BURLINGTON LANDFILL SITE
MONITORING PROGRAM
INTERIM REPORT

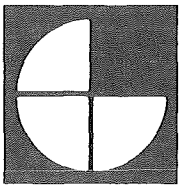
FOR

THE REGIONAL MUNICIPALITY OF HALTON

PROJECT NO: 80-96-B

APRIL, 1981

Gartner Lee
Associates Limited



Gartner Lee Associates Limited

Consulting Engineering Geologists and Hydrogeologists

Toronto-Buttonville Airport ■ Markham, Ontario ■ L3P 3J9 ■ 416-477-8400
Telex - 06-986278

April 23rd, 1981.

The Regional Municipality of Halton,
1151 Bronte Road,
Oakville, Ontario.
L6J 4Z3

Attention: Mr. D.R. Morrier, P.Eng.

Dear Sirs:

Re: Burlington Landfill Site
Monitoring Program
Interim Report
GLAL 80-96-B

We are pleased to submit our interim report on the monitoring program presently being carried out at the Burlington Landfill Site.

It has been a pleasure to serve you, and should you have any questions please contact me.

Yours very truly,

GARTNER LEE ASSOCIATES LIMITED,

E. G. Anderson, P.Eng.,
Consulting Hydrogeologist.

EGA/hr

Enclosure.

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1.0 SUMMARY:

The Burlington Landfill is located north of Highway 403, east of Regional Road 26 on the lower slopes of the Niagara Escarpment. The site is underlain by a thin, but variable thickness of glacial till soils that overlie weathered red shale followed by Queenston shale bedrock.

The original site topography was severely gullied and Falcon Creek which borders the west and north perimeters of the site follows one of these bedrock incised valleys. A small gully, which is a tributary to Indian Creek drains a portion of the east side of the site.

Solid wastes have been filled onto this site for about the last ten years, and this present program is designed to monitor the effects of this landfilling on the surrounding lands.

Previous work completed in 1979 is combined with the results of drilling, sampling and testing carried out in 1980-1981 to evaluate potential impacts.

We have found that while a leachate plume has developed and has moved downgradient from the landfill for an estimated distance of about 150 m, it does not appear to be having any significant impact on the surrounding lands. The background natural ground water quality is very poor, and it is sometimes difficult to differentiate this from the leachate affected ground water based on the parameters analysed to date.

Falcon Creek has only intermittent flow and when sampled in February, 1981, the water quality in the creek seemed little affected by the landfill. However, we think that a staff gauging station should be installed on the creek near the North Service Road to provide more reliable data on the status of this water course.

We have recommended that the monitoring program be continued, but have cut back somewhat on the frequency. All ground water monitors should be sampled and tested twice a year, while surface water stations should be sampled and tested four times per year. Additional surface water sampling stations should be established on the tributary to Indian Creek to evaluate migration in this area.

2.0 INTRODUCTION:

Gartner Lee Associates Limited were retained on August 13, 1980 by the Regional Municipality of Halton to carry out a monitoring program at the Burlington Regional Landfill. This program was required by the Ministry of the Environment as part of their provisional certificate of approval No. A210102.

Both ground water and surface water monitoring was carried out. The ground water program was designed to assess not only the impact of the existing and expanded landfills on the ground water quality, but also to document possible off-site movement of the contaminant plume.

The purpose of the surface water monitoring program was to assess the impact of landfill site operations on the water quality of Falcon Creek, and to determine the effectiveness of the toe-drain collection system in preventing overland leachate flow to the creek.

A considerable amount of hydrogeological work has already been done. Previous reports were reviewed and pertinent data and interpretations are included in this report. For a more detailed analysis of the hydrogeological setting please refer to the October, 1979, Burlington Landfill Site, Hydrogeological Study by Gartner Lee Associates Limited in conjunction with M.M. Dillon Limited.

3.0 METHODOLOGY:

3.1 MONITOR INSTALLATION:

Six new monitors were installed with a mobile drill mounted on an all terrain vehicle, between October 8th and October 17th, 1980. Monitors BH 8A and BH 11A were replacements for monitors BH 8 and BH 11 which were destroyed during landfilling operations. In both of these monitors a PVC piezometer and a standpipe were installed in single boreholes with bentonite seals between them.

Monitors BH 14 and BH 15 were placed in the bottom of the Falcon Creek valley in order to detect subsurface leachate movement towards the Creek. These installations also consist of one piezometer and one standpipe per borehole.

