-11-21
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Ground Water

PARAMETER	UNITS	MDL	97714 GW13	97715 GW 14	97716 GW 15	97717 GW 16	97718 P20
Tl	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ti	mg/L	0.01	0.05	0.04	0.06	0.08	<0.01
TDS	mg/L	2	76	180	144	256	<2
Total P	mg/L	0.01	0.04	0.15	0.30	0.18	<0.01
V	mg/L	0.001	0.003	0.010	0.003	0.006	<0.001
Zn	mg/L	0.01	<0.01	0.01	<0.01	0.01	<0.01
O-PO4	mg/L	0.03	0.05	0.28	0.05	0.20	<0.03

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012808
Date: 2000-11-24
Date Submitted: 2000-11-03
Date Collected: 2000-11-01
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	97459 SW-1 SW 6	97460 SW-2 SW 4	97461 SW-3 SW 5		
Alkalinity as CaCO3	mg/L	5	148	156	163		
COD	mg/L	4	22	17	30		
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001		
Al	mg/L	0.05	<0.05	<0.05	<0.05		
B	mg/L	0.01	<0.01	0.03	0.05		
Ba	mg/L	0.01	0.02	0.03	0.05		
Be	mg/L	0.002	<0.002	<0.002	<0.002		
Ca	mg/L	2	39	44	47		
Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001		
Cl	mg/L	1	2	4	7		
Co	mg/L	0.0002	0.0003	<0.0002	0.0008		
Cr	mg/L	0.01	<0.01	<0.01	<0.01		
Cu	mg/L	0.001	<0.001	<0.001	0.002		
DOC	mg/L	0.3	4.5	5.6	6.8		
Fe	mg/L	0.01	0.06	0.96	2.14		
Hardness as CaCO3	mg/L	1	151	155	171		
Pb	mg/L	0.001	<0.001	<0.001	<0.001		
Mg	mg/L	1	13	11	13		
Mn	mg/L	0.01	0.03	0.07	0.28		
Mo	mg/L	0.01	<0.01	0.01	<0.01		
Ni	mg/L	0.01	<0.01	<0.01	<0.01		
N-NH3	mg/L	0.02	0.70	0.31	0.35		
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10		
N-NO3	mg/L	0.10	<0.10	<0.10	0.20		
Phenols	mg/L	0.001	<0.001	<0.001	<0.001		
K	mg/L	1	1	2	4		
Si	mg/L	0.01	7.59	7.51	7.59		
Na	mg/L	2	4	9	10		
Sr	mg/L	0.003	0.085	0.101	0.127		
SO4	mg/L	1	10	16	21		

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012808
Date: 2000-11-24
Date Submitted: 2000-11-03
Date Collected: 2000-11-01
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	97459 SW-1	97460 SW-2	97461 SW-3		
Tl	mg/L	0.001	<0.001	<0.001	<0.001		
Sn	mg/L	0.01	<0.01	<0.01	<0.01		
Ti	mg/L	0.01	<0.01	<0.01	0.02		
TDS	mg/L	2	216	248	256		
Total P	mg/L	0.01	0.01	0.09	0.25		
V	mg/L	0.001	<0.001	0.002	0.003		
Zn	mg/L	0.01	<0.01	<0.01	<0.01		
O-PO4	mg/L	0.03	<0.03	<0.03	<0.03		

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012881
Date: 2000-11-29
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	97719 SW4 SW1	97720 SW5 SW2	97721 SW6 SW3	97722 SW7 SW7	
Alkalinity as CaCO3	mg/L	5	228	223	171	534	
COD	mg/L	4	38	35	21	45	
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Al	mg/L	0.05	0.31	<0.05	<0.05	1.08	
B	mg/L	0.01	0.03	0.03	0.03	0.57	
Ba	mg/L	0.01	0.06	0.06	0.05	5.17	
Be	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	
Ca	mg/L	2	66	66	64	142	
Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001	0.0003	
Cl	mg/L	1	104	104	96	43	
Co	mg/L	0.0002	0.0003	0.0002	<0.0002	0.0029	
Cr	mg/L	0.01	<0.01	<0.01	<0.01	0.01	
Cu	mg/L	0.001	0.001	<0.001	<0.001	0.011	
DOC	mg/L	0.3	7.5	7.9	7.4	16.9	
Fe	mg/L	0.01	0.41	0.41	0.41	47.4	
Hardness as CaCO3	mg/L	1	260	256	246	487	
Pb	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	
Mg	mg/L	1	23	22	21	32	
Mn	mg/L	0	0.04	0.04	0.04	29.8	
Mo	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	
Ni	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	
N-NH3	mg/L	0.02	0.04	0.03	0.08	0.85	
N-NO2	mg/L	0.10	<0.10	<0.10	<0.10	<0.10	
N-NO3	mg/L	0.10	1.39	1.37	1.27	0.46	
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	
K	mg/L	1	4	4	4	8	
Si	mg/L	0.01	3.52	3.60	3.77	26.7	
Na	mg/L	2	71	66	63	63	
Sr	mg/L	0.003	0.380	0.380	0.356	3.02	
SO4	mg/L	1	30	30	29	27	

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: J. Reuck

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012881
Date: 2000-11-29
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	97719 SW4	97720 SW5	97721 SW6	97722 SW7	
Tl	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	
Sn	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	
Ti	mg/L	0.01	0.01	0.02	0.01	<0.01	
TDS	mg/L	2	472	464	388	680	
Total P	mg/L	0.01	0.06	0.03	0.02	0.02	
V	mg/L	0.001	0.002	<0.001	<0.001	0.002	
Zn	mg/L	0.01	<0.01	<0.01	<0.01	0.09	
O-PO4	mg/L	0.03	<0.03	<0.03	<0.03	<0.03	
Conductivity	mg/L	5				1080	
pH						7.44	

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012881
Date: 2000-11-17
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	97719 SW4	97721 SW6			
BTEX / 624 / PURGEABLE HYDROCARBONS							
Benzene	µg/L	0.5	<0.5	<0.5			
Toluene	µg/L	0.5	<0.5	<0.5			
Ethylbenzene	µg/L	0.5	<0.5	<0.5			
m/p-Xylene	µg/L	1.0	<1.0	<1.0			
o-Xylene	µg/L	0.5	<0.5	<0.5			
Bromodichloromethane	µg/L	0.3	<0.3	<0.3			
Bromoform	µg/L	0.4	<0.4	<0.4			
Bromomethane	µg/L	0.5	<0.5	<0.5			
Carbon Tetrachloride	µg/L	0.9	<0.9	<0.9			
Monochlorobenzene	µg/L	0.2	<0.2	<0.2			
Chloroethane	µg/L	1.0	<1.0	<1.0			
Chloroform	µg/L	0.5	2.1	<0.5			
Chloromethane	µg/L	1.0	<1.0	<1.0			
Dibromochloromethane	µg/L	0.3	<0.3	<0.3			
1,2-Dibromoethane	µg/L	1.0	<1.0	<1.0			
1,2-Dichlorobenzene	µg/L	0.4	<0.4	<0.4			
1,3-Dichlorobenzene	µg/L	0.4	<0.4	<0.4			
1,4-Dichlorobenzene	µg/L	0.4	<0.4	<0.4			
1,1-Dichloroethane	µg/L	0.4	<0.4	<0.4			
1,2-Dichloroethane	µg/L	0.7	<0.7	<0.7			
1,1-Dichloroethylene	µg/L	0.5	<0.5	<0.5			
c-1,2-Dichloroethylene	µg/L	0.4	<0.4	<0.4			
t-1,2-Dichloroethylene	µg/L	0.4	<0.4	<0.4			
1,2-Dichloropropane	µg/L	0.7	<0.7	<0.7			
c-1,3-Dichloropropylene	µg/L	0.2	<0.2	<0.2			
t-1,3-Dichloropropylene	µg/L	0.2	<0.2	<0.2			
Dichloromethane	µg/L	4.0	<4.0	<4.0			
Styrene	µg/L	0.5	<0.5	<0.5			
1,1,1,2-Tetrachloroethane	µg/L	0.6	<0.6	<0.6			

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: APPROVAL:

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ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2012881
Date: 2000-11-17
Date Submitted: 2000-11-03
Date Collected: 2000-11-03
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	97719 SW4	97721 SW6			
1,1,2,2-Tetrachloroethane	µg/L	0.6	<0.6	<0.6			
Tetrachloroethylene	µg/L	0.3	<0.3	<0.3			
1,1,1-Trichloroethane	µg/L	0.4	<0.4	<0.4			
1,1,2-Trichloroethane	µg/L	0.4	<0.4	<0.4			
Trichlorethylene	µg/L	0.3	<0.3	<0.3			
Trichlorofluoromethane	µg/L	0.5	<0.5	<0.5			
1,3,5-Trimethylbenzene	µg/L	0.3	<0.3	<0.3			
Vinyl Chloride	µg/L	0.5	<0.5	<0.5			
BTEX / 624 Surrogate Recoveries							
Toluene-d8	%		89	88			
1,2-Dichloroethane-d4	%		128	120			
4-Bromofluorobenzene	%		110	110			

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

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APPENDIX B-III

WINTER MONITORING SESSION

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2015118
Date: 2001-01-11
Date Submitted: 2000-12-27
Date Collected: 2000-12-23
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	106889 SW3				
Alkalinity as CaCO3	mg/L	5	165				
COD	mg/L	4	45				
Ag	mg/L	0.0001	<0.0001				
Al	mg/L	0.05	0.38				
B	mg/L	0.01	0.02				
Ba	mg/L	0.01	0.05				
Be	mg/L	0.002	<0.002				
Ca	mg/L	2	48				
Cd	mg/L	0.0001	<0.0001				
Cl	mg/L	1	97				
Co	mg/L	0.0002	0.0005				
Cr	mg/L	0.01	<0.01				
Cu	mg/L	0.001	0.002				
DOC	mg/L	0.3	9.2				
Fe	mg/L	0.01	0.61				
Hardness as CaCO3	mg/L	1	182				
Pb	mg/L	0.001	<0.001				
Mg	mg/L	1	15				
Mn	mg/L	0.01	0.15				
Mo	mg/L	0.01	<0.01				
Ni	mg/L	0.01	<0.01				
N-NH3	mg/L	0.02	0.20				
N-NO2	mg/L	0.10	<0.10				
N-NO3	mg/L	0.10	1.36				
Phenols	mg/L	0.001	<0.001				
K	mg/L	1	3				
Si	mg/L	0.01	4.73				
Na	mg/L	2	61				
Sr	mg/L	0.003	0.330				
SO4	mg/L	1	28				

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Golder Associates Ltd.

ATT: Mr. Andrew Harwood

Report Number: 2015118
Date: 2001-01-11
Date Submitted: 2000-12-27
Date Collected: 2000-12-23
Project: 001-2782

P.O. Number:
Matrix: Surfacewater

PARAMETER	UNITS	MDL	106889 SW3				
Tl	mg/L	0.001	<0.001				
Sn	mg/L	0.01	<0.01				
Ti	mg/L	0.01	0.01				
TDS	mg/L	2	404				
Total P	mg/L	0.01	0.05				
V	mg/L	0.001	0.002				
Zn	mg/L	0.01	<0.01				
O-PO4	mg/L	0.03	0.05				

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL:

146 Colonnade Road, Unit 8, Nepean, Ontario, K2E 7Y1 Tel:(613)727-5692 Fax:(613)727-5222

APPENDIX C

RESULTS OF FIELD AND LABORATORY CHEMICAL AND PHYSICAL ANALYSES

APPENDIX C-I - GROUNDWATER MONITORS
APPENDIX C-II - SURFACE WATER SAMPLING STATIONS

APPENDIX C-I

GROUNDWATER MONITORS

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:

ODWS/O	Ontario Drinking Water Standards (Ministry of the Environment, 2000)
PWQO	Provincial Water Quality Objective (Ministry of the Environment, 1994b (Reprint 1999)) (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	*Escherichia coli*
TOC	total organic carbon
TS	total solids
TSS	total suspended solids
TDS	total dissolved solids
TC	total coliform
FC	fecal coliform
FS	fecal 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
*	See Ministry of Environment and Energy (2000) for narrative guideline

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P2-1**

Sheet: 1

Date Sampled:		19-Nov-1991	03-Dec-1997	21-Apr-1998	14-May-1999	02-Sep-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	126	111	105	136	123
Aluminum	0.1		0.130	0.080	<0.030	<0.030
Ammonia (as N)			0.14	0.19	0.53	0.30
Antimony			<0.1000	<0.1000		
Arsenic	0.025	<0.001	<0.100	<0.100		
Barium	1	0.990	0.017	0.015	<0.010	0.020
Beryllium			<0.001	<0.001	<0.010	<0.010
Bicarbonate				1.00		
Bismuth			<0.100	<0.100		
Boron	5	0.110	0.030	0.020	<0.010	<0.010
Bromide			0.05	<0.50		
Cadmium	0.005	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		21.0	23.7	22.8	26.0	25.0
Carbonate			135.20	125.60		
Chloride	250	7.2	10.9	7.2	8.0	8.0
Chromium	0.05	0.510	<0.005	<0.005	<0.010	<0.010
Cobalt			<0.0050	<0.0050	<0.0100	<0.0100
COD		39	6	9	10	<3
Colour (TCU)	5	451	116	2030		
Conductivity (uS/cm)		244	267	249	150	240
Copper	1	0.5100	0.0050	<0.0030	<0.0050	<0.0050
Cyanide	0.2	0.100				
DOC	5	1.8	1.7	1.0	2.5	1.9
Fluoride	1.5	0.30	0.30	<0.10		
Hardness (CaCO3)	80-100		94	93	110	104
Hydrogen Sulphide	0.05	<0.02				
Iron	0.3	236.00	0.05	0.15	0.05	0.03
Lead	0.01	0.2400			<0.0020	<0.0020
Magnesium			8.53	8.79	11.00	10.00
Manganese	0.05	4.440	0.044	0.061	0.060	0.060
Mercury	0.001	<0.0001				
Molybdenum			<0.010	<0.010	<0.010	<0.010
Nickel		0.060	<0.020	<0.020	<0.010	<0.010
Nitrate (as N)	10	<0.10	0.09	<0.20	0.10	<0.10
Nitrite (as N)	1	0.06	<0.02	<0.20	<0.10	<0.10
Organic Nitrogen	0.15	<0.10				
pH (pH units)	6.5-8.5	7.5	8.2	8.0	7.8	7.2
Phenols		<0.002			<0.001	<0.001
Phosphate (as P)			<0.10	<1.00	0.27	0.13
Phosphorus (total)		0.24	0.97	6.40	8.38	
Potassium			3.0	<1.0	3.0	3.0
Selenium		<0.001	<0.100	<0.100		
Silicon					7.70	8.00
Silver		<0.0500	<0.0030	0.0050	<0.0100	0.0200
Sodium	200	23.0	25.3	15.1	20.0	21.0
Strontium			0.083	0.068	0.085	0.085
Sulphate	500	16.4	16.6	16.2	10.0	10.0
Sulphur			6	5	5	4
TDS	500	364	155	134	176	148
Temperature (C)	15				8.5	9.5
Thallium					<0.20000	<0.50000
Tin			<0.050	<0.050	<0.050	<0.050
Titanium			<0.005	0.006	<0.010	<0.010
TOC		2				
Turbidity (NTU)	1	306.0	67.0	49.0		
Vanadium			<0.0050	<0.0050	<0.0100	<0.0100
Zinc	5	0.610	0.019	<0.005	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P2-1**

Date Sampled:		19-Oct-1999	03-Nov-2000
Parameter	ODWS/O		
Alkalinity (CaCO3)	30-500	128	140
Aluminum	0.1	<0.030	2.020
Ammonia (as N)		0.27	0.37
Antimony			
Arsenic	0.025		
Barium	1	NA	0.040
Beryllium		<0.010	<0.002
Bicarbonate			
Bismuth			
Boron	5	NA	0.020
Bromide			
Cadmium	0.005	<0.00500	<0.00010
Calcium		24.0	29.0
Carbonate			
Chloride	250	7.0	9.0
Chromium	0.05	<0.010	<0.010
Cobalt		<0.0100	0.0012
COD		8	46
Colour (TCU)	5		
Conductivity (uS/cm)		195	383
Copper	1	<0.0050	0.0010
Cyanide	0.2		
DOC	5	2.3	15.9
Fluoride	1.5		
Hardness (CaCO3)	80-100	97	122
Hydrogen Sulphide	0.05		
Iron	0.3	0.02	2.03
Lead	0.01	<0.0020	<0.0010
Magnesium		9.00	12.00
Manganese	0.05	0.050	0.110
Mercury	0.001		
Molybdenum		<0.010	<0.010
Nickel		<0.010	<0.010
Nitrate (as N)	10	0.18	<0.10
Nitrite (as N)	1	<0.10	<0.10
Organic Nitrogen	0.15		
pH (pH units)	6.5-8.5	8.2	7.6
Phenols		<0.001	<0.001
Phosphate (as P)		0.51	0.11
Phosphorus (total)		2.91	10.10
Potassium		3.0	2.0
Selenium			
Silicon		8.30	10.10
Silver		<0.0100	0.0001
Sodium	200	20.0	19.0
Strontium		0.089	0.105
Sulphate	500	8.0	12.0
Sulphur		3	4
TDS	500	156	184
Temperature (C)	15	3.0	9.5
Thallium		<0.20000	<0.00100
Tin		<0.050	<0.010
Titanium		<0.010	0.070
TOC			
Turbidity (NTU)	1		
Vanadium		<0.0100	0.0040
Zinc	5	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

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LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P2-2** Sheet: 1

Date Sampled:		19-Nov-1991	03-Dec-1997	21-Apr-1998	14-May-1999	02-Sep-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	104	121	194	211	235
Aluminum	0.1		0.360	0.060	<0.030	<0.030
Ammonia (as N)			0.03	0.06	0.39	0.09
Antimony			<0.1000	<0.1000		
Arsenic	0.025	<0.001	<0.100	<0.100		
Barium	1	4.080	0.079	0.076	0.080	0.110
Beryllium			<0.001	<0.001	<0.010	<0.010
Bicarbonate				1.00		
Bismuth			<0.100	<0.100		
Boron	5	0.070	0.040	0.200	0.150	0.030
Bromide			<0.05	<0.50		
Cadmium	0.005	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		31.0	36.4	63.5	71.0	88.0
Carbonate			147.30	234.10		
Chloride	250	5.4	3.7	3.3	12.0	31.0
Chromium	0.05	0.210	<0.005	<0.005	<0.010	<0.010
Cobalt			<0.0050	<0.0050	<0.0100	<0.0100
COD		24	<5	10	19	40
Colour (TCU)	5	278	4	1010		
Conductivity (uS/cm)		244	281	440	255	410
Copper	1	0.1600	<0.0030	<0.0030	<0.0050	<0.0050
Cyanide	0.2	0.020				
DOC	5	4.2	1.3	3.0	8.0	19.2
Fluoride	1.5	0.24	<0.10	<0.10		
Hardness (CaCO3)	80-100		134	232	255	314
Hydrogen Sulphide	0.05	<0.02				
Iron	0.3	97.00	0.49	0.32	0.06	0.17
Lead	0.01	0.0800			<0.0020	<0.0020
Magnesium			10.40	17.80	19.00	23.00
Manganese	0.05	2.230	0.050	0.650	0.050	0.090
Mercury	0.001	<0.0001				
Molybdenum			<0.010	<0.010	<0.010	<0.010
Nickel		<0.050	<0.020	<0.020	<0.010	<0.010
Nitrate (as N)	10	<0.01	<0.02	<0.20	0.10	<0.10
Nitrite (as N)	1	0.01	<0.02	<0.20	<0.10	<0.10
Organic Nitrogen	0.15	<0.10				
pH (pH units)	6.5-8.5	7.6	7.9	7.8	7.7	6.9
Phenols		<0.002			<0.001	0.040
Phosphate (as P)			<0.10	<1.00	0.15	<0.01
Phosphorus (total)		0.28	0.33	28.00	16.90	
Potassium			2.0	2.0	3.0	2.0
Selenium		<0.001	<0.100	<0.100		
Silicon					4.80	6.90
Silver		<0.0500	<0.0030	0.0050	<0.0100	0.0200
Sodium	200	5.0	6.2	4.9	14.0	7.0
Strontium			0.063	0.102	0.119	0.154
Sulphate	500	46.0	23.3	42.5	55.0	21.0
Sulphur			8	15	16	8
TDS	500	148	155	250	320	348
Temperature (C)	15				8.0	11.0
Thallium					<0.20000	<0.50000
Tin			<0.050	<0.050	<0.050	<0.050
Titanium			0.018	<0.005	<0.010	<0.010
TOC		6				
Turbidity (NTU)	1	143.0	3.6	2.0		
Vanadium			0.0090	<0.0050	0.0200	<0.0100
Zinc	5	0.320	<0.005	<0.005	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P2-2**

Date Sampled:		19-Oct-1999	03-Nov-2000
Parameter	ODWS/O		
Alkalinity (CaCO3)	30-500	289	594
Aluminum	0.1	<0.030	0.400
Ammonia (as N)		0.08	0.36
Antimony			
Arsenic	0.025		
Barium	1	NA	0.230
Beryllium		<0.010	<0.002
Bicarbonate			
Bismuth			
Boron	5	NA	0.190
Bromide			
Cadmium	0.005	<0.00500	<0.00010
Calcium		87.0	215.0
Carbonate			
Chloride	250	26.0	14.0
Chromium	0.05	<0.010	<0.010
Cobalt		<0.0100	0.0007
COD		54	11
Colour (TCU)	5		
Conductivity (uS/cm)		350	1400
Copper	1	<0.0050	<0.0010
Cyanide	0.2		
DOC	5	18.0	2.3
Fluoride	1.5		
Hardness (CaCO3)	80-100	312	760
Hydrogen Sulphide	0.05		
Iron	0.3	0.06	0.97
Lead	0.01	<0.0020	<0.0010
Magnesium		23.00	54.00
Manganese	0.05	0.070	0.280
Mercury	0.001		
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
Organic Nitrogen	0.15		
pH (pH units)	6.5-8.5	7.5	6.7
Phenols		0.038	<0.001
Phosphate (as P)		<0.03	<0.03
Phosphorus (total)		0.88	15.60
Potassium		2.0	4.0
Selenium			
Silicon		6.30	6.82
Silver		<0.0100	<0.0001
Sodium	200	9.0	10.0
Strontium		0.180	0.621
Sulphate	500	19.0	174.0
Sulphur		7	58
TDS	500	356	880
Temperature (C)	15	5.0	9.9
Thallium		<0.20000	<0.00100
Tin		<0.050	<0.010
Titanium		<0.010	0.030
TOC			
Turbidity (NTU)	1		
Vanadium		<0.0100	0.0070
Zinc	5	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

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LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P3-1** Sheet: 1

Date Sampled:		31-Oct-1991	14-May-1999	02-Sep-1999	19-Oct-1999	03-Nov-2000
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	274	50	NS	NS	DRY
Aluminum	0.1		0.030			
Ammonia (as N)			0.34			
Arsenic	0.025	0.008				
Barium	1	0.460	0.050			
Beryllium			<0.010			
Boron	5	0.170	0.130			
Cadmium	0.005	<0.00500	<0.00500			
Calcium		92.0	21.0			
Chloride	250	165.0	21.0			
Chromium	0.05	<0.050	<0.010			
Cobalt			<0.0100			
COD		23	14			
Colour (TCU)	5	11				
Conductivity (uS/cm)		1057	160			
Copper	1	0.1100	<0.0050			
Cyanide	0.2	<0.005				
DOC	5	5.0	3.9			
Fluoride	1.5	0.50				
Hardness (CaCO3)	80-100		73			
Hydrogen Sulphide	0.05	<0.02				
Iron	0.3	14.10	0.05			
Lead	0.01	0.1100	<0.0020			
Magnesium			5.00			
Manganese	0.05	1.600	0.180			
Mercury	0.001	<0.0001				
Molybdenum			<0.010			
Nickel		0.070	<0.010			
Nitrate (as N)	10	1.39	0.55			
Nitrite (as N)	1	0.01	<0.10			
Organic Nitrogen	0.15	<0.10				
pH (pH units)	6.5-8.5	7.4	6.0			
Phenols		<0.002	<0.001			
Phosphate (as P)			<0.03			
Phosphorus (total)		2.09	8.91			
Potassium			6.0			
Selenium		<0.001				
Silicon			5.40			
Silver		<0.0500	<0.0100			
Sodium	200	56.0	17.0			
Strontium			0.191			
Sulphate	500	72.0	48.0			
Sulphur			14			
TDS	500	624	160			
Temperature (C)	15		10.0			
Thallium			<0.20000			
Tin			<0.050			
Titanium			<0.010			
TOC		7				
Turbidity (NTU)	1	2.2				
Vanadium			<0.0100			
Zinc	5	0.380	<0.010			

All values reported in mg/L unless otherwise noted.

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LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P3-2** Sheet: 1

Date Sampled:		31-Oct-1991	21-Apr-1998	14-May-1999	02-Sep-1999	19-Oct-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	116	81	NS	NS	NS
Aluminum	0.1		0.750			
Ammonia (as N)			<0.02			
Antimony			<0.1000			
Arsenic	0.025	0.008	<0.100			
Barium	1	0.750	0.048			
Beryllium			<0.001			
Bicarbonate			1.00			
Bismuth			<0.100			
Boron	5	0.080	0.170			
Bromide			<0.50			
Cadmium	0.005	0.00600	<0.00500			
Calcium		69.0	25.1			
Carbonate			96.30			
Chloride	250	238.0	12.5			
Chromium	0.05	<0.050	<0.005			
Cobalt			<0.0050			
COD		6	18			
Colour (TCU)	5	7	7640			
Conductivity (uS/cm)		1010	264			
Copper	1	0.0800	<0.0030			
Cyanide	0.2	<0.005				
DOC	5	1.9	3.1			
Fluoride	1.5	0.59	<0.10			
Hardness (CaCO3)	80-100		86			
Hydrogen Sulphide	0.05	<0.02				
Iron	0.3	8.78	0.27			
Lead	0.01	<0.0500				
Magnesium			5.56			
Manganese	0.05	1.880	0.357			
Mercury	0.001	<0.0001				
Molybdenum			0.010			
Nickel		<0.050	<0.020			
Nitrate (as N)	10	2.68	0.60			
Nitrite (as N)	1	<0.01	<0.20			
Organic Nitrogen	0.15	0.28				
pH (pH units)	6.5-8.5	7.2	6.3			
Phenols		<0.002				
Phosphate (as P)			<1.00			
Phosphorus (total)		1.02	46.00			
Potassium			4.0			
Selenium		<0.001	<0.100			
Silver		<0.0500	0.0050			
Sodium	200	91.0	16.5			
Strontium			0.224			
Sulphate	500	72.0	31.4			
Sulphur			11			
TDS	500	564	144			
Tin			<0.050			
Titanium			0.020			
TOC		10				
Turbidity (NTU)	1	1.9	1.3			
Vanadium			<0.0050			
Zinc	5	<0.050	<0.005			

All values reported in mg/L unless otherwise noted.

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LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P3-2**

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
Alkalinity (CaCO3)	30-500	DRY
Aluminum	0.1	
Ammonia (as N)		
Antimony		
Arsenic	0.025	
Barium	1	
Beryllium		
Bicarbonate		
Bismuth		
Boron	5	
Bromide		
Cadmium	0.005	
Calcium		
Carbonate		
Chloride	250	
Chromium	0.05	
Cobalt		
COD		
Colour (TCU)	5	
Conductivity (uS/cm)		
Copper	1	
Cyanide	0.2	
DOC	5	
Fluoride	1.5	
Hardness (CaCO3)	80-100	
Hydrogen Sulphide	0.05	
Iron	0.3	
Lead	0.01	
Magnesium		
Manganese	0.05	
Mercury	0.001	
Molybdenum		
Nickel		
Nitrate (as N)	10	
Nitrite (as N)	1	
Organic Nitrogen	0.15	
pH (pH units)	6.5-8.5	
Phenols		
Phosphate (as P)		
Phosphorus (total)		
Potassium		
Selenium		
Silver		
Sodium	200	
Strontium		
Sulphate	500	
Sulphur		
TDS	500	
Tin		
Titanium		
TOC		
Turbidity (NTU)	1	
Vanadium		
Zinc	5	

All values reported in mg/L unless otherwise noted.

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LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P4-1** Sheet: 1

Date Sampled:		31-Oct-1991	03-Dec-1997	21-Apr-1998	14-May-1999	02-Sep-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	258	660	681	555	585
Aluminum	0.1		0.210	0.760	<0.030	<0.030
Ammonia (as N)			0.16	0.17	0.23	0.23
Antimony			<0.1000	<0.1000		
Arsenic	0.025	0.016	<0.100	<0.100		
Barium	1	0.490	0.258	0.263	0.220	0.230
Beryllium			<0.001	<0.001	<0.010	<0.010
Bicarbonate				1.00		
Bismuth			<0.100	<0.100		
Boron	5	0.490	0.430	0.560	0.810	0.570
Bromide			0.50	<0.50		
Cadmium	0.005	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		91.0	188.0	229.0	209.0	189.0
Carbonate			804.50	827.90		
Chloride	250	143.0	100.0	93.8	61.0	51.0
Chromium	0.05	<0.050	<0.005	<0.005	<0.010	<0.010
Cobalt			0.0070	<0.0050	<0.0100	<0.0100
COD		12	84	74	71	56
Colour (TCU)	5	4	16	1480		
Conductivity (uS/cm)		1030	1450	1550	1000	900
Copper	1	0.0600	0.0030	0.0090	<0.0050	<0.0050
Cyanide	0.2	<0.005				
DOC	5	7.2	24.0	24.9	26.0	29.9
Fluoride	1.5	0.48	<0.10	<0.10		
Hardness (CaCO3)	80-100		657	766	682	620
Hydrogen Sulphide	0.05	<0.02				
Iron	0.3	10.60	1.39	1.55	0.85	0.55
Lead	0.01	0.0800			<0.0020	<0.0020
Magnesium			45.50	46.50	39.00	36.00
Manganese	0.05	1.210	3.630	5.840	4.440	3.780
Mercury	0.001	<0.0001				
Molybdenum			<0.010	<0.010	<0.010	<0.010
Nickel		<0.050	<0.020	<0.020	<0.010	<0.010
Nitrate (as N)	10	<0.01	<0.02	<0.20	<0.10	<0.10
Nitrite (as N)	1	<0.01	<0.20	<0.20	<0.10	<0.10
Organic Nitrogen	0.15	<0.10				
pH (pH units)	6.5-8.5	7.7	6.9	6.9	6.7	6.9
Phenols		<0.002			<0.001	<0.001
Phosphate (as P)			<0.10	<1.00		<0.01
Phosphorus (total)		2.92	0.03	40.00	2.04	
Potassium			5.0	5.0	6.0	6.0
Selenium		<0.001	<0.100	<0.100		
Silicon					10.10	9.60
Silver		<0.0500	<0.0030	0.0070	<0.0100	0.0200
Sodium	200	44.0	69.4	74.5	73.0	75.0
Strontium			0.885	1.110	0.970	0.834
Sulphate	500	117.0	80.5	143.0	110.0	91.0
Sulphur			55	48	30	28
TDS	500	624	885	1001	948	772
Temperature (C)	15				12.0	12.0
Thallium					<0.20000	<0.50000
Tin			<0.050	<0.050	<0.050	<0.050
Titanium			0.011	0.006	<0.010	<0.010
TOC		9				
Turbidity (NTU)	1	2.4	2.4	1.6		
Vanadium			0.0060	<0.0050	<0.0100	<0.0100
Zinc	5	<0.050	<0.005	<0.005	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P4-1**

Date Sampled:		19-Oct-1999	03-Nov-2000
Parameter	ODWS/O		
Alkalinity (CaCO3)	30-500	575	628
Aluminum	0.1	0.080	0.430
Ammonia (as N)		0.17	0.12
Antimony			
Arsenic	0.025		
Barium	1	NA	0.250
Beryllium		<0.010	<0.002
Bicarbonate			
Bismuth			
Boron	5	NA	0.570
Bromide			
Cadmium	0.005	<0.00500	0.00010
Calcium		164.0	185.0
Carbonate			
Chloride	250	47.0	41.0
Chromium	0.05	<0.010	<0.010
Cobalt		<0.0100	0.0051
COD		65	57
Colour (TCU)	5		
Conductivity (uS/cm)		680	1370
Copper	1	<0.0050	0.0060
Cyanide	0.2		
DOC	5	22.2	22.2
Fluoride	1.5		
Hardness (CaCO3)	80-100	533	623
Hydrogen Sulphide	0.05		
Iron	0.3	0.56	1.74
Lead	0.01	<0.0020	<0.0010
Magnesium		30.00	39.00
Manganese	0.05	3.070	2.950
Mercury	0.001		
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
Organic Nitrogen	0.15		
pH (pH units)	6.5-8.5	6.7	6.4
Phenols		<0.001	<0.001
Phosphate (as P)		<0.03	<0.03
Phosphorus (total)		2.48	16.30
Potassium		5.0	7.0
Selenium			
Silicon		10.10	10.50
Silver		<0.0100	<0.0001
Sodium	200	68.0	68.0
Strontium		0.801	0.806
Sulphate	500	77.0	63.0
Sulphur		26	21
TDS	500	804	848
Temperature (C)	15	4.0	10.2
Thallium		<0.20000	<0.00100
Tin		<0.050	<0.010
Titanium		<0.010	0.020
TOC			
Turbidity (NTU)	1		
Vanadium		<0.0100	0.0070
Zinc	5	0.250	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P4-1** Sheet: 2

Date Sampled:		19-Oct-1999	03-Nov-2000
Parameter	ODWS/O		
1,1,1,2-Tetrachloroethane			<0.60
1,1,1-Trichloroethane			<0.40
1,1,2,2-Tetrachloroethane			<0.60
1,1,2-Trichloroethane			<0.40
1,1-Dichloroethane			<0.40
1,1-Dichloroethylene	14		<0.5000
1,2-Dibromoethane			<1.00
1,2-Dichlorobenzene	200		<0.40
1,2-Dichloroethane	5		<0.700
1,2-Dichloropropane			<0.70
1,3,5-Trimethylbenzene			<0.30
1,3-Dichlorobenzene			<0.40
1,4-Dichlorobenzene	5		<0.400
Benzene	5		0.8000
Bromodichloromethane			<0.300
Bromoform			<0.400
Bromomethane			<0.500
c-1,3-Dichloropropylene			<0.20
Carbon Tetrachloride	5		<0.900
Chlorobenzene	80		<0.200
Chloroethane			<1.0
Chloroform			<0.50
Chloromethane			<1.000
cis-1,2-Dichloroethylene			6.00
Dibromochloromethane			<0.30
Ethylbenzene	2.4		<0.5000
m/p-Xylene	300		<1.000
Methylene Chloride	50		<4.00
o-Xylene	300		<0.500
Styrene			<0.50
t-1,2-Dichloroethylene			<0.4000
t-1,3-Dichloropropylene			<0.20
Tetrachloroethylene	30		<0.30
Toluene	24		<0.5000
Trichloroethylene	50		<0.30
Trichlorofluoromethane			<0.50
Vinyl Chloride	2		<0.500