Monitors BH 16 and BH 18 each have 3 piezometers plus one standpipe installed in two closely spaced boreholes. These monitors are located south of the landfill in order to document subsurface leachate movement in that direction.

The locations of all monitors drilled to date by Gartner Lee Associates Limited are shown on Figure 1. The borehole logs and monitor construction details are presented in Appendix A.

3.2 MONITORING PROGRAM:

Ground water samples were collected from these monitors in October and December, 1980 using a stainless steel bailer or a vacuum pump. Falcon Creek was not flowing during these site visits, and therefore, was not sampled. However, surface water samples were collected in February 1981 after a period of heavy rain. All water samples were submitted to the Ministry of the Environment for analysis of selected chemical and bacteriological parameters.

Ground water levels were measured in monitors prior to sample collection. The Regional Municipality of Halton provided vertical and horizontal survey control. This allowed the calculation of ground water elevations and resultant flow directions.

A portable gas probe was used to measure combustible gas

concentrations in all existing standpipes in February, 1981. No evidence of significant gas migration was discovered.

4.0 STUDY RESULTS:

4.1 PHYSICAL SETTING:

Regionally the subject lands are situated on the lower slopes of the Niagara Escarpment in an area heavily dissected by gullies and ravines. The geographic location of the site is shown in Figure 2. The lands comprising the site slope moderately towards the south and east, except as altered by the existing fills. A deep ravine, eroded into the shale bedrock, borders the western periphery of the site. In places, along the east slope of this ravine, erosional gullies occur. Falcon Creek flows intermittently to the south along the ravine bottom.

A less pronounced ravine borders the east side of the expansion area. Intermittent drainage channels to the east of the property are part of the Indian Creek drainage basin.

4.2 GEOLOGY:

The northern portion of the site is mantled by a relatively dense to very dense clayey silt till. A maximum till thickness of 12.5 m occurs in the vicinity of BH 1, but this till is absent in the southern part of the site. A layer of weathered Queenston shale, varying in thickness up to 5.2 m occurs beneath the till in the northern part of the subject area and at surface in the south. Unweathered Queenston shale forms the bedrock base and it is reported to be about 180 m thick.

Physical properties of these geological materials, as determined from field observations, laboratory analyses and literature review are summarized below.

GLACIAL TILL

Grain Size (MIT)	Gravel	(>2 mm)	- 1-6%
	Sand	(2 -.06 mm)	- 4-15%
	Silt	(.06 - .002 mm)	- 40-54%
	Clay	(>.002 mm)	- 36-44%