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P4-2** Sheet: 1

Date Sampled:		31-Oct-1991	03-Dec-1997	21-Apr-1998	14-May-1999	02-Sep-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	88	325	637	528	690
Aluminum	0.1		0.180	0.080	0.050	<0.030
Ammonia (as N)			0.24	0.19	0.79	0.15
Antimony			<0.1000	<0.1000		
Arsenic	0.025	0.012	<0.100	<0.100		
Barium	1	0.100	0.059	0.095	0.090	0.070
Beryllium			<0.001	<0.001	<0.010	<0.010
Bicarbonate				1.00		
Bismuth			<0.100	<0.100		
Boron	5	0.420	1.040	1.130	1.350	1.090
Bromide			0.33	<0.50		
Cadmium	0.005	0.00700	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		17.0	117.0	177.0	181.0	219.0
Carbonate			396.00	774.20		
Chloride	250	40.0	97.4	79.0	26.0	31.0
Chromium	0.05	<0.050	<0.005	<0.005	<0.010	<0.010
Cobalt			<0.0050	<0.0050	<0.0100	<0.0100
COD		8	62	76	48	88
Colour (TCU)	5	7	10	2390		
Conductivity (uS/cm)		300	1005	1460	1000	950
Copper	1	0.0600	0.0070	0.0130	<0.0050	0.0060
Cyanide	0.2	<0.005				
DOC	5	4.3	14.8	24.0	20.4	20.9
Fluoride	1.5	0.32	<0.10	<0.10		
Hardness (CaCO3)	80-100		366	549	563	675
Hydrogen Sulphide	0.05	<0.02				
Iron	0.3	3.50	0.04	0.10	0.08	0.02
Lead	0.01	<0.0500			<0.0020	<0.0020
Magnesium			17.80	25.80	27.00	31.00
Manganese	0.05	0.320	5.740	3.700	3.790	9.810
Mercury	0.001	<0.0001				
Molybdenum			<0.010	<0.010	<0.010	<0.010
Nickel		<0.050	<0.020	<0.020	<0.010	<0.010
Nitrate (as N)	10	0.35	0.06	0.70	0.59	<0.10
Nitrite (as N)	1	<0.01	<0.20	<0.20	<0.10	<0.10
Organic Nitrogen	0.15	<0.10				
pH (pH units)	6.5-8.5	7.2	7.1	6.9	6.9	7.0
Phenols		<0.002			<0.001	<0.001
Phosphate (as P)			<0.10	<1.00	<0.03	<0.01
Phosphorus (total)		6.23	0.77	21.00	8.05	
Potassium			2.0	2.0	9.0	3.0
Selenium		<0.001	<0.100	<0.100		
Silicon					1.80	2.00
Silver		<0.0500	<0.0030	0.0030	<0.0100	0.0200
Sodium	200	42.0	70.2	128.0	82.0	78.0
Strontium			1.120	1.390	1.080	1.240
Sulphate	500	48.0	92.9	120.0	108.0	69.0
Sulphur			30	41	29	22
TDS	500	164	592	916	716	800
Temperature (C)	15				11.0	11.0
Thallium					<0.20000	<0.50000
Tin			<0.050	<0.050	<0.050	<0.050
Titanium			<0.005	0.009	<0.010	<0.010
TOC		6				
Turbidity (NTU)	1	5.2	2.2	1.8		
Vanadium			<0.0050	<0.0050	<0.0100	<0.0100
Zinc	5	<0.050	0.011	<0.005	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P4-2** Sheet: 2

Date Sampled:		20-Oct-1999	03-Nov-2000
Parameter	ODWS/O		
Alkalinity (CaCO3)	30-500	691	430
Aluminum	0.1	<0.030	0.050
Ammonia (as N)		0.03	0.04
Antimony			
Arsenic	0.025		
Barium	1	NA	0.060
Beryllium		<0.010	<0.002
Bicarbonate			
Bismuth			
Boron	5	NA	1.170
Bromide			
Cadmium	0.005	<0.00500	0.00010
Calcium		232.0	154.0
Carbonate			
Chloride	250	38.0	43.0
Chromium	0.05	<0.010	<0.010
Cobalt		<0.0100	0.0020
COD		61	38
Colour (TCU)	5		
Conductivity (uS/cm)		930	832
Copper	1	<0.0050	0.0090
Cyanide	0.2		
DOC	5	21.1	13.7
Fluoride	1.5		
Hardness (CaCO3)	80-100	703	476
Hydrogen Sulphide	0.05		
Iron	0.3	<0.01	0.08
Lead	0.01	<0.0020	<0.0010
Magnesium		30.00	22.00
Manganese	0.05	13.900	5.780
Mercury	0.001		
Molybdenum		<0.010	0.010
Nickel		<0.010	<0.010
Nitrate (as N)	10	<0.10	4.88
Nitrite (as N)	1	<0.10	<0.10
Organic Nitrogen	0.15		
pH (pH units)	6.5-8.5	6.9	6.7
Phenols		0.004	<0.001
Phosphate (as P)		<0.03	<0.03
Phosphorus (total)		0.03	4.84
Potassium		3.0	4.0
Selenium			
Silicon		3.30	2.38
Silver		<0.0100	<0.0001
Sodium	200	74.0	44.0
Strontium		1.330	0.682
Sulphate	500	87.0	68.0
Sulphur		27	23
TDS	500	900	668
Temperature (C)	15	5.0	10.3
Thallium		<0.20000	<0.00100
Tin		<0.050	<0.010
Titanium		<0.010	<0.010
TOC			
Turbidity (NTU)	1		
Vanadium		<0.0100	0.0020
Zinc	5	0.230	<0.010

All values reported in mg/L unless otherwise noted.

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P4-2**

Parameter	ODWS/O	Date Sampled: 20-Oct-1999	03-Nov-2000
1,1,1,2-Tetrachloroethane			<0.60
1,1,1-Trichloroethane			<0.40
1,1,2,2-Tetrachloroethane			<0.60
1,1,2-Trichloroethane			<0.40
1,1-Dichloroethane			<0.40
1,1-Dichloroethylene	14		<0.5000
1,2-Dibromoethane			<1.00
1,2-Dichlorobenzene	200		<0.40
1,2-Dichloroethane	5		<0.700
1,2-Dichloropropane			<0.70
1,3,5-Trimethylbenzene			<0.30
1,3-Dichlorobenzene			<0.40
1,4-Dichlorobenzene	5		<0.400
Benzene	5		<0.5000
Bromodichloromethane			<0.300
Bromoform			<0.400
Bromomethane			<0.500
c-1,3-Dichloropropylene			<0.20
Carbon Tetrachloride	5		<0.900
Chlorobenzene	80		<0.200
Chloroethane			<1.0
Chloroform			<0.50
Chloromethane			<1.000
cis-1,2-Dichloroethylene			<0.40
Dibromochloromethane			<0.30
Ethylbenzene	2.4		<0.5000
m/p-Xylene	300		<1.000
Methylene Chloride	50		<4.00
o-Xylene	300		<0.500
Styrene			<0.50
t-1,2-Dichloroethylene			<0.4000
t-1,3-Dichloropropylene			<0.20
Tetrachloroethylene	30		<0.30
Toluene	24		<0.5000
Trichloroethylene	50		<0.30
Trichlorofluoromethane			<0.50
Vinyl Chloride	2		<0.500

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P5-1**

Date Sampled:		31-Oct-1991	03-Dec-1997	14-May-1999	02-Sep-1999	19-Oct-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	142	100	110	93	97
Aluminum	0.1		0.730	<0.030	0.030	<0.030
Ammonia (as N)			0.19	0.34	0.34	0.38
Antimony			<0.1000			
Arsenic	0.025	0.022	<0.100			
Barium	1	0.160	0.022	0.020	<0.010	NA
Beryllium			<0.001	<0.010	<0.010	<0.010
Bismuth			<0.100			
Boron	5	0.030	0.030	<0.010	<0.010	NA
Bromide			<0.05			
Cadmium	0.005	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		20.0	25.5	21.0	21.0	18.0
Carbonate			121.80			
Chloride	250	52.0	6.6	7.0	6.0	7.0
Chromium	0.05	<0.050	<0.005	<0.010	<0.010	<0.010
Cobalt			<0.0050	<0.0100	<0.0100	<0.0100
COD		6	<5	10	8	8
Colour (TCU)	5	66	102			
Conductivity (uS/cm)		247	233	200	175	140
Copper	1	<0.0500	0.0030	<0.0050	<0.0050	<0.0050
Cyanide	0.2	0.014				
DOC	5	2.1	1.8	2.0	2.1	2.3
Fluoride	1.5	0.28	0.20			
Hardness (CaCO3)	80-100		95	89	89	78
Hydrogen Sulphide	0.05	<0.02				
Iron	0.3	17.92	0.08	0.02	0.04	0.07
Lead	0.01	<0.0500		<0.0020	<0.0020	<0.0020
Magnesium			7.51	9.00	9.00	8.00
Manganese	0.05	0.380	0.086	0.050	0.040	0.040
Mercury	0.001	<0.0001				
Molybdenum			<0.010	<0.010	<0.010	<0.010
Nickel		0.060	<0.020	<0.010	<0.010	<0.010
Nitrate (as N)	10	<0.10	0.02	<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.01	<0.02	<0.10	<0.10	<0.10
Organic Nitrogen	0.15	0.11				
pH (pH units)	6.5-8.5	7.7	8.1	8.3	7.2	7.7
Phenols		0.016		<0.001	<0.001	<0.001
Phosphate (as P)			<0.10	0.15	0.28	0.87
Phosphorus (total)		4.93	0.22	5.40		3.44
Potassium			2.0	4.0	4.0	4.0
Selenium		<0.001	<0.100			
Silicon				8.30	8.50	8.40
Silver		<0.0500	<0.0030	<0.0100	0.0200	<0.0100
Sodium	200	21.0	16.9	22.0	21.0	22.0
Strontium			0.069	0.064	0.068	0.072
Sulphate	500	34.0	20.5	19.0	18.0	17.0
Sulphur			7	7	7	6
TDS	500	144	139	156	148	164
Temperature (C)	15			9.5	9.0	4.5
Thallium				<0.20000	<0.50000	<0.20000
Tin			<0.050	<0.050	<0.050	<0.050
Titanium			<0.005	<0.010	<0.010	<0.010
TOC		4				
Turbidity (NTU)	1	29.0	58.0			
Vanadium			<0.0050	<0.0100	<0.0100	<0.0100
Zinc	5	<0.050	0.007	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P5-1**

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
Alkalinity (CaCO3)	30-500	86
Aluminum	0.1	0.480
Ammonia (as N)		0.37
Antimony		
Arsenic	0.025	
Barium	1	0.010
Beryllium		<0.002
Bismuth		
Boron	5	<0.010
Bromide		
Cadmium	0.005	<0.00010
Calcium		19.0
Carbonate		
Chloride	250	7.0
Chromium	0.05	<0.010
Cobalt		0.0004
COD		8
Colour (TCU)	5	
Conductivity (uS/cm)		302
Copper	1	0.0020
Cyanide	0.2	
DOC	5	2.0
Fluoride	1.5	
Hardness (CaCO3)	80-100	76
Hydrogen Sulphide	0.05	
Iron	0.3	0.51
Lead	0.01	<0.0010
Magnesium		7.00
Manganese	0.05	<0.010
Mercury	0.001	
Molybdenum		<0.010
Nickel		<0.010
Nitrate (as N)	10	<0.10
Nitrite (as N)	1	<0.10
Organic Nitrogen	0.15	
pH (pH units)	6.5-8.5	7.9
Phenols		<0.001
Phosphate (as P)		0.10
Phosphorus (total)		0.27
Potassium		3.0
Selenium		
Silicon		7.73
Silver		<0.0001
Sodium	200	22.0
Strontium		0.058
Sulphate	500	19.0
Sulphur		6
TDS	500	160
Temperature (C)	15	9.5
Thallium		<0.00100
Tin		<0.010
Titanium		0.020
TOC		
Turbidity (NTU)	1	
Vanadium		0.0020
Zinc	5	0.040

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P5-2**

Sheet: 1

Date Sampled:		31-Oct-1991	03-Dec-1997	17-May-1999	02-Sep-1999	19-Oct-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	52	29	57	35	37
Aluminum	0.1		0.210	<0.030	<0.030	0.350
Ammonia (as N)			0.05	<0.02	0.02	0.44
Antimony			<0.1000			
Arsenic	0.025	0.005	<0.100			
Barium	1	<0.100	0.007	<0.010	<0.010	NA
Beryllium			<0.001	<0.010	<0.010	<0.010
Bismuth			<0.100			
Boron	5	0.010	<0.010	<0.010	<0.010	NA
Bromide			<0.05			
Cadmium	0.005	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		16.0	11.2	17.0	15.0	13.0
Carbonate			35.10			
Chloride	250	48.0	1.1	2.0	2.0	1.0
Chromium	0.05	<0.050	<0.005	<0.010	<0.010	<0.010
Cobalt			<0.0050	<0.0100	<0.0100	<0.0100
COD		4	<5	15	3	11
Colour (TCU)	5	46	172			
Conductivity (uS/cm)		126	86	93	80	73
Copper	1	<0.0500	<0.0030	<0.0050	<0.0050	<0.0050
Cyanide	0.2	<0.005				
DOC	5	1.8	1.4	3.9	0.8	2.5
Fluoride	1.5	0.23	<0.10			
Hardness (CaCO3)	80-100		38	63	58	49
Hydrogen Sulphide	0.05	<0.02				
Iron	0.3	2.20	0.03	0.01	0.02	0.36
Lead	0.01	<0.0500		<0.0020	<0.0020	<0.0020
Magnesium			2.47	5.00	5.00	4.00
Manganese	0.05	<0.050	0.062	<0.010	<0.010	<0.010
Mercury	0.001	<0.0001				
Molybdenum			<0.010	<0.010	<0.010	<0.010
Nickel		<0.050	<0.020	<0.010	<0.010	<0.010
Nitrate (as N)	10	<0.10	0.13	1.18	1.54	1.83
Nitrite (as N)	1	<0.01	<0.02	<0.10	<0.10	<0.10
Organic Nitrogen	0.15	<0.10				
pH (pH units)	6.5-8.5	7.4	7.7	7.1	6.2	7.1
Phenols		<0.002		<0.001	0.009	<0.001
Phosphate (as P)			<0.10	<0.03	0.13	0.30
Phosphorus (total)		1.58	0.49	19.30		2.33
Potassium			1.0	2.0	2.0	2.0
Selenium		<0.001	<0.100			
Silicon				6.50	7.30	8.30
Silver		<0.0500	<0.0030	<0.0100	0.0200	<0.0100
Sodium	200	4.0	2.3	3.0	3.0	3.0
Strontium			0.029	0.044	0.045	0.530
Sulphate	500	29.0	10.8	14.0	10.0	10.0
Sulphur			4	6	4	3
TDS	500	56	47	80	80	76
Temperature (C)	15			7.5	12.0	6.0
Thallium				<0.20000	<0.50000	<0.20000
Tin			<0.050	<0.050	<0.050	<0.050
Titanium			<0.005	<0.010	<0.010	<0.010
TOC		3				
Turbidity (NTU)	1	25.0	70.0			
Vanadium			<0.0050	<0.0100	<0.0100	<0.0100
Zinc	5	<0.050	0.051	0.010	0.010	0.040

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P5-2**

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
Alkalinity (CaCO3)	30-500	31
Aluminum	0.1	1.370
Ammonia (as N)		0.03
Antimony		
Arsenic	0.025	
Barium	1	0.020
Beryllium		<0.002
Bismuth		
Boron	5	0.020
Bromide		
Cadmium	0.005	<0.00010
Calcium		12.0
Carbonate		
Chloride	250	<1.0
Chromium	0.05	<0.010
Cobalt		0.0008
COD		11
Colour (TCU)	5	
Conductivity (uS/cm)		120
Copper	1	<0.0010
Cyanide	0.2	
DOC	5	3.2
Fluoride	1.5	
Hardness (CaCO3)	80-100	42
Hydrogen Sulphide	0.05	
Iron	0.3	1.42
Lead	0.01	<0.0010
Magnesium		3.00
Manganese	0.05	0.070
Mercury	0.001	
Molybdenum		<0.010
Nickel		<0.010
Nitrate (as N)	10	2.15
Nitrite (as N)	1	<0.10
Organic Nitrogen	0.15	
pH (pH units)	6.5-8.5	7.7
Phenols		<0.001
Phosphate (as P)		0.19
Phosphorus (total)		0.04
Potassium		2.0
Selenium		
Silicon		9.78
Silver		<0.0001
Sodium	200	5.0
Strontium		0.071
Sulphate	500	9.0
Sulphur		3
TDS	500	76
Temperature (C)	15	11.0
Thallium		<0.00100
Tin		<0.010
Titanium		0.050
TOC		
Turbidity (NTU)	1	
Vanadium		0.0030
Zinc	5	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P6-1** Sheet: 1