Atterberg Limits
- Liquid Limit - 33%
- Plasticity Index - 14%

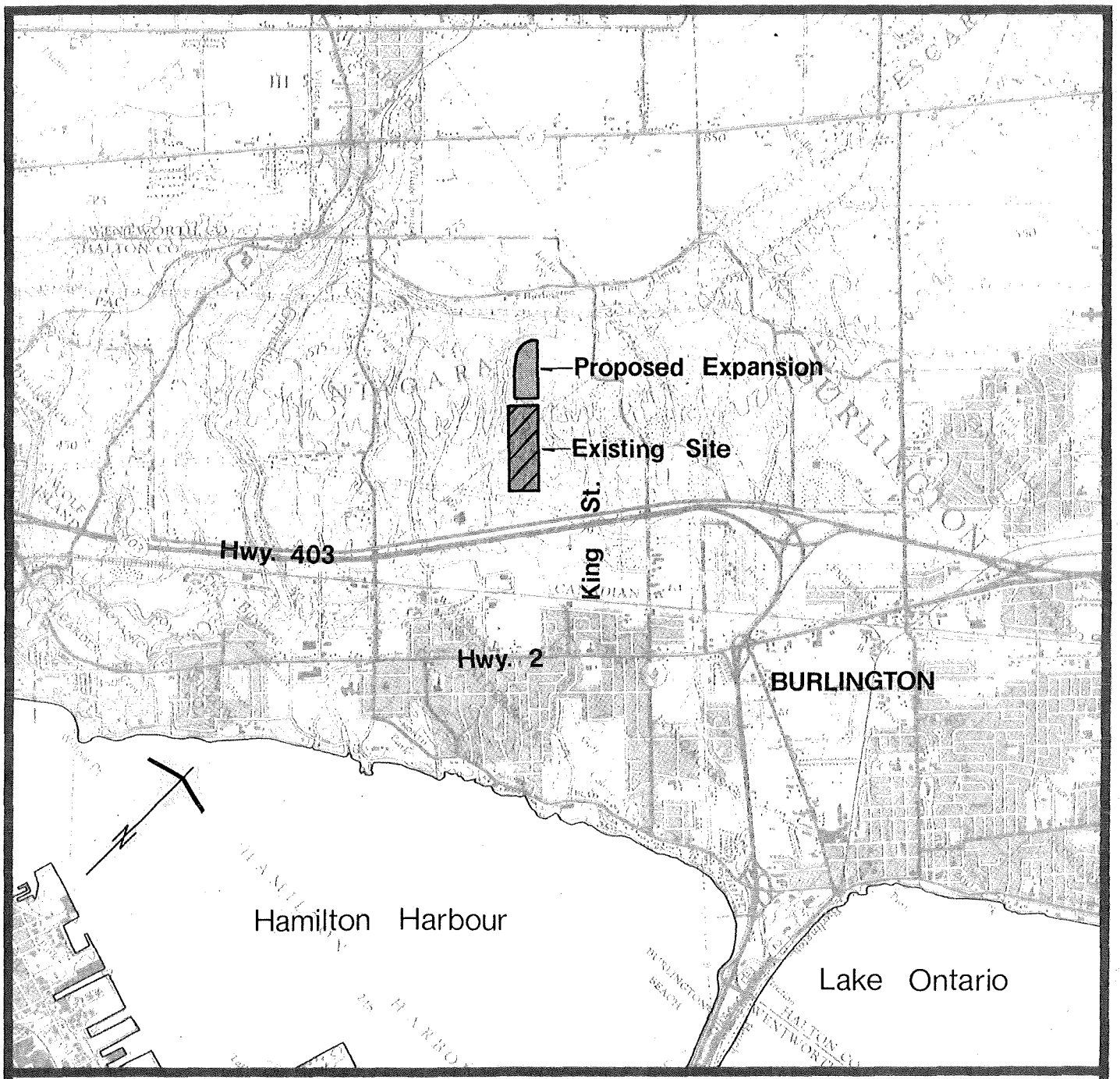


Figure 2

Key Map

Project 80·96
Scale 1:50,000

Cation Exchange Capacity - 10.5 meq/100 gm

Porosity (estimated porous media flow) - 30%

(estimated fracture flow) - 5%

Hydraulic Conductivity (porous media flow) - .03 m/a

(estimated fracture flow) - 3 m/a

NOTE: The till appeared to be fractured in test pits to depths > 6.4 m.

SHALE

Porosity (estimated) - 5%

Hydraulic Conductivity - High - 4.7 m/a (1.5×10^{-5} cm/sec)
- Low - .2 m/a (6.8×10^{-7} cm/sec)
- Average - 1.3 m/a (4.2×10^{-6} cm/sec)

Based on pressure packer and slug test results - See Table 10.

REFUSE

Porosity (estimated) - 25%

Hydraulic Conductivity (estimated) - 315 m/a (1×10^{-3} cm/sec)

4.3 WATER BUDGET:

A water budget was prepared, based on 20 year normal weather data obtained from the Burlington Climatological Station. The potential evapotranspiration was calculated using the Thornthwaite Method. Following is a summary of the results shown in Figures 3, 4 and 5.

Average Annual Total Precipitation	-	76.1 cm
Average Annual Potential Evapotranspiration	-	62.5 cm
Potential Water Surplus	-	13.6 cm

FIGURE 3

TEMPERATURE-PRECIPITATION GRAPH

20 YEAR NORMAL

BURLINGTON CLIMATOLOGICAL STATION

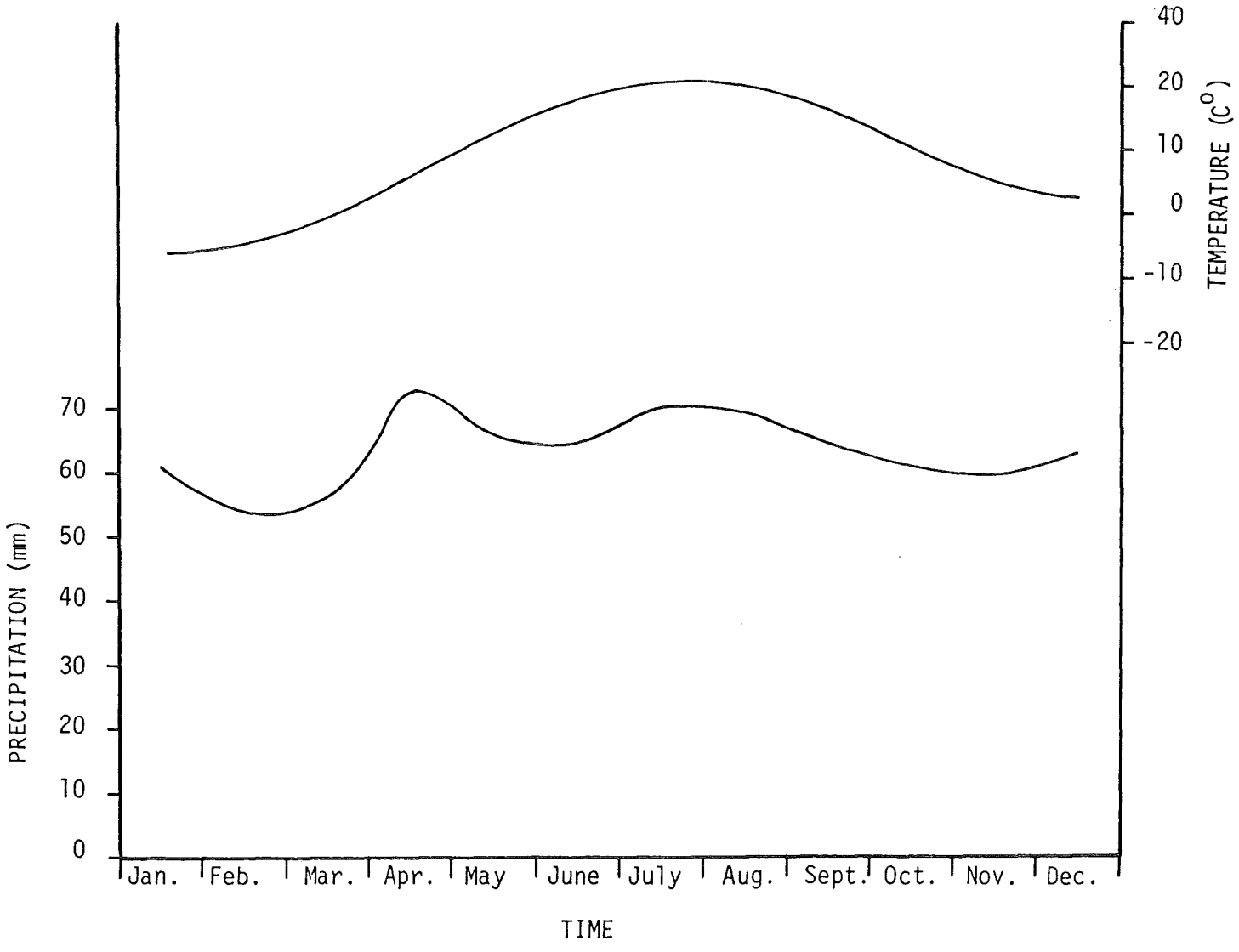