Date Sampled:		31-Oct-1991	03-Dec-1997	21-Apr-1998	14-May-1999	02-Sep-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	138	166	164	192	181
Aluminum	0.1		<0.030	0.040	<0.030	<0.030
Ammonia (as N)			0.09	0.11	0.17	0.14
Antimony			<0.1000	<0.1000		
Arsenic	0.025	0.001	<0.100	<0.100		
Barium	1	<0.100	0.055	0.050	0.060	0.060
Beryllium			<0.001	<0.001	<0.010	<0.010
Bicarbonate				1.00		
Bismuth			<0.100	<0.100		
Boron	5	0.020	<0.010	<0.010	<0.010	<0.010
Bromide			<0.05	<0.50		
Cadmium	0.005	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		42.0	65.2	63.5	76.0	78.0
Carbonate			202.20	197.60		
Chloride	250	44.0	48.6	36.9	40.0	41.0
Chromium	0.05	<0.050	<0.005	<0.005	<0.010	<0.010
Cobalt			<0.0050	<0.0050	<0.0100	<0.0100
COD		6	6	20	5	10
Colour (TCU)	5	23	2	167		
Conductivity (uS/cm)		315	493	462	405	390
Copper	1	<0.0500	<0.0030	<0.0030	<0.0050	<0.0050
Cyanide	0.2	<0.005				
DOC	5	3.5	2.6	1.6	2.8	2.6
Fluoride	1.5	0.26	0.10	<0.10		
Hardness (CaCO3)	80-100		236	225	268	273
Hydrogen Sulphide	0.05	<0.02				
Iron	0.3	4.44	0.17	0.93	0.70	0.11
Lead	0.01	<0.0500			<0.0020	<0.0020
Magnesium			17.60	16.00	19.00	19.00
Manganese	0.05	0.240	0.285	0.253	0.300	0.270
Mercury	0.001	<0.0001				
Molybdenum			<0.010	<0.010	<0.010	<0.010
Nickel		<0.050	<0.020	<0.020	<0.010	<0.010
Nitrate (as N)	10	<0.10	<0.02	<0.20	<0.10	<0.10
Nitrite (as N)	1	<0.01	<0.20	<0.20	<0.10	<0.10
Organic Nitrogen	0.15	0.10				
pH (pH units)	6.5-8.5	7.7	7.7	7.9	7.0	6.8
Phenols		<0.002			<0.001	<0.001
Phosphate (as P)			<0.10	<1.00	<0.03	<0.01
Phosphorus (total)		2.22	0.29	4.40	6.33	
Potassium			2.0	<1.0	1.0	1.0
Selenium		<0.001	<0.100	<0.100		
Silicon					12.10	12.20
Silver		<0.0500	<0.0030	<0.0030	<0.0100	0.0200
Sodium	200	11.0	10.0	9.5	11.0	10.0
Strontium			0.120	0.103	0.126	0.114
Sulphate	500	28.0	34.5	24.4	32.0	35.0
Sulphur			11	9	11	12
TDS	500	160	277	250	356	324
Temperature (C)	15				9.0	13.0
Thallium					<0.20000	<0.50000
Tin			<0.050	<0.050	<0.050	<0.050
Titanium			<0.005	<0.005	<0.010	<0.010
TOC		5				
Turbidity (NTU)	1	11.0	1.3	2.1		
Vanadium			<0.0050	<0.0050	<0.0100	<0.0100
Zinc	5	<0.050	<0.005	<0.005	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P6-1**

Date Sampled:		20-Oct-1999	03-Nov-2000
Parameter	ODWS/O		
Alkalinity (CaCO3)	30-500	176	153
Aluminum	0.1	<0.030	0.360
Ammonia (as N)		0.10	0.06
Antimony			
Arsenic	0.025		
Barium	1	NA	0.050
Beryllium		<0.010	<0.002
Bicarbonate			
Bismuth			
Boron	5	NA	<0.010
Bromide			
Cadmium	0.005	<0.00500	<0.00010
Calcium		73.0	50.0
Carbonate			
Chloride	250	38.0	20.0
Chromium	0.05	<0.010	<0.010
Cobalt		<0.0100	0.0004
COD		<3	11
Colour (TCU)	5		
Conductivity (uS/cm)		235	519
Copper	1	<0.0050	<0.0010
Cyanide	0.2		
DOC	5	2.0	1.8
Fluoride	1.5		
Hardness (CaCO3)	80-100	252	179
Hydrogen Sulphide	0.05		
Iron	0.3	0.03	1.17
Lead	0.01	<0.0020	<0.0010
Magnesium		17.00	13.00
Manganese	0.05	0.270	0.220
Mercury	0.001		
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
Organic Nitrogen	0.15		
pH (pH units)	6.5-8.5	7.6	7.4
Phenols		0.001	<0.001
Phosphate (as P)		0.75	<0.03
Phosphorus (total)		0.49	1.24
Potassium		1.0	1.0
Selenium			
Silicon		11.30	12.00
Silver		<0.0100	<0.0001
Sodium	200	11.0	10.0
Strontium		0.144	0.092
Sulphate	500	34.0	25.0
Sulphur		11	8
TDS	500	292	252
Temperature (C)	15	3.0	9.5
Thallium		<0.20000	<0.00100
Tin		<0.050	<0.010
Titanium		<0.010	0.020
TOC			
Turbidity (NTU)	1		
Vanadium		<0.0100	0.0010
Zinc	5	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P6-2** Sheet: 1

Date Sampled:		31-Oct-1991	03-Dec-1997	21-Apr-1998	14-May-1999	02-Sep-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	30	19	15	12	13
Aluminum	0.1		0.290	0.070	<0.030	<0.030
Ammonia (as N)			0.04	<0.02	0.09	<0.10
Antimony			<0.1000	<0.1000		
Arsenic	0.025	0.046	<0.100	<0.100		
Barium	1	<0.100	0.017	0.013	<0.010	<0.010
Beryllium			<0.001	<0.001	<0.010	<0.010
Bicarbonate				1.00		
Bismuth			<0.100	<0.100		
Boron	5	0.010	<0.010	<0.010	<0.010	<0.010
Bromide			<0.05	<0.50		
Cadmium	0.005	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		35.0	13.4	11.7	8.0	7.0
Carbonate			22.90	15.90		
Chloride	250	96.0	32.2	24.7	13.0	12.0
Chromium	0.05	<0.050	<0.005	<0.005	<0.010	<0.010
Cobalt			<0.0050	<0.0050	<0.0100	<0.0100
COD		5	9	7	7	8
Colour (TCU)	5	6	<1	517		
Conductivity (uS/cm)		362	201	168	100	500
Copper	1	<0.0500	0.0030	<0.0030	<0.0050	<0.0050
Cyanide	0.2	<0.005				
DOC	5	2.9	1.9	1.5	2.4	2.8
Fluoride	1.5	0.32	<0.10	<0.10		
Hardness (CaCO3)	80-100		45	40	28	22
Hydrogen Sulphide	0.05	<0.02				
Iron	0.3	2.24	0.21	0.06	<0.01	<0.01
Lead	0.01	<0.0500			<0.0020	<0.0020
Magnesium			2.84	2.50	2.00	1.00
Manganese	0.05	0.140	0.011	0.008	<0.010	<0.010
Mercury	0.001	<0.0001				
Molybdenum			<0.010	<0.010	<0.010	<0.010
Nickel		<0.050	<0.020	<0.020	<0.010	<0.010
Nitrate (as N)	10	0.10	0.09	<0.20	0.10	0.11
Nitrite (as N)	1	<0.01	<0.20	<0.20	<0.10	<0.10
Organic Nitrogen	0.15	0.28				
pH (pH units)	6.5-8.5	6.5	6.4	6.1	6.8	5.6
Phenols		<0.002			<0.001	<0.001
Phosphate (as P)			<0.10	<1.00	0.06	<0.01
Phosphorus (total)		5.18	1.34	3.00	4.23	
Potassium			<1.0	<1.0	1.0	1.0
Selenium		<0.001	<0.100	<0.100		
Silicon					3.80	3.80
Silver		<0.0500	<0.0030	<0.0030	<0.0100	0.0200
Sodium	200	22.0	20.1	14.8	11.0	10.0
Strontium			0.124	0.127	0.083	0.064
Sulphate	500	33.0	31.7	20.7	18.0	14.0
Sulphur			8	8	7	6
TDS	500	200	113	85	96	60
Temperature (C)	15				8.0	11.0
Thallium					<0.20000	<0.50000
Tin			<0.050	<0.050	<0.050	<0.050
Titanium			0.015	<0.005	<0.010	<0.010
TOC		4				
Turbidity (NTU)	1	2.9	1.8	2.4		
Vanadium			<0.0050	<0.0050	<0.0100	<0.0100
Zinc	5	<0.050	0.013	<0.005	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P6-2**

Date Sampled:		20-Oct-1999	03-Nov-2000
Parameter	ODWS/O		
Alkalinity (CaCO3)	30-500	15	18
Aluminum	0.1	0.050	0.200
Ammonia (as N)		<0.02	<0.02
Antimony			
Arsenic	0.025		
Barium	1	NA	<0.010
Beryllium		<0.010	<0.002
Bicarbonate			
Bismuth			
Boron	5	NA	<0.010
Bromide			
Cadmium	0.005	<0.00500	<0.00010
Calcium		8.0	9.0
Carbonate			
Chloride	250	16.0	24.0
Chromium	0.05	<0.010	<0.010
Cobalt		<0.0100	0.0002
COD		8	11
Colour (TCU)	5		
Conductivity (uS/cm)		64	151
Copper	1	<0.0050	<0.0010
Cyanide	0.2		
DOC	5	1.8	1.5
Fluoride	1.5		
Hardness (CaCO3)	80-100	28	35
Hydrogen Sulphide	0.05		
Iron	0.3	0.06	0.20
Lead	0.01	<0.0020	<0.0010
Magnesium		2.00	3.00
Manganese	0.05	<0.010	<0.010
Mercury	0.001		
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
Organic Nitrogen	0.15		
pH (pH units)	6.5-8.5	7.0	6.6
Phenols		0.004	<0.001
Phosphate (as P)		0.27	<0.03
Phosphorus (total)		0.44	1.72
Potassium		1.0	<1.0
Selenium			
Silicon		3.90	4.04
Silver		<0.0100	<0.0001
Sodium	200	11.0	13.0
Strontium		0.093	0.090
Sulphate	500	16.0	14.0
Sulphur		5	5
TDS	500	64	88
Temperature (C)	15	5.0	10.0
Thallium		<0.20000	<0.00100
Tin		<0.050	<0.010
Titanium		<0.010	0.010
TOC			
Turbidity (NTU)	1		
Vanadium		<0.0100	<0.0010
Zinc	5	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P7-1** Sheet: 1

Date Sampled:		31-Oct-1991	03-Dec-1997	21-Apr-1998	14-May-1999	02-Sep-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	154	168	160	179	165
Aluminum	0.1		0.180	0.620	<0.030	0.040
Ammonia (as N)			0.45	0.32	0.39	0.38
Antimony			<0.1000	<0.1000		
Arsenic	0.025	0.058	<0.100	<0.100		
Barium	1	0.180	0.014	0.014	<0.010	<0.010
Beryllium			<0.001	<0.001	<0.010	<0.010
Bicarbonate				1.00		
Bismuth			<0.100	<0.100		
Boron	5	0.100	0.080	0.080	0.080	0.080
Bromide			0.20	<0.50		
Cadmium	0.005	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		20.0	16.0	17.6	18.0	18.0
Carbonate			204.70	192.70		
Chloride	250	53.0	47.2	38.3	38.0	39.0
Chromium	0.05	<0.050	<0.005	<0.005	<0.010	<0.010
Cobalt			<0.0050	<0.0050	<0.0100	<0.0100
COD		5	10	11	7	10
Colour (TCU)	5	41	90	862		
Conductivity (uS/cm)		418	455	432	370	340
Copper	1	0.1300	0.0030	0.0050	<0.0050	<0.0050
Cyanide	0.2	0.009				
DOC	5	5.7	1.6	2.1	2.9	3.1
Fluoride	1.5	0.54	0.40	0.30		
Hardness (CaCO3)	80-100		81	86	90	90
Hydrogen Sulphide	0.05	<0.02				
Iron	0.3	23.25	0.03	0.90	<0.01	0.33
Lead	0.01	0.1600			<0.0020	<0.0020
Magnesium			10.00	10.20	11.00	11.00
Manganese	0.05	2.450	0.023	0.034	0.020	0.020
Mercury	0.001	<0.0001				
Molybdenum			<0.010	<0.010	<0.010	<0.010
Nickel		0.060	<0.020	<0.020	<0.010	<0.010
Nitrate (as N)	10	<0.10	0.02	<0.20	0.35	0.21
Nitrite (as N)	1	<0.01	<0.20	<0.20	<0.10	<0.10
Organic Nitrogen	0.15	0.48				
pH (pH units)	6.5-8.5	7.9	8.1	8.1	8.3	6.5
Phenols		<0.002			<0.001	<0.001
Phosphate (as P)			<0.10	<1.00	0.45	0.38
Phosphorus (total)		2.65	0.01	2.90	14.10	
Potassium			5.0	3.0	5.0	5.0
Selenium		<0.001	<0.100	<0.100		
Silicon					6.30	6.00
Silver		<0.0500	<0.0030	0.0050	<0.0100	0.0200
Sodium	200	53.0	68.8	61.8	73.0	74.0
Strontium			0.127	0.112	0.114	0.120
Sulphate	500	26.0	6.8	4.7	5.0	6.0
Sulphur			2	2	3	3
TDS	500	272	254	232	284	268
Temperature (C)	15				9.5	12.0
Thallium					<0.20000	<0.50000
Tin			<0.050	<0.050	<0.050	<0.050
Titanium			<0.005	0.024	<0.010	<0.010
TOC		6				
Turbidity (NTU)	1	35.0	55.0	50.0		
Vanadium			<0.0050	0.0070	<0.0100	<0.0100
Zinc	5	0.210	<0.005	<0.005	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P7-1**

Date Sampled:		20-Oct-1999	03-Nov-2000
Parameter	ODWS/O		
Alkalinity (CaCO3)	30-500	160	170
Aluminum	0.1	0.310	4.590
Ammonia (as N)		0.11	<0.02
Antimony			
Arsenic	0.025		
Barium	1	NA	0.040
Beryllium		<0.010	<0.002
Bicarbonate			
Bismuth			
Boron	5	NA	0.080
Bromide			
Cadmium	0.005	<0.00500	<0.00010
Calcium		19.0	16.0
Carbonate			
Chloride	250	34.0	41.0
Chromium	0.05	<0.010	<0.010
Cobalt		<0.0100	0.0029
COD		11	19
Colour (TCU)	5		
Conductivity (uS/cm)		240	548
Copper	1	<0.0050	0.0070
Cyanide	0.2		
DOC	5	2.4	2.9
Fluoride	1.5		
Hardness (CaCO3)	80-100	93	89
Hydrogen Sulphide	0.05		
Iron	0.3	0.27	4.78
Lead	0.01	<0.0020	0.0020
Magnesium		11.00	12.00
Manganese	0.05	0.020	0.120
Mercury	0.001		
Molybdenum		<0.010	<0.010
Nickel		<0.010	<0.010
Nitrate (as N)	10	0.20	0.73
Nitrite (as N)	1	<0.10	<0.10
Organic Nitrogen	0.15		
pH (pH units)	6.5-8.5	8.1	7.7
Phenols		<0.001	<0.001
Phosphate (as P)		1.02	0.54
Phosphorus (total)		0.93	2.05
Potassium		5.0	5.0
Selenium			
Silicon		6.30	9.52
Silver		<0.0100	<0.0001
Sodium	200	68.0	69.0
Strontium		0.126	0.138
Sulphate	500	5.0	6.0
Sulphur		2	2
TDS	500	240	316
Temperature (C)	15	3.0	9.3
Thallium		<0.20000	<0.00100
Tin		<0.050	<0.010
Titanium		<0.010	0.080
TOC			
Turbidity (NTU)	1		
Vanadium		<0.0100	0.0110
Zinc	5	<0.010	0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P7-2** Sheet: 1