FIGURE 4

POTENTIAL EVAPOTRANSPIRATION

20 YEAR NORMAL

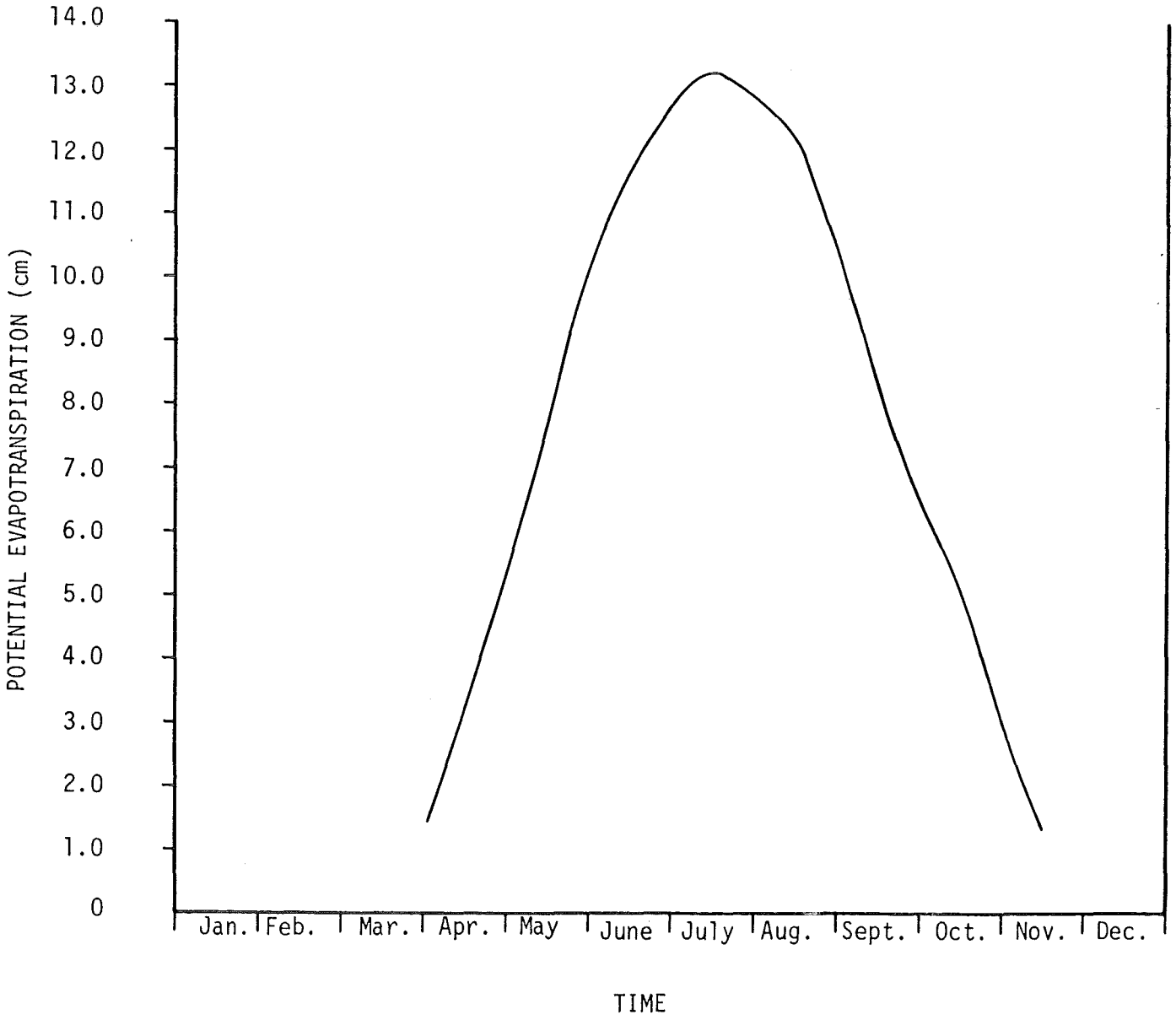
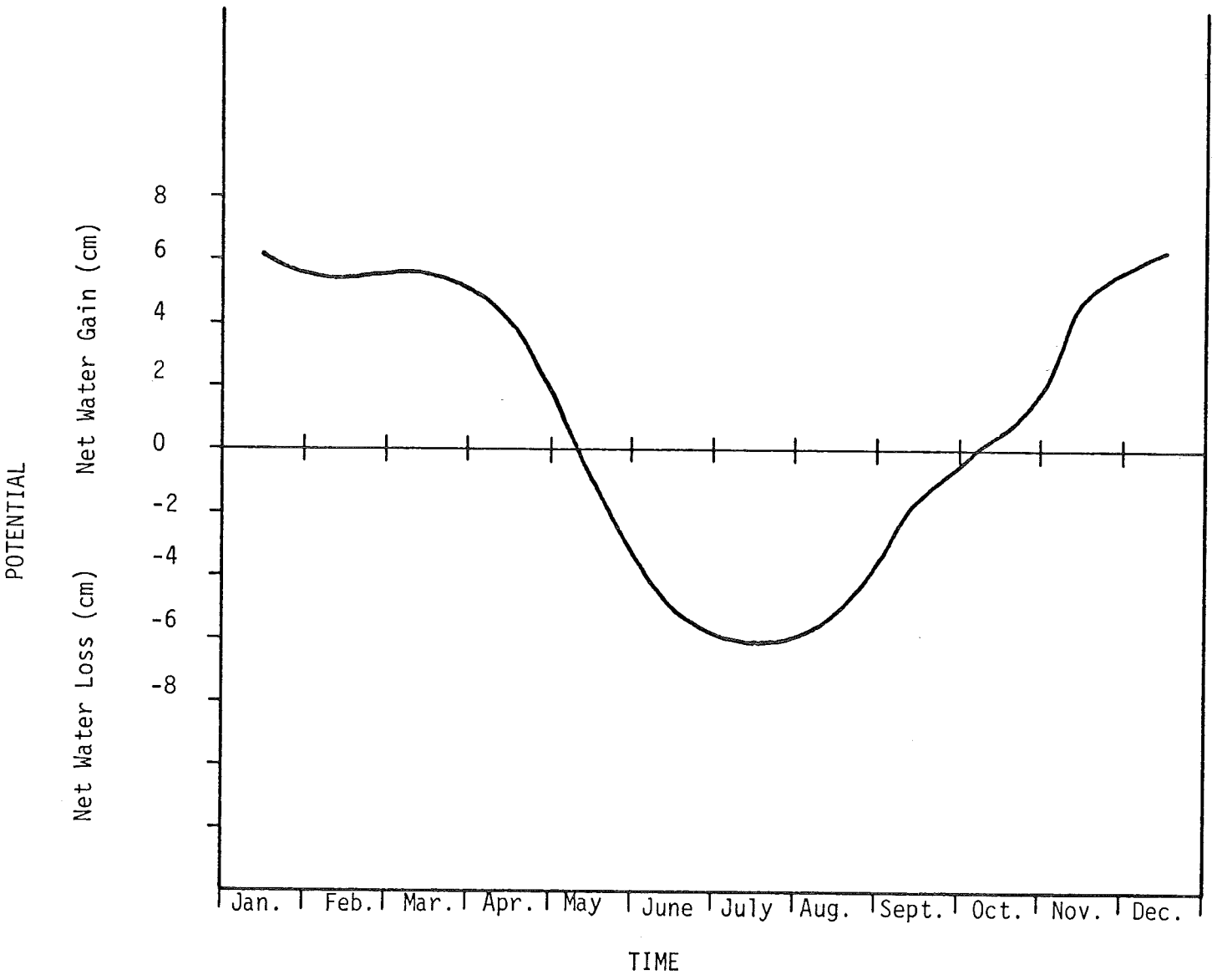