Date Sampled:		31-Oct-1991	03-Dec-1997	21-Apr-1998	14-May-1999	02-Sep-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	60	54	57	71	52
Aluminum	0.1		0.440	1.670	<0.030	<0.030
Ammonia (as N)			0.03	<0.02	0.28	0.05
Antimony			<0.1000	<0.1000		
Arsenic	0.025	0.052	<0.100	<0.100		
Barium	1	0.100	0.022	0.021	0.010	0.010
Beryllium			<0.001	<0.001	<0.010	<0.010
Bicarbonate			1.50	1.00		
Bismuth			<0.100	<0.100		
Boron	5	0.020	0.010	<0.010	<0.010	<0.010
Bromide			<0.05	<0.50		
Cadmium	0.005	0.00600	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		16.0	17.2	19.5	19.0	18.0
Carbonate			59.70	67.20		
Chloride	250	14.0	2.2	2.8	2.0	2.0
Chromium	0.05	<0.050	<0.005	<0.005	<0.010	<0.010
Cobalt			<0.0050	<0.0050	<0.0100	<0.0100
COD		2	<5	7	5	8
Colour (TCU)	5	55	74	1290		
Conductivity (uS/cm)		140	130	151	140	80
Copper	1	0.0900	0.0040	0.0060	<0.0050	<0.0050
Cyanide	0.2	<0.005				
DOC	5	11.4	0.7	0.5	1.3	1.7
Fluoride	1.5	0.23	<0.10	<0.10		
Hardness (CaCO3)	80-100		66	73	76	70
Hydrogen Sulphide	0.05	0.20				
Iron	0.3	5.16	0.37	0.21	<0.01	0.12
Lead	0.01	0.0900			<0.0020	<0.0020
Magnesium			5.64	5.97	7.00	6.00
Manganese	0.05	0.430	0.010	0.019	<0.010	0.020
Mercury	0.001	<0.0001				
Molybdenum			<0.010	<0.010	<0.010	<0.010
Nickel		0.060	<0.020	<0.020	<0.010	<0.010
Nitrate (as N)	10	<0.10	0.05	0.30	0.58	0.70
Nitrite (as N)	1	<0.01	<0.02	<0.20	<0.10	<0.10
Organic Nitrogen	0.15	<0.10				
pH (pH units)	6.5-8.5	7.7	8.4	8.2	8.4	6.8
Phenols		<0.002			<0.001	0.001
Phosphate (as P)			<0.10	<1.00	0.12	0.08
Phosphorus (total)		2.65	0.17	7.40	9.25	
Potassium			2.0	2.0	1.0	1.0
Selenium		<0.001	<0.100	<0.100		
Silicon					6.30	6.80
Silver		<0.0500	<0.0030	0.0040	<0.0100	0.0200
Sodium	200	4.0	2.5	2.1	3.0	3.0
Strontium			0.038	0.045	0.039	0.047
Sulphate	500	22.0	13.8	12.5	11.0	12.0
Sulphur			5	5	5	4
TDS	500	120	75	79	100	84
Temperature (C)	15				8.0	13.0
Thallium					<0.20000	<0.50000
Tin			<0.050	<0.050	<0.050	<0.050
Titanium			0.016	0.008	<0.010	<0.010
TOC		14				
Turbidity (NTU)	1	56.0	48.0	41.0		
Vanadium			<0.0050	<0.0050	<0.0100	<0.0100
Zinc	5	0.340	<0.005	0.008	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P7-2**

Date Sampled:		20-Oct-1999	03-Nov-2000
Parameter	ODWS/O		
Alkalinity (CaCO3)	30-500	53	60
Aluminum	0.1	1.190	1.450
Ammonia (as N)		<0.02	0.45
Antimony			
Arsenic	0.025		
Barium	1	NA	0.030
Beryllium		<0.010	<0.002
Bicarbonate			
Bismuth			
Boron	5	NA	<0.010
Bromide			
Cadmium	0.005	<0.00500	<0.00010
Calcium		18.0	17.0
Carbonate			
Chloride	250	2.0	2.0
Chromium	0.05	<0.010	<0.010
Cobalt		<0.0100	0.0010
COD		5	5
Colour (TCU)	5		
Conductivity (uS/cm)		105	176
Copper	1	<0.0050	0.0040
Cyanide	0.2		
DOC	5	0.8	0.6
Fluoride	1.5		
Hardness (CaCO3)	80-100	70	67
Hydrogen Sulphide	0.05		
Iron	0.3	1.49	1.30
Lead	0.01	<0.0020	<0.0010
Magnesium		6.00	6.00
Manganese	0.05	0.040	0.030
Mercury	0.001		
Molybdenum		<0.010	<0.010
Nickel		<0.010	<0.010
Nitrate (as N)	10	0.27	<0.10
Nitrite (as N)	1	<0.10	<0.10
Organic Nitrogen	0.15		
pH (pH units)	6.5-8.5	8.5	7.7
Phenols		<0.001	<0.001
Phosphate (as P)		0.57	0.05
Phosphorus (total)		1.71	7.96
Potassium		2.0	2.0
Selenium			
Silicon		8.40	8.05
Silver		<0.0100	<0.0001
Sodium	200	4.0	<2.0
Strontium		0.046	0.038
Sulphate	500	12.0	13.0
Sulphur		4	4
TDS	500	84	112
Temperature (C)	15	5.0	10.0
Thallium		<0.20000	<0.00100
Tin		<0.050	<0.010
Titanium		0.040	0.050
TOC			
Turbidity (NTU)	1		
Vanadium		<0.0100	0.0040
Zinc	5	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P8-1** Sheet: 1

Date Sampled:		03-Dec-1997	21-Apr-1998	14-May-1999	02-Sep-1999	20-Oct-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	194	180	177	166	176
Aluminum	0.1	1.000	1.600	<0.030	<0.030	0.190
Ammonia (as N)		0.29	0.48	0.48	0.35	0.34
Antimony		<0.1000	<0.1000			
Arsenic	0.025	<0.100	<0.100			
Barium	1	0.038	0.037	0.020	0.010	NA
Beryllium		0.002	<0.001	<0.010	<0.010	<0.010
Bicarbonate			1.00			
Bismuth		<0.100	<0.100			
Boron	5	0.100	0.110	0.090	0.080	NA
Bromide		0.18	<0.50			
Cadmium	0.005	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		22.4	20.0	19.0	20.0	22.0
Carbonate		236.30	217.10			
Chloride	250	42.7	34.8	27.0	29.0	32.0
Chromium	0.05	<0.005	<0.005	<0.010	<0.010	<0.010
Cobalt		<0.0050	<0.0050	<0.0100	<0.0100	<0.0100
COD		28	23	14	8	21
Colour (TCU)	5	110	1720			
Conductivity (uS/cm)		560	545	480	420	330
Copper	1	0.0040	0.0040	<0.0050	<0.0050	<0.0050
DOC	5	10.3	5.6	5.0	5.1	4.8
Fluoride	1.5	0.30	<0.10			
Hardness (CaCO3)	80-100	106	103	97	99	104
Iron	0.3	1.44	2.38	<0.01	0.04	0.16
Lead	0.01			<0.0020	<0.0020	<0.0020
Magnesium		12.00	12.70	12.00	12.00	12.00
Manganese	0.05	0.036	0.085	0.020	<0.010	0.020
Molybdenum		<0.010	0.010	<0.010	<0.010	<0.010
Nickel		<0.020	<0.020	<0.010	<0.010	<0.010
Nitrate (as N)	10	0.03	<0.20	<0.10	0.19	0.42
Nitrite (as N)	1	<0.20	<0.20	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.8	8.0	8.0	7.8	8.1
Phenols				<0.001	<0.001	0.001
Phosphate (as P)		<0.10	<1.00	0.15	0.14	0.69
Phosphorus (total)		0.44	4.90	1.09		1.18
Potassium		6.0	5.0	5.0	5.0	5.0
Selenium			<0.100			
Silicon				5.30	5.20	5.90
Silver		<0.0030	0.0060	<0.0100	0.0200	<0.0100
Sodium	200	80.4	84.3	81.0	85.0	96.0
Strontium		0.141	0.142	0.138	0.139	0.138
Sulphate	500	45.6	48.6	47.0	49.0	53.0
Sulphur		22	16	15	16	17
TDS	500	325	314	336	312	312
Temperature (C)	15			11.0	14.0	4.5
Thallium				<0.20000	<0.50000	<0.20000
Tin		<0.050	<0.050	<0.050	<0.050	<0.050
Titanium		0.039	0.034	<0.010	<0.010	<0.010
Turbidity (NTU)	1	49.0	57.0			
Vanadium		<0.0050	0.0070	<0.0100	<0.0100	<0.0100
Zinc	5	0.005	0.010	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P8-1**

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
Alkalinity (CaCO3)	30-500	168
Aluminum	0.1	0.640
Ammonia (as N)		0.29
Antimony		
Arsenic	0.025	
Barium	1	0.010
Beryllium		<0.002
Bicarbonate		
Bismuth		
Boron	5	0.100
Bromide		
Cadmium	0.005	<0.00010
Calcium		17.0
Carbonate		
Chloride	250	31.0
Chromium	0.05	<0.010
Cobalt		0.0005
COD		11
Colour (TCU)	5	
Conductivity (uS/cm)		655
Copper	1	0.0020
DOC	5	3.2
Fluoride	1.5	
Hardness (CaCO3)	80-100	100
Iron	0.3	0.74
Lead	0.01	<0.0010
Magnesium		14.00
Manganese	0.05	0.020
Molybdenum		0.020
Nickel		<0.010
Nitrate (as N)	10	0.43
Nitrite (as N)	1	<0.10
pH (pH units)	6.5-8.5	7.4
Phenols		<0.001
Phosphate (as P)		0.46
Phosphorus (total)		0.21
Potassium		6.0
Selenium		
Silicon		6.13
Silver		<0.0001
Sodium	200	80.0
Strontium		0.129
Sulphate	500	46.0
Sulphur		15
TDS	500	328
Temperature (C)	15	10.1
Thallium		<0.00100
Tin		<0.010
Titanium		0.030
Turbidity (NTU)	1	
Vanadium		0.0040
Zinc	5	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P8-2**

Sheet: 1

Date Sampled:		03-Dec-1997	21-Apr-1998	14-May-1999	02-Sep-1999	20-Oct-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	757	749	840	809	804
Aluminum	0.1	0.050	0.130	<0.030	<0.030	0.030
Ammonia (as N)		<0.02	<0.02	0.07	0.07	0.02
Antimony		<0.1000	<0.1000			
Arsenic	0.025	<0.100	<0.100			
Barium	1	0.334	0.290	0.270	0.290	NA
Beryllium		<0.001	<0.001	<0.010	<0.010	<0.010
Bicarbonate			1.00			
Bismuth		<0.100	<0.100			
Boron	5	0.670	0.730	0.730	0.670	NA
Bromide		0.44	<0.50			
Cadmium	0.005	<0.00500	<0.00500	<0.05000	<0.00500	<0.00500
Calcium		265.0	239.0	286.0	271.0	268.0
Carbonate		922.70	910.80			
Chloride	250	75.9	68.1	51.0	59.0	55.0
Chromium	0.05	<0.005	<0.005	<0.010	<0.010	<0.010
Cobalt		0.0110	0.0110	<0.0100	<0.0100	<0.0100
COD		106	100	98	109	108
Colour (TCU)	5	44	1210			
Conductivity (uS/cm)		1650	1510	1000	950	970
Copper	1	0.0370	0.0220	0.0390	0.0410	0.0670
DOC	5	39.0	46.0	47.5	41.1	41.0
Fluoride	1.5	0.10	<0.10			
Hardness (CaCO3)	80-100	825	764	883	850	809
Iron	0.3	0.03	0.13	<0.01	0.06	0.15
Lead	0.01			<0.0020	<0.0020	<0.0020
Magnesium		37.40	40.10	41.00	42.00	34.00
Manganese	0.05	5.700	4.920	4.790	2.780	4.220
Molybdenum		<0.010	0.010	<0.010	<0.010	<0.010
Nickel		<0.020	<0.020	<0.010	<0.010	<0.010
Nitrate (as N)	10	0.02	<0.20	<0.10	0.12	<0.10
Nitrite (as N)	1	<0.20	<0.20	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	6.8	6.8	6.9	6.6	6.8
Phenols				<0.001	<0.001	<0.001
Phosphate (as P)		<0.10	<1.00	<0.03	0.02	1.38
Phosphorus (total)		0.04	16.00	1.81		2.53
Potassium		5.0	4.0	6.0	5.0	5.0
Selenium		<0.100	<0.100			
Silicon				16.60	15.70	18.30
Silver		<0.0030	0.0060	<0.0100	0.0200	<0.0100
Sodium	200	61.5	59.6	70.0	68.0	69.0
Strontium		1.350	1.090	1.300	1.020	1.350
Sulphate	500	159.0	58.4	37.0	42.0	14.0
Sulphur		45	24	13	14	5
TDS	500	1060	919	1112	984	1028
Temperature (C)	15			11.0	11.0	6.0
Thallium				<0.20000	<0.50000	<0.20000
Tin		<0.050	<0.050	<0.050	<0.050	<0.050
Titanium		0.006	0.007	<0.010	<0.010	<0.010
Turbidity (NTU)	1	1.8	1.8			
Vanadium		<0.0050	<0.0050	<0.0100	<0.0100	<0.0100
Zinc	5	0.013	<0.005	<0.010	<0.010	0.260

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P8-2**

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
Alkalinity (CaCO3)	30-500	745
Aluminum	0.1	0.170
Ammonia (as N)		0.03
Antimony		
Arsenic	0.025	
Barium	1	0.230
Beryllium		<0.002
Bicarbonate		
Bismuth		
Boron	5	0.600
Bromide		
Cadmium	0.005	0.00010
Calcium		238.0
Carbonate		
Chloride	250	41.0
Chromium	0.05	<0.010
Cobalt		0.0068
COD		68
Colour (TCU)	5	
Conductivity (uS/cm)		1450
Copper	1	0.0820
DOC	5	31.7
Fluoride	1.5	
Hardness (CaCO3)	80-100	743
Iron	0.3	0.19
Lead	0.01	<0.0010
Magnesium		36.00
Manganese	0.05	4.110
Molybdenum		0.010
Nickel		0.020
Nitrate (as N)	10	<0.10
Nitrite (as N)	1	<0.10
pH (pH units)	6.5-8.5	6.3
Phenols		<0.001
Phosphate (as P)		<0.03
Phosphorus (total)		10.90
Potassium		6.0
Selenium		
Silicon		20.20
Silver		<0.0001
Sodium	200	52.0
Strontium		1.180
Sulphate	500	19.0
Sulphur		6
TDS	500	944
Temperature (C)	15	10.5
Thallium		<0.00100
Tin		<0.010
Titanium		<0.010
Turbidity (NTU)	1	
Vanadium		0.0200
Zinc	5	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P9-1** Sheet: 1

Date Sampled:		03-Dec-1997	21-Apr-1998	14-May-1999	02-Sep-1999	19-Oct-1999
Parameter	ODWS/O					
Alkalinity (CaCO3)	30-500	92	75	86	73	75
Aluminum	0.1	3.180	3.520	<0.030	0.050	<0.030
Ammonia (as N)		0.12	0.07	0.24	0.23	0.30
Antimony		<0.1000	<0.1000			
Arsenic	0.025	<0.100	<0.100			
Barium	1	0.087	0.088	0.020	0.020	NA
Beryllium		<0.001	<0.001	<0.010	<0.010	<0.010
Bicarbonate		1.10	2.00			
Bismuth		<0.100				
Boron	5	<0.010	<0.010	<0.010	<0.010	NA
Bromide		<0.05	<0.50			
Cadmium	0.005	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500
Calcium		24.1	22.7	25.0	23.0	22.0
Carbonate		107.40	84.30			
Chloride	250	3.5	1.7	3.0	2.0	2.0
Chromium	0.05	0.010	0.010	<0.010	<0.010	<0.010
Cobalt		0.0090	0.0050	<0.0100	<0.0100	<0.0100
COD		23	7	5	3	11
Colour (TCU)	5	148	12700			
Conductivity (uS/cm)		206	184	110	140	130
Copper	1	0.0050	0.0100	<0.0050	<0.0050	<0.0050
DOC	5	1.4	0.9	3.0	2.1	2.6
Fluoride	1.5	<0.10	0.10			
Hardness (CaCO3)	80-100	97	89	99	90	88
Iron	0.3	5.11	5.47	0.04	0.07	0.01
Lead	0.01			<0.0020	<0.0020	<0.0020
Magnesium		8.82	7.48	9.00	8.00	8.00
Manganese	0.05	0.190	0.156	0.020	0.030	0.020
Molybdenum		<0.010	<0.010	<0.010	<0.010	<0.010
Nickel		<0.020	<0.020	<0.010	<0.010	<0.010
Nitrate (as N)	10	0.02	<0.20	<0.10	<0.10	<0.10
Nitrite (as N)	1	<0.02	<0.20	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	8.4	8.5	8.4	7.1	8.6
Phenols				<0.001	<0.001	<0.001
Phosphate (as P)		<0.10	<1.00	0.09	0.33	<0.03
Phosphorus (total)		0.11	64.00	0.80		8.22
Potassium		3.0	2.0	5.0	4.0	4.0
Selenium		<0.100	<0.100			
Silicon				5.70	5.70	5.60
Silver		<0.0030	0.0060	<0.0100	0.0200	<0.0100
Sodium	200	10.6	5.4	8.0	7.0	7.0
Strontium		0.077	0.057	0.056	0.051	0.055
Sulphate	500	17.5	17.1	23.0	17.0	169.0
Sulphur		6	6	7	6	6
TDS	500	123	102	140	116	116
Temperature (C)	15			9.0	8.0	3.0
Thallium				<0.20000	<0.50000	<0.20000
Tin		<0.050	<0.050	<0.050	<0.050	<0.050
Titanium		0.067	0.078	<0.010	<0.010	<0.010
Turbidity (NTU)	1	104.0	125.0			
Vanadium		0.0080	0.0090	<0.0100	<0.0100	<0.0100
Zinc	5	0.016	0.017	<0.010	0.020	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **P9-1**

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
Alkalinity (CaCO3)	30-500	64
Aluminum	0.1	3.890
Ammonia (as N)		0.12
Antimony		
Arsenic	0.025	
Barium	1	0.070
Beryllium		<0.002
Bicarbonate		
Bismuth		
Boron	5	<0.010
Bromide		
Cadmium	0.005	<0.00010
Calcium		21.0
Carbonate		
Chloride	250	2.0
Chromium	0.05	<0.010
Cobalt		0.0022
COD		16
Colour (TCU)	5	
Conductivity (uS/cm)		228
Copper	1	0.0050
DOC	5	1.5
Fluoride	1.5	
Hardness (CaCO3)	80-100	90
Iron	0.3	3.93
Lead	0.01	0.0020
Magnesium		9.00
Manganese	0.05	0.110
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	7.9
Phenols		<0.001
Phosphate (as P)		0.18
Phosphorus (total)		0.06
Potassium		3.0
Selenium		
Silicon		8.94
Silver		<0.0001
Sodium	200	5.0
Strontium		0.055
Sulphate	500	17.0
Sulphur		6
TDS	500	120
Temperature (C)	15	8.4
Thallium		<0.00100
Tin		<0.010
Titanium		0.100
Turbidity (NTU)	1	
Vanadium		0.0070
Zinc	5	0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **G10-1**

Sheet: 1

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
Alkalinity (CaCO3)	30-500	100
Aluminum	0.1	3.560
Ammonia (as N)		0.21
Barium	1	0.040
Beryllium		<0.002
Boron	5	0.030
Cadmium	0.005	<0.00010
Calcium		18.0
Chloride	250	16.0
Chromium	0.05	<0.010
Cobalt		0.0022
COD		11
Conductivity (uS/cm)		507
Copper	1	0.0050
DOC	5	1.8
Hardness (CaCO3)	80-100	74
Iron	0.3	3.65
Lead	0.01	0.0010
Magnesium		7.00
Manganese	0.05	0.120
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)		0.69
Phosphorus (total)		0.18
Potassium		4.0
Silicon		9.97
Silver		<0.0001
Sodium	200	35.0
Strontium		0.079
Sulphate	500	27.0
Sulphur		9
TDS	500	256
Temperature (C)	15	8.2
Thallium		<0.00100
Tin		<0.010
Titanium		0.080
Vanadium		0.0060
Zinc	5	0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sheet: 1

Sample Source: **G10-1**

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
1,1,1,2-Tetrachloroethane		<0.60
1,1,1-Trichloroethane		<0.40
1,1,2,2-Tetrachloroethane		<0.60
1,1,2-Trichloroethane		<0.40
1,1-Dichloroethane		<0.40
1,1-Dichloroethylene	14	<0.5000
1,2-Dibromoethane		<1.00
1,2-Dichlorobenzene	200	<0.40
1,2-Dichloroethane	5	<0.700
1,2-Dichloropropane		<0.70
1,3,5-Trimethylbenzene		<0.30
1,3-Dichlorobenzene		<0.40
1,4-Dichlorobenzene	5	<0.400
Benzene	5	<0.5000
Bromodichloromethane		<0.300
Bromoform		<0.400
Bromomethane		<0.500
c-1,3-Dichloropropylene		<0.20
Carbon Tetrachloride	5	<0.900
Chlorobenzene	80	<0.200
Chloroethane		<1.0
Chloroform		1.00
Chloromethane		<1.000
cis-1,2-Dichloroethylene		<0.40
Dibromochloromethane		<0.30
Ethylbenzene	2.4	<0.5000
m/p-Xylene	300	<1.000
Methylene Chloride	50	<4.00
o-Xylene	300	<0.500
Styrene		<0.50
t-1,2-Dichloroethylene		<0.4000
t-1,3-Dichloropropylene		<0.20
Tetrachloroethylene	30	<0.30
Toluene	24	<0.5000
Trichloroethylene	50	<0.30
Trichlorofluoromethane		<0.50
Vinyl Chloride	2	<0.500

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **G10-2**

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
Alkalinity (CaCO3)	30-500	80
Aluminum	0.1	1.780
Ammonia (as N)		0.24
Barium	1	0.040
Beryllium		<0.002
Boron	5	<0.010
Cadmium	0.005	<0.00010
Calcium		23.0
Chloride	250	4.0
Chromium	0.05	<0.010
Cobalt		0.0011
COD		11
Conductivity (uS/cm)		278
Copper	1	0.0020
DOC	5	1.1
Hardness (CaCO3)	80-100	86
Iron	0.3	1.72
Lead	0.01	<0.0010
Magnesium		7.00
Manganese	0.05	0.090
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	7.7
Phenols		<0.001
Phosphate (as P)		0.75
Phosphorus (total)		0.30
Potassium		2.0
Silicon		9.49
Silver		<0.0001
Sodium	200	8.0
Strontium		0.063
Sulphate	500	25.0
Sulphur		8
TDS	500	144
Temperature (C)	15	8.4
Thallium		<0.00100
Tin		<0.010
Titanium		0.060
Vanadium		0.0030
Zinc	5	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **G10-2**

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
1,1,1,2-Tetrachloroethane		<0.60
1,1,1-Trichloroethane		<0.40
1,1,2,2-Tetrachloroethane		<0.60
1,1,2-Trichloroethane		<0.40
1,1-Dichloroethane		<0.40
1,1-Dichloroethylene	14	<0.5000
1,2-Dibromoethane		<1.00
1,2-Dichlorobenzene	200	<0.40
1,2-Dichloroethane	5	<0.700
1,2-Dichloropropane		<0.70
1,3,5-Trimethylbenzene		<0.30
1,3-Dichlorobenzene		<0.40
1,4-Dichlorobenzene	5	<0.400
Benzene	5	<0.5000
Bromodichloromethane		<0.300
Bromoform		<0.400
Bromomethane		<0.500
c-1,3-Dichloropropylene		<0.20
Carbon Tetrachloride	5	<0.900
Chlorobenzene	80	<0.200
Chloroethane		<1.0
Chloroform		1.30
Chloromethane		<1.000
cis-1,2-Dichloroethylene		<0.40
Dibromochloromethane		<0.30
Ethylbenzene	2.4	<0.5000
m/p-Xylene	300	<1.000
Methylene Chloride	50	<4.00
o-Xylene	300	<0.500
Styrene		<0.50
t-1,2-Dichloroethylene		<0.4000
t-1,3-Dichloropropylene		<0.20
Tetrachloroethylene	30	0.30
Toluene	24	<0.5000
Trichloroethylene	50	<0.30
Trichlorofluoromethane		<0.50
Vinyl Chloride	2	<0.500

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **G10-3**

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
Alkalinity (CaCO3)	30-500	95
Aluminum	0.1	1.780
Ammonia (as N)		0.18
Barium	1	0.030
Beryllium		<0.002
Boron	5	<0.010
Cadmium	0.005	<0.00010
Calcium		6.0
Chloride	250	5.0
Chromium	0.05	<0.010
Cobalt		0.0014
COD		8
Conductivity (uS/cm)		271
Copper	1	0.0060
DOC	5	1.7
Hardness (CaCO3)	80-100	19
Iron	0.3	1.46
Lead	0.01	0.0010
Magnesium		1.00
Manganese	0.05	0.040
Molybdenum		<0.010
Nickel		<0.010
Nitrate (as N)	10	3.02
Nitrite (as N)	1	<0.10
pH (pH units)	6.5-8.5	8.4
Phenols		<0.001
Phosphate (as P)		0.28
Phosphorus (total)		0.15
Potassium		1.0
Silicon		6.41
Silver		<0.0001
Sodium	200	40.0
Strontium		0.027
Sulphate	500	17.0
Sulphur		6
TDS	500	180
Temperature (C)	15	9.5
Thallium		<0.00100
Tin		<0.010
Titanium		0.040
Vanadium		0.0100
Zinc	5	0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **G10-3**

Sheet: 1

Date Sampled: 03-Nov-2000

Parameter	ODWS/O	
1,1,1,2-Tetrachloroethane		<0.60
1,1,1-Trichloroethane		<0.40
1,1,2,2-Tetrachloroethane		<0.60
1,1,2-Trichloroethane		<0.40
1,1-Dichloroethane		<0.40
1,1-Dichloroethylene	14	<0.5000
1,2-Dibromoethane		<1.00
1,2-Dichlorobenzene	200	<0.40
1,2-Dichloroethane	5	<0.700
1,2-Dichloropropane		<0.70
1,3,5-Trimethylbenzene		<0.30
1,3-Dichlorobenzene		<0.40
1,4-Dichlorobenzene	5	<0.400
Benzene	5	<0.5000
Bromodichloromethane		<0.300
Bromoform		<0.400
Bromomethane		<0.500
c-1,3-Dichloropropylene		<0.20
Carbon Tetrachloride	5	<0.900
Chlorobenzene	80	<0.200
Chloroethane		<1.0
Chloroform		0.70
Chloromethane		<1.000
cis-1,2-Dichloroethylene		<0.40
Dibromochloromethane		<0.30
Ethylbenzene	2.4	<0.5000
m/p-Xylene	300	<1.000
Methylene Chloride	50	<4.00
o-Xylene	300	<0.500
Styrene		<0.50
t-1,2-Dichloroethylene		<0.4000
t-1,3-Dichloropropylene		<0.20
Tetrachloroethylene	30	<0.30
Toluene	24	<0.5000
Trichloroethylene	50	<0.30
Trichlorofluoromethane		<0.50
Vinyl Chloride	2	<0.500

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

APPENDIX C-II

SURFACE WATER SAMPLING STATIONS

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-1**

Date Sampled:		30-Oct-1991	03-Dec-1997	21-Apr-1998	17-May-1999	02-Sep-1999
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	154	219	123	167	104
Aluminum	f (pH)	0.230	0.580	0.322	<0.030	0.270
Ammonia (as N)		<0.10	0.07	0.04	<0.02	0.08
Antimony	0.02		<0.0005	<0.0005		
Arsenic	0.005	<0.001	<0.002	<0.002		
Barium			0.069	0.043	0.040	0.030
Beryllium	f (Hardness)		<0.001	<0.001	<0.010	<0.010
Bicarbonate				1.00		
Bismuth			<0.001	<0.001		
BOD		5				
Boron	0.2		0.025	0.023	0.010	<0.010
Bromide			0.12	<0.05		
Cadmium	0.0002	<0.00020	<0.00010	<0.00010	<0.00015	<0.00015
Calcium		67.0	90.2	41.7	53.0	30.0
Carbonate			266.80	147.60		
Chloride		185.0	119.0	85.0	113.0	22.0
Chromium		<0.002	<0.005	<0.005	<0.010	<0.010
Cobalt	0.0009		0.0002	0.0003	<0.0004	<0.0004
COD		40	19	37	40	13
Colour (TCU)		21	40	145		
Conductivity (uS/cm)		932	886	539	580	225
Copper	0.005	<0.0050	0.0022	0.0028	<0.0050	<0.0050
Cyanide		<0.005				
Dissolved Oxygen	f (Temp)				9.3	6.7
DOC			6.9	12.1	14.9	4.7
Fecal Coliform (per 100mL)		30				
Fecal Streptococci (per 100mL)		58				
Fluoride			0.10	<0.10		
Hardness (CaCO3)		262	344	158	194	108
Iron	0.3	0.54	0.58	0.84	0.69	0.59
Lead	f (Alk)	<0.0120	<0.0005	<0.0005	<0.0020	<0.0020
Magnesium		23.00	28.90	13.00	15.00	8.00
Manganese			0.058	0.090	0.210	0.120
Mercury	0.0002	<0.0001				
Molybdenum	0.04		<0.001	<0.001	<0.010	<0.010
Nickel	0.025	<0.005	<0.001	<0.001	<0.010	<0.010
Nitrate (as N)		<0.10	2.80	<0.20	0.84	0.19
Nitrite (as N)		<0.10	<0.20	<0.20	<0.10	<0.10
pH (pH units)	6.5-8.5	7.7	7.7	7.7	7.8	6.8
Phenols	0.001	<0.002			<0.001	<0.001
Phosphate (as P)			<0.10	<1.00	<0.03	0.04
Phosphorus (total)	0.03	0.20	0.04	0.05	0.05	0.07
Potassium		6.0	4.0	1.8	3.0	3.0
Selenium	0.1	<0.001	<0.002	<0.002		
Silicon					2.10	3.90
Silver	0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		78.0	65.6	52.6	68.0	20.0
Strontium			0.451	0.287	0.341	0.143
Sulphate			58.2	22.9	26.0	10.0
Sulphur					7	4
TDS			497	291	396	168
Temperature (C)					20.0	17.0
Thallium	0.0003				<0.00500	<0.00500
Tin			<0.001	<0.001	<0.050	<0.050
Titanium			0.019	0.014	<0.010	<0.010
TOC		12				
TSS		30				
Turbidity (NTU)		0.6	5.7	8.6		
Unionized Ammonia	0.02	<0.020	0.000	0.000	<0.020	<0.100
Vanadium	0.006		0.0007	0.0024	<0.0070	<0.0070
Zinc	0.03	0.007	0.008	0.004	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-1** Sheet: 2

Date Sampled:		20-Oct-1999	08-Aug-2000	03-Nov-2000	23-Dec-2000
Parameter	PWQO				
Alkalinity (CaCO3)	75% Bkgd	216	141	228	NS
Aluminum	f (pH)	<0.030	0.130	0.310	
Ammonia (as N)		0.03	0.08	0.04	
Antimony	0.02				
Arsenic	0.005				
Barium		0.070	0.040	0.060	
Beryllium	f (Hardness)	<0.010	<0.002	<0.002	
Bicarbonate					
Bismuth					
BOD					
Boron	0.2	0.030	0.050	0.030	
Bromide					
Cadmium	0.0002	<0.00015	<0.00010	<0.00010	
Calcium		81.0	42.0	66.0	
Carbonate					
Chloride		148.0	52.0	104.0	
Chromium		<0.010	<0.010	<0.010	
Cobalt	0.0009	<0.0004	0.0003	0.0003	
COD		23	38	38	
Colour (TCU)					
Conductivity (uS/cm)		620	468	890	
Copper	0.005	<0.0050	0.0020	0.0010	
Cyanide					
Dissolved Oxygen	f (Temp)		7.3	11.5	
DOC		9.6	11.4	7.5	
Fecal Coliform (per 100mL)					
Fecal Streptococci (per 100mL)					
Fluoride					
Hardness (CaCO3)		293	150	260	
Iron	0.3	0.21	0.18	0.41	
Lead	f (Alk)	<0.0020	<0.0010	<0.0010	
Magnesium		22.00	11.00	23.00	
Manganese		0.010	0.030	0.040	
Mercury	0.0002				
Molybdenum	0.04	<0.010	<0.010	<0.010	
Nickel	0.025	<0.010	<0.010	<0.010	
Nitrate (as N)		2.66	1.90	1.39	
Nitrite (as N)		<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.7	7.7	7.3	
Phenols	0.001	0.001	0.002	<0.001	
Phosphate (as P)		0.03	0.24	<0.03	
Phosphorus (total)	0.03	0.04	0.17	0.06	
Potassium		5.0	5.0	4.0	
Selenium	0.1				
Silicon		3.90	3.55	3.52	
Silver	0.0001	<0.0001	0.0002	<0.0001	
Sodium		113.0	42.0	71.0	
Strontium		0.622	0.249	0.380	
Sulphate		60.0	22.0	30.0	
Sulphur		19	9	10	
TDS		560	272	472	
Temperature (C)		1.0	20.1	3.4	
Thallium	0.0003	<0.00500	<0.00100	<0.00100	
Tin		<0.050	<0.010	<0.010	
Titanium		<0.010	<0.010	0.010	
TOC					
TSS					
Turbidity (NTU)					
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	
Vanadium	0.006	<0.0070	<0.0100	0.0020	
Zinc	0.03	<0.010	<0.010	<0.010	

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-1**

Date Sampled:		20-Oct-1999	08-Aug-2000	03-Nov-2000	23-Dec-2000
Parameter	PWQO				
1,1,1,2-Tetrachloroethane	20			<0.60	
1,1,1-Trichloroethane	10			<0.40	
1,1,2,2-Tetrachloroethane				<0.60	
1,1,2-Trichloroethane	800			<0.40	
1,1-Dichloroethane	200			<0.40	
1,1-Dichloroethylene	40			<0.5000	
1,2-Dibromoethane				<1.00	
1,2-Dichlorobenzene	2.5			<0.40	
1,2-Dichloroethane	100			<0.700	
1,2-Dichloropropane	0.7			<0.70	
1,3,5-Trimethylbenzene				<0.30	
1,3-Dichlorobenzene	2.5			<0.40	
1,4-Dichlorobenzene	4			<0.400	
Benzene	100			<0.5000	
Bromodichloromethane	200			<0.300	
Bromoform	60			<0.400	
Bromomethane	0.9			<0.500	
c-1,3-Dichloropropylene				<0.20	
Carbon Tetrachloride				<0.900	
Chlorobenzene	15			<0.200	
Chloroethane				<1.0	
Chloroform				2.10	
Chloromethane	700			<1.000	
cis-1,2-Dichloroethylene				<0.40	
Dibromochloromethane				<0.30	
Ethylbenzene	8			<0.5000	
m/p-Xylene	32			<1.000	
Methylene Chloride	100			<4.00	
o-Xylene	40			<0.500	
Styrene	4			<0.50	
t-1,2-Dichloroethylene				<0.4000	
t-1,3-Dichloropropylene	7			<0.20	
Tetrachloroethylene	50			<0.30	
Toluene	0.8			<0.5000	
Trichloroethylene	20			<0.30	
Trichlorofluoromethane				<0.50	
Vinyl Chloride	600			<0.500	