FIGURE 5

WATER BUDGET



In this area the actual evapotranspiration is about 10 cm less than the potential calculated by the Thornthwaite Method. Thus, the actual annual water surplus available for infiltration and run-off is about 23.5 cm on the average.

During the operation of the landfill, precipitation is lost through run-off and evaporation, and the remainder infiltrates. It is estimated that the infiltration rate may be about 30 cm per year or 5.7 litres per minute per hectare. Once the site is closed, finally covered and vegetated, the infiltration rate should be about 10 cm per year or 1.9 litres per minute per hectare.

Long term measurements of leachate flows in the toe-drain were not available for inclusion in this report. When these results are available they will be correlated with climatic and water level data. This will permit a more detailed analysis of the water budget and leachate fluxes in the 1982 monitoring report.

4.4 Ground Water Flow:

Figures 6, 7 and 8 (Appendix A) are hydrographs showing ground water levels in boreholes 1, 4 and 12 respectively. They indicate that seasonal water level fluctuations from 1 to 6 metres occur during the year depending on the monitor depth and location.

Water levels recorded in the shallow standpipe installations are relatively higher in elevation than those recorded in the corresponding piezometers which were installed at greater depth. This observation was recorded in all three of these monitors, and it indicates a significant downward hydraulic gradient. Hence, ground water movement is interpreted to be downward.

Figure 9, bound at the rear of this report, shows the inferred water table configuration based on the October 30, 1980 data. The water table slopes predominantly to the southeast with south-westerly components towards the Falcon Creek valley. At the extreme north end of the Phase II expansion area there is a ground water divide and a small area where ground water flows north-westerly towards Falcon Creek valley.

Figure 10 (at rear of report) shows the configuration of

the piezometric surface as measured in the shale bedrock. The pattern is very similar to that of the water table, but the piezometric surface is at a lower elevation than the water table during all seasons, at every monitoring nest. This includes the levels at BH 14 and BH 15 which are located in the bottom of Falcon Creek valley.

An analysis