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-2** Sheet: 1

Date Sampled:		30-Oct-1991	03-Dec-1997	21-Apr-1998	17-May-1999	02-Sep-1999
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	143	209	117	166	106
Aluminum	f (pH)	0.280	0.394	0.346	0.380	0.530
Ammonia (as N)		<0.10	0.08	0.03	<0.02	<0.10
Antimony	0.02		<0.0005	<0.0005		
Arsenic	0.005	<0.001	<0.002	<0.002		
Barium			0.066	0.040	0.060	0.020
Beryllium	f (Hardness)		<0.001	<0.001	<0.010	<0.010
Bicarbonate				1.00		
Bismuth			<0.001	<0.001		
BOD		4				
Boron	0.2		0.024	0.018	<0.010	<0.010
Bromide			0.13	<0.05		
Cadmium	0.0002	<0.00020	<0.00010	<0.00010	<0.00015	0.00018
Calcium		69.0	77.3	42.0	53.0	32.0
Carbonate			254.60	140.20		
Chloride		173.0	120.0	80.7	114.0	26.0
Chromium		<0.002	<0.005	<0.005	<0.010	<0.010
Cobalt	0.0009		0.0002	0.0003	<0.0004	<0.0004
COD		41	28	36	38	20
Colour (TCU)		21	48	137		
Conductivity (uS/cm)		880	870	522	560	260
Copper	0.005	<0.0050	0.0014	0.0022	<0.0050	<0.0050
Cyanide		<0.005				
Dissolved Oxygen	f (Temp)				10.1	13.5
DOC			6.6	10.2	14.6	7.4
Fecal Coliform (per 100mL)		31				
Fecal Streptococci (per 100mL)		60				
Fluoride			0.10	<0.10		
Hardness (CaCO3)		255	298	159	194	113
Iron	0.3	0.52	0.53	0.90	0.81	0.76
Lead	f (Alk)	<0.0070	<0.0005	<0.0005	<0.0020	<0.0020
Magnesium		20.00	25.30	13.10	15.00	8.00
Manganese			0.044	0.088	0.200	0.130
Mercury	0.0002	<0.0001				
Molybdenum	0.04		<0.001	<0.001	<0.010	<0.010
Nickel	0.025	<0.005	<0.001	<0.001	<0.010	<0.010
Nitrate (as N)		<0.10	2.66	<0.20	<0.10	<0.10
Nitrite (as N)		<0.10	<0.20	<0.20	<0.10	<0.10
pH (pH units)	6.5-8.5	7.6	7.7	7.7	7.7	7.1
Phenols	0.001	<0.002			<0.001	<0.001
Phosphate (as P)			<0.10	<1.00	<0.03	<0.03
Phosphorus (total)	0.03	0.50	0.04	0.05	0.22	0.09
Potassium		6.0	3.7	1.8	3.0	3.0
Selenium	0.1	<0.001	<0.002	<0.002		
Silicon					2.20	4.50
Silver	0.0001	0.0002	0.0001	<0.0001	<0.0001	<0.0001
Sodium		77.0	62.5	52.7	67.0	22.0
Strontium			0.450	0.270	0.572	0.154
Sulphate			58.0	22.5	26.0	13.0
Sulphur					7	5
TDS			472	283	400	176
Temperature (C)					21.0	24.0
Thallium	0.0003				<0.00500	<0.00500
Tin			<0.001	<0.001	<0.050	<0.050
Titanium			0.021	0.019	<0.010	0.010
TOC		10				
TSS		18				
Turbidity (NTU)		0.4	6.1	8.3		
Unionized Ammonia	0.02	<0.020	0.000	0.000	<0.020	<0.100
Vanadium	0.006		0.0005	0.0024	<0.0070	<0.0070
Zinc	0.03	<0.005	0.004	0.002	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-2**

Date Sampled:		20-Oct-1999	08-Aug-2000	03-Nov-2000	23-Dec-2000
Parameter	PWQO				
Alkalinity (CaCO3)	75% Bkgd	213	139	223	NS
Aluminum	f (pH)	0.130	0.110	<0.050	
Ammonia (as N)		0.03	0.05	0.03	
Antimony	0.02				
Arsenic	0.005				
Barium		0.070	0.050	0.060	
Beryllium	f (Hardness)	<0.010	<0.002	<0.002	
Bicarbonate					
Bismuth					
BOD					
Boron	0.2	0.030	0.040	0.030	
Bromide					
Cadmium	0.0002	<0.00015	<0.00010	<0.00010	
Calcium		80.0	40.0	66.0	
Carbonate					
Chloride		159.0	49.0	104.0	
Chromium		<0.010	<0.010	<0.010	
Cobalt	0.0009	<0.0004	0.0003	0.0002	
COD		18	38	35	
Colour (TCU)					
Conductivity (uS/cm)		620	450	874	
Copper	0.005	<0.0050	0.0030	<0.0010	
Cyanide					
Dissolved Oxygen	f (Temp)		6.1	12.5	
DOC		9.1	11.3	7.9	
Fecal Coliform (per 100mL)					
Fecal Streptococci (per 100mL)					
Fluoride					
Hardness (CaCO3)		290	145	256	
Iron	0.3	0.18	0.54	0.41	
Lead	f (Alk)	<0.0020	<0.0010	<0.0010	
Magnesium		22.00	11.00	22.00	
Manganese		0.010	0.040	0.040	
Mercury	0.0002				
Molybdenum	0.04	<0.010	<0.010	<0.010	
Nickel	0.025	<0.010	<0.010	<0.010	
Nitrate (as N)		2.44	1.75	1.37	
Nitrite (as N)		<0.10	<0.10	<0.10	
pH (pH units)	6.5-8.5	7.7	7.4	7.4	
Phenols	0.001	<0.001	0.001	<0.001	
Phosphate (as P)		0.03	0.26	<0.03	
Phosphorus (total)	0.03	0.03	0.19	0.03	
Potassium		5.0	5.0	4.0	
Selenium	0.1				
Silicon		3.90	4.27	3.60	
Silver	0.0001	<0.0001	<0.0001	<0.0001	
Sodium		112.0	42.0	66.0	
Strontium		0.665	0.250	0.380	
Sulphate		62.0	21.0	30.0	
Sulphur		19	9	10	
TDS		564	288	464	
Temperature (C)		0.0	19.9	4.5	
Thallium	0.0003	<0.00500	<0.00100	<0.00100	
Tin		<0.050	<0.010	<0.010	
Titanium		<0.010	0.020	0.020	
TOC					
TSS					
Turbidity (NTU)					
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	
Vanadium	0.006	<0.0070	<0.0100	<0.0010	
Zinc	0.03	<0.010	<0.010	<0.010	

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-3** Sheet: 1

Date Sampled:		30-Oct-1991	03-Dec-1997	21-Apr-1998	17-May-1999	02-Sep-1999
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	104	206	116	163	138
Aluminum	f (pH)	0.290	0.336	0.378	<0.030	0.230
Ammonia (as N)		<0.10	0.08	0.05	0.08	0.27
Antimony	0.02		<0.0005	<0.0005		
Arsenic	0.005	<0.001	<0.002	<0.002		
Barium			0.066	0.043	0.040	0.030
Beryllium	f (Hardness)		<0.001	<0.001	<0.010	<0.010
Bicarbonate				1.00		
Bismuth			<0.001	<0.001		
BOD		4				
Boron	0.2		0.025	0.020	0.010	0.040
Bromide			0.12	<0.05		
Cadmium	0.0002	<0.00020	<0.00010	<0.00010	<0.00015	<0.00015
Calcium		53.0	78.1	40.9	51.0	43.0
Carbonate			251.00	139.00		
Chloride		141.0	116.0	76.9	92.0	17.0
Chromium		<0.002	<0.005	<0.005	<0.010	<0.010
Cobalt	0.0009		0.0002	0.0003	<0.0004	<0.0004
COD		37	20	38	45	20
Colour (TCU)		16	44	143		
Conductivity (uS/cm)		774	849	515	530	280
Copper	0.005	<0.0050	0.0014	0.0026	<0.0050	<0.0050
Cyanide		<0.005				
Dissolved Oxygen	f (Temp)				9.2	10.4
DOC			7.4	10.9	13.1	8.0
Fecal Coliform (per 100mL)		73				
Fecal Streptococci (per 100mL)		48				
Fluoride			0.10	<0.10		
Hardness (CaCO3)		207	301	153	185	157
Iron	0.3	0.31	0.52	0.84	0.81	0.47
Lead	f (Alk)	<0.0050	<0.0005	<0.0005	<0.0020	<0.0020
Magnesium		18.00	25.60	12.40	14.00	12.00
Manganese			0.053	0.093	0.230	0.130
Mercury	0.0002	<0.0001				
Molybdenum	0.04		<0.001	<0.001	<0.010	<0.010
Nickel	0.025	0.008	<0.001	<0.001	<0.010	<0.010
Nitrate (as N)		<0.10	2.67	<0.20	<0.10	0.27
Nitrite (as N)		<0.10	<0.20	<0.20	<0.10	0.20
pH (pH units)	6.5-8.5	7.7	7.7	7.7	7.8	7.0
Phenols	0.001	<0.002			<0.001	<0.001
Phosphate (as P)			<0.10	<1.00	<0.03	<0.03
Phosphorus (total)	0.03	0.24	0.03	0.05	0.08	0.11
Potassium		5.0	3.7	3.4	3.0	4.0
Selenium	0.1	<0.001	<0.002	<0.002		
Silicon					2.90	5.70
Silver	0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		58.0	64.7	47.9	58.0	17.0
Strontium			0.445	0.271	0.301	0.142
Sulphate			57.8	22.3	26.0	24.0
Sulphur					7	8
TDS			470	273	364	212
Temperature (C)					17.5	17.0
Thallium	0.0003				<0.00500	<0.00500
Tin			<0.001	<0.001	<0.050	<0.050
Titanium			0.018	0.016	<0.010	<0.010
TOC		9				
TSS		13				
Turbidity (NTU)		0.4	6.7	8.8		
Unionized Ammonia	0.02	<0.020	0.000	0.000	<0.020	<0.100
Vanadium	0.006		<0.0005	0.0024	<0.0070	<0.0070
Zinc	0.03	0.006	0.005	0.090	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-3**

Date Sampled:		19-Oct-1999	08-Aug-2000	03-Nov-2000	23-Dec-2000
Parameter	PWQO				
Alkalinity (CaCO3)	75% Bkgd	157	136	171	165
Aluminum	f (pH)	<0.030	0.110	<0.050	0.380
Ammonia (as N)		0.43	0.11	0.08	0.20
Antimony	0.02				
Arsenic	0.005				
Barium		0.040	0.040	0.050	0.050
Beryllium	f (Hardness)	<0.010	<0.002	<0.002	<0.002
Bicarbonate					
Bismuth					
BOD					
Boron	0.2	0.040	0.050	0.030	0.020
Bromide					
Cadmium	0.0002	<0.00015	<0.00010	<0.00010	<0.00010
Calcium		44.0	39.0	64.0	48.0
Carbonate					
Chloride		8.0	50.0	96.0	97.0
Chromium		<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	<0.0004	0.0004	<0.0002	0.0005
COD		16	35	21	45
Colour (TCU)					
Conductivity (uS/cm)		240	440	998	918
Copper	0.005	<0.0100	0.0020	<0.0010	0.0020
Cyanide					
Dissolved Oxygen	f (Temp)		5.5	13.6	10.5
DOC		6.4	11.6	7.4	9.2
Fecal Coliform (per 100mL)					
Fecal Streptococci (per 100mL)					
Fluoride					
Hardness (CaCO3)		159	143	246	182
Iron	0.3	0.43	0.14	0.41	0.61
Lead	f (Alk)	<0.0020	<0.0010	<0.0010	<0.0010
Magnesium		12.00	11.00	21.00	15.00
Manganese		0.120	0.030	0.040	0.150
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	1.83	1.27	1.36
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.3	7.4	7.5	6.8
Phenols	0.001	<0.001	0.001	<0.001	<0.001
Phosphate (as P)		<0.03	0.30	<0.03	0.05
Phosphorus (total)	0.03	0.10	0.20	0.02	0.05
Potassium		4.0	5.0	4.0	3.0
Selenium	0.1				
Silicon		7.30	3.33	3.77	4.73
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		11.0	39.0	63.0	61.0
Strontium		0.124	0.239	0.356	0.330
Sulphate		28.0	21.0	29.0	28.0
Sulphur		10	9	10	9
TDS		200	308	388	404
Temperature (C)		0.0	19.7	4.5	0.9
Thallium	0.0003	<0.00500	<0.00100	<0.00100	<0.00100
Tin		<0.050	<0.010	<0.010	<0.010
Titanium		<0.010	<0.010	0.010	0.010
TOC					
TSS					
Turbidity (NTU)					
Unionized Ammonia	0.02	<0.020	<0.020	<0.020	<0.020
Vanadium	0.006	<0.0070	<0.0100	<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

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-3**

Date Sampled:		19-Oct-1999	08-Aug-2000	03-Nov-2000	23-Dec-2000
Parameter	PWQO				
1,1,1,2-Tetrachloroethane	20			<0.60	
1,1,1-Trichloroethane	10			<0.40	
1,1,2,2-Tetrachloroethane				<0.60	
1,1,2-Trichloroethane	800			<0.40	
1,1-Dichloroethane	200			<0.40	
1,1-Dichloroethylene	40			<0.5000	
1,2-Dibromoethane				<1.00	
1,2-Dichlorobenzene	2.5			<0.40	
1,2-Dichloroethane	100			<0.700	
1,2-Dichloropropane	0.7			<0.70	
1,3,5-Trimethylbenzene				<0.30	
1,3-Dichlorobenzene	2.5			<0.40	
1,4-Dichlorobenzene	4			<0.400	
Benzene	100			<0.5000	
Bromodichloromethane	200			<0.300	
Bromoform	60			<0.400	
Bromomethane	0.9			<0.500	
c-1,3-Dichloropropylene				<0.20	
Carbon Tetrachloride				<0.900	
Chlorobenzene	15			<0.200	
Chloroethane				<1.0	
Chloroform				<0.50	
Chloromethane	700			<1.000	
cis-1,2-Dichloroethylene				<0.40	
Dibromochloromethane				<0.30	
Ethylbenzene	8			<0.5000	
m/p-Xylene	32			<1.000	
Methylene Chloride	100			<4.00	
o-Xylene	40			<0.500	
Styrene	4			<0.50	
t-1,2-Dichloroethylene				<0.4000	
t-1,3-Dichloropropylene	7			<0.20	
Tetrachloroethylene	50			<0.30	
Toluene	0.8			<0.5000	
Trichloroethylene	20			<0.30	
Trichlorofluoromethane				<0.50	
Vinyl Chloride	600			<0.500	

All VOC's reported in µg/L. All other values reported in mg/L unless otherwise noted.

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LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-4** Sheet: 1

Date Sampled:		03-Dec-1997	21-Apr-1998	17-May-1999	02-Sep-1999	19-Oct-1999
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	135	128	128	134	146
Aluminum	f (pH)	0.013	0.037	<0.030	0.110	<0.030
Ammonia (as N)		0.15	0.46	0.33	0.56	0.36
Antimony	0.02	<0.0005	<0.0005			
Arsenic	0.005	<0.002	<0.002			
Barium		0.038	0.033	0.030	0.040	0.040
Beryllium	f (Hardness)	<0.001	<0.001	<0.010	<0.010	<0.010
Bicarbonate			1.00			
Bismuth		<0.001	<0.001			
Boron	0.2	0.020	0.034	0.020	0.030	0.010
Bromide		<0.05	<0.05			
Cadmium	0.0002	<0.00010	<0.00010	<0.00015	<0.00015	<0.00015
Calcium		46.3	38.7	36.0	42.0	40.0
Carbonate		164.40	153.70			
Chloride		5.3	6.0	5.0	6.0	5.0
Chromium		<0.005	0.001	<0.010	<0.010	<0.010
Cobalt	0.0009	<0.0001	<0.0050	<0.0004	<0.0004	<0.0004
COD		11	15	15	15	14
Colour (TCU)		12	22			
Conductivity (uS/cm)		515	312	205	250	210
Copper	0.005	<0.0001	0.0011	<0.0050	<0.0050	<0.0100
Dissolved Oxygen	f (Temp)			8.6	9.1	10.7
DOC		4.1	4.1	4.8	5.0	5.7
Fluoride		0.10	<0.10			
Hardness (CaCO3)		169	142	131	154	145
Iron	0.3	0.35	0.34	0.56	0.92	0.67
Lead	f (Alk)	<0.0005	<0.0005	<0.0020	<0.0020	<0.0020
Magnesium		12.80	10.90	10.00	12.00	11.00
Manganese		0.070	0.126	0.110	0.140	0.070
Molybdenum	0.04	<0.001	<0.001	<0.010	<0.010	<0.010
Nickel	0.025	<0.001	<0.001	<0.010	<0.010	<0.010
Nitrate (as N)		0.37	<0.20	0.28	0.21	0.11
Nitrite (as N)		<0.02	<0.20	<0.10	0.10	<0.10
pH (pH units)	6.5-8.5	7.8	7.7	7.4	6.8	7.3
Phenols	0.001			<0.001	<0.001	<0.001
Phosphate (as P)		<0.10	<1.00	0.02	0.04	0.03
Phosphorus (total)	0.03	0.01	0.04	0.07	0.45	0.04
Potassium		1.8	2.6	2.0	3.0	2.0
Selenium	0.1	<0.002	0.002			
Silicon				6.90	7.20	7.30
Silver	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		7.5	8.6	8.0	8.0	8.0
Strontium		0.098	0.094	0.079	0.088	0.099
Sulphate		26.4	24.3	19.0	22.0	19.0
Sulphur				7	7	7
TDS		181	168	164	164	176
Temperature (C)				12.0	11.0	0.0
Thallium	0.0003			<0.00500	<0.00500	<0.00500
Tin		<0.001	<0.001	<0.050	<0.050	<0.050
Titanium		<0.005	<0.005	<0.010	<0.010	<0.010
Turbidity (NTU)		0.5	1.3			
Unionized Ammonia	0.02	0.001	0.001	<0.020	<0.100	<0.020
Vanadium	0.006	<0.0005	0.0012	<0.0070	<0.0070	<0.0070
Zinc	0.03	<0.002	<0.002	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-4**

Date Sampled:		08-Aug-2000	01-Nov-2000	23-Dec-2000
Parameter	PWQO			
Alkalinity (CaCO3)	75% Bkgd	187	156	NS
Aluminum	f (pH)	<0.050	<0.050	
Ammonia (as N)		5.95	0.31	
Antimony	0.02			
Arsenic	0.005			
Barium		0.050	0.030	
Beryllium	f (Hardness)	<0.002	<0.002	
Bicarbonate				
Bismuth				
Boron	0.2	0.040	0.030	
Bromide				
Cadmium	0.0002	<0.00010	<0.00010	
Calcium		51.0	44.0	
Carbonate				
Chloride		12.0	4.0	
Chromium		<0.010	<0.010	
Cobalt	0.0009	0.0006	<0.0002	
COD		30	17	
Colour (TCU)				
Conductivity (uS/cm)		396	428	
Copper	0.005	<0.0010	<0.0010	
Dissolved Oxygen	f (Temp)	7.9	9.1	
DOC		8.9	5.6	
Fluoride				
Hardness (CaCO3)		173	155	
Iron	0.3	0.39	0.96	
Lead	f (Alk)	<0.0010	<0.0010	
Magnesium		11.00	11.00	
Manganese		0.280	0.070	
Molybdenum	0.04	<0.010	0.010	
Nickel	0.025	<0.010	<0.010	
Nitrate (as N)		0.27	<0.10	
Nitrite (as N)		<0.10	<0.10	
pH (pH units)	6.5-8.5	7.4	6.9	
Phenols	0.001	0.001	<0.001	
Phosphate (as P)		1.56	<0.03	
Phosphorus (total)	0.03	0.56	0.09	
Potassium		5.0	2.0	
Selenium	0.1			
Silicon		7.42	7.51	
Silver	0.0001	<0.0001	<0.0001	
Sodium		11.0	9.0	
Strontium		0.132	0.101	
Sulphate		27.0	16.0	
Sulphur		11	5	
TDS		232	248	
Temperature (C)		18.2	7.1	
Thallium	0.0003	<0.00100	<0.00100	
Tin		<0.010	<0.010	
Titanium		<0.010	<0.010	
Turbidity (NTU)				
Unionized Ammonia	0.02	0.051	<0.020	
Vanadium	0.006	<0.0100	0.0020	
Zinc	0.03	<0.010	<0.010	

All values reported in mg/L unless otherwise noted.

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LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-5** Sheet: 1

Date Sampled:		03-Dec-1997	21-Apr-1998	17-May-1999	02-Sep-1999	19-Oct-1999
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	144	137	140	147	204
Aluminum	f (pH)	0.012	0.036	<0.030	0.030	0.130
Ammonia (as N)		0.30	0.64	0.48	0.58	0.32
Antimony	0.02	<0.0005	<0.0005			
Arsenic	0.005	<0.002	<0.002			
Barium		0.042	0.037	0.040	<0.010	0.070
Beryllium	f (Hardness)	<0.001	<0.001	<0.010	<0.010	<0.010
Bicarbonate			1.00			
Bismuth		<0.001	<0.001			
Boron	0.2	0.034	0.047	0.040	0.060	0.020
Bromide		0.06	<0.05			
Cadmium	0.0002	<0.00010	<0.00010	<0.00015	<0.00015	<0.00015
Calcium		51.8	45.2	41.0	49.0	67.0
Carbonate		175.40	164.60			
Chloride		8.5	8.1	8.0	11.0	137.0
Chromium		<0.005	<0.005	<0.010	<0.010	<0.010
Cobalt	0.0009	0.0001	0.0002	<0.0004	<0.0004	<0.0004
COD		11	16	20	15	24
Colour (TCU)		10	27			
Conductivity (uS/cm)		352	346	250	290	615
Copper	0.005	<0.0005	0.0011	<0.0050	<0.0050	<0.0100
Dissolved Oxygen	f (Temp)			9.8	8.8	
DOC		4.5	4.7	5.8	5.4	9.1
Fluoride		0.10	<0.10			
Hardness (CaCO3)		188	165	148	180	250
Iron	0.3	0.41	0.51	0.54	0.37	0.30
Lead	f (Alk)	<0.0005	<0.0005	<0.0020	0.0030	<0.0020
Magnesium		14.30	12.60	11.00	14.00	20.00
Manganese		0.114	0.174	0.160	0.160	<0.010
Molybdenum	0.04	<0.001	<0.001	<0.010	<0.010	<0.010
Nickel	0.025	<0.001	<0.001	<0.010	<0.010	<0.010
Nitrate (as N)		0.32	<0.20	0.31	0.87	2.39
Nitrite (as N)		<0.02	<0.20	<0.10	0.18	<0.10
pH (pH units)	6.5-8.5	7.7	7.6	7.5	7.0	6.7
Phenols	0.001			<0.001	<0.001	<0.001
Phosphate (as P)		<0.10	<1.00	<0.03	<0.03	<0.03
Phosphorus (total)	0.03	0.02	0.03	0.05	0.05	0.03
Potassium		3.2	4.1	4.0	5.0	5.0
Selenium	0.1	<0.002	<0.002			
Silicon				6.80	7.10	4.50
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Sodium		9.1	11.4	10.0	13.0	87.0
Strontium		0.110	0.110	0.102	0.119	0.594
Sulphate		33.0	28.3	27.0	34.0	57.0
Sulphur				9	11	19
TDS		206	192	184	220	516
Temperature (C)				13.0	12.0	3.0
Thallium	0.0003			<0.00500	<0.00500	<0.00500
Tin		<0.001	<0.001	<0.050	<0.050	<0.050
Titanium		<0.005	<0.005	<0.010	<0.010	<0.010
Turbidity (NTU)		0.7	1.4			
Unionized Ammonia	0.02	0.001	0.001	<0.020	<0.100	<0.020
Vanadium	0.006	<0.0005	0.0011	<0.0070	<0.0070	<0.0070
Zinc	0.03	<0.002	<0.002	<0.010	<0.010	<0.010

All values reported in mg/L unless otherwise noted.

Golder Associates

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-5**

Date Sampled:		08-Aug-2000	01-Nov-2000	23-Dec-2000
Parameter	PWQO			
Alkalinity (CaCO3)	75% Bkgd	191	163	NS
Aluminum	f (pH)	<0.050	<0.050	
Ammonia (as N)		5.47	0.35	
Antimony	0.02			
Arsenic	0.005			
Barium		0.050	0.050	
Beryllium	f (Hardness)	<0.002	<0.002	
Bicarbonate				
Bismuth				
Boron	0.2	0.050	0.050	
Bromide				
Cadmium	0.0002	<0.00010	<0.00010	
Calcium		53.0	47.0	
Carbonate				
Chloride		13.0	7.0	
Chromium		<0.010	<0.010	
Cobalt	0.0009	0.0006	0.0008	
COD		28	30	
Colour (TCU)				
Conductivity (uS/cm)		418	390	
Copper	0.005	0.0010	0.0020	
Dissolved Oxygen	f (Temp)	7.2	8.4	
DOC		8.7	6.8	
Fluoride				
Hardness (CaCO3)		182	171	
Iron	0.3	0.41	2.14	
Lead	f (Alk)	<0.0010	<0.0010	
Magnesium		12.00	13.00	
Manganese		0.220	0.280	
Molybdenum	0.04	<0.010	<0.010	
Nickel	0.025	<0.010	<0.010	
Nitrate (as N)		0.38	0.20	
Nitrite (as N)		<0.10	<0.10	
pH (pH units)	6.5-8.5	7.4	7.1	
Phenols	0.001	<0.001	<0.001	
Phosphate (as P)		1.18	<0.03	
Phosphorus (total)	0.03	0.51	0.25	
Potassium		6.0	4.0	
Selenium	0.1			
Silicon		7.52	7.59	
Silver	0.0001	<0.0001	<0.0001	
Sodium		13.0	10.0	
Strontium		0.145	0.127	
Sulphate		30.0	21.0	
Sulphur		12	7	
TDS		256	256	
Temperature (C)		15.9	7.0	
Thallium	0.0003	<0.00100	<0.00100	
Tin		<0.010	<0.010	
Titanium		<0.010	0.020	
Turbidity (NTU)				
Unionized Ammonia	0.02	0.040	<0.020	
Vanadium	0.006	<0.0100	0.0030	
Zinc	0.03	<0.010	<0.010	

All values reported in mg/L unless otherwise noted.

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LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-6** Sheet: 1

Date Sampled:		17-May-1999	02-Sep-1999	19-Oct-1999	08-Aug-2000	01-Nov-2000
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	132	145	154	204	148
Aluminum	f (pH)	<0.030	<0.030	<0.030	<0.050	<0.050
Ammonia (as N)		0.03	0.06	<0.02	7.07	0.70
Barium		0.030	0.040	0.040	0.040	0.020
Beryllium	f (Hardness)	<0.010	<0.010	<0.010	<0.002	<0.002
Boron	0.2	<0.010	<0.010	<0.010	0.020	<0.010
Cadmium	0.0002	0.00019	0.00017	<0.00015	<0.00010	<0.00010
Calcium		34.0	41.0	39.0	53.0	39.0
Chloride		2.0	2.0	2.0	11.0	2.0
Chromium		<0.010	<0.010	<0.010	<0.010	<0.010
Cobalt	0.0009	<0.0004	<0.0004	<0.0004	0.0006	0.0003
COD		15	15	16	38	22
Conductivity (uS/cm)		205	230	210	420	375
Copper	0.005	<0.0050	<0.0050	<0.0100	<0.0010	<0.0010
Dissolved Oxygen	f (Temp)	7.5	7.6	8.0	5.0	9.0
DOC		4.1	6.6	5.3	10.4	4.5
Hardness (CaCO3)		126	156	147	186	151
Iron	0.3	0.09	0.13	0.40	0.21	0.06
Lead	f (Alk)	<0.0020	<0.0020	<0.0020	<0.0010	<0.0010
Magnesium		10.00	13.00	12.00	13.00	13.00
Manganese		0.120	0.120	0.040	0.430	0.030
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)		0.23	0.26	0.17	0.33	<0.10
Nitrite (as N)		<0.10	<0.10	<0.10	<0.10	<0.10
pH (pH units)	6.5-8.5	7.5	6.7	7.5	7.6	7.2
Phenols	0.001	<0.001	<0.001	<0.001	0.002	<0.001
Phosphate (as P)		0.05	0.05	0.06	2.16	<0.03
Phosphorus (total)	0.03	0.07	0.07	0.04	0.73	0.01
Potassium		1.0	1.0	1.0	4.0	1.0
Silicon		7.70	8.00	8.30	8.25	7.59
Silver	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium		7.0	6.0	7.0	11.0	4.0
Strontium		0.071	0.076	0.093	0.135	0.085
Sulphate		12.0	12.0	12.0	22.0	10.0
Sulphur		5	4	4	9	3
TDS		148	172	168	260	216
Temperature (C)		11.0	11.0	0.0	16.0	7.2
Thallium	0.0003	<0.00500	<0.00500	<0.00500	<0.00100	<0.00100
Tin		<0.050	<0.050	<0.050	<0.010	<0.010
Titanium		<0.010	<0.010	<0.010	<0.010	<0.010
Unionized Ammonia	0.02	<0.020	<0.100	<0.020	0.082	<0.020
Vanadium	0.006	<0.0070	<0.0070	<0.0070	<0.0100	<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

LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-6**

Date Sampled: 23-Dec-2000

Parameter	PWQO	
Alkalinity (CaCO3)	75% Bkgd	NS
Aluminum	f (pH)	
Ammonia (as N)		
Barium		
Beryllium	f (Hardness)	
Boron	0.2	
Cadmium	0.0002	
Calcium		
Chloride		
Chromium		
Cobalt	0.0009	
COD		
Conductivity (uS/cm)		
Copper	0.005	
Dissolved Oxygen	f (Temp)	
DOC		
Hardness (CaCO3)		
Iron	0.3	
Lead	f (Alk)	
Magnesium		
Manganese		
Molybdenum	0.04	
Nickel	0.025	
Nitrate (as N)		
Nitrite (as N)		
pH (pH units)	6.5-8.5	
Phenols	0.001	
Phosphate (as P)		
Phosphorus (total)	0.03	
Potassium		
Silicon		
Silver	0.0001	
Sodium		
Strontium		
Sulphate		
Sulphur		
TDS		
Temperature (C)		
Thallium	0.0003	
Tin		
Titanium		
Unionized Ammonia	0.02	
Vanadium	0.006	
Zinc	0.03	

All values reported in mg/L unless otherwise noted.

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LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-7** Sheet: 1

Date Sampled:		17-May-1999	02-Sep-1999	19-Oct-1999	08-Aug-2000	03-Nov-2000
Parameter	PWQO					
Alkalinity (CaCO3)	75% Bkgd	476	NS	NS	514	534
Aluminum	f (pH)	<0.030			<0.050	1.080
Ammonia (as N)		0.22			0.34	0.85
Barium		0.210			0.120	5.170
Beryllium	f (Hardness)	<0.010			<0.002	<0.002
Boron	0.2	0.450			0.570	0.570
Cadmium	0.0002	<0.00015			<0.00010	0.00030
Calcium		135.0			136.0	142.0
Chloride		57.0			40.0	43.0
Chromium		<0.010			<0.010	0.010
Cobalt	0.0009	<0.0004			0.0004	0.0029
COD		70			68	45
Conductivity (uS/cm)		930			1040	1080
Copper	0.005	<0.0050			<0.0010	0.0110
Dissolved Oxygen	f (Temp)	5.5			8.8	IS
DOC		26.0			25.3	16.9
Hardness (CaCO3)		473			463	487
Iron	0.3	24.40			4.15	47.40
Lead	f (Alk)	<0.0020			<0.0010	<0.0010
Magnesium		33.00			30.00	32.00
Manganese		1.470			1.880	29.800
Molybdenum	0.04	<0.010			<0.010	<0.010
Nickel	0.025	<0.010			<0.010	<0.010
Nitrate (as N)		<0.10			0.14	0.46
Nitrite (as N)		<0.10			<0.10	<0.10
pH (pH units)	6.5-8.5	7.3			7.3	7.4
Phenols	0.001	<0.001			<0.001	<0.001
Phosphate (as P)		<0.03			<0.01	<0.03
Phosphorus (total)	0.03	0.46			0.32	0.02
Potassium		8.0			9.0	8.0
Silicon		9.90			10.20	26.70
Silver	0.0001	<0.0001			<0.0001	<0.0001
Sodium		60.0			59.0	63.0
Strontium		0.624			0.667	3.020
Sulphate		31.0			22.0	27.0
Sulphur		9			10	9
TDS		616			668	680
Temperature (C)		17.0			17.4	IS
Thallium	0.0003	<0.00500			<0.00100	<0.00100
Tin		0.050			<0.010	<0.010
Titanium		<0.010			<0.010	<0.010
Unionized Ammonia	0.02	<0.020			<0.020	
Vanadium	0.006	<0.0070			<0.0100	0.0020
Zinc	0.03	<0.010			<0.010	0.090

All values reported in mg/L unless otherwise noted.

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LIMOGES LANDFILL - NATION MUNICIPALITY - REPORT OF MONITORING RESULTS

Sample Source: **SW-7**

Date Sampled: 23-Dec-2000

Parameter	PWQO	
Alkalinity (CaCO3)	75% Bkgd	NS
Aluminum	f (pH)	
Ammonia (as N)		
Barium		
Beryllium	f (Hardness)	
Boron	0.2	
Cadmium	0.0002	
Calcium		
Chloride		
Chromium		
Cobalt	0.0009	
COD		
Conductivity (uS/cm)		
Copper	0.005	
Dissolved Oxygen	f (Temp)	
DOC		
Hardness (CaCO3)		
Iron	0.3	
Lead	f (Alk)	
Magnesium		
Manganese		
Molybdenum	0.04	
Nickel	0.025	
Nitrate (as N)		
Nitrite (as N)		
pH (pH units)	6.5-8.5	
Phenols	0.001	
Phosphate (as P)		
Phosphorus (total)	0.03	
Potassium		
Silicon		
Silver	0.0001	
Sodium		
Strontium		
Sulphate		
Sulphur		
TDS		
Temperature (C)		
Thallium	0.0003	
Tin		
Titanium		
Unionized Ammonia	0.02	
Vanadium	0.006	
Zinc	0.03	

All values reported in mg/L unless otherwise noted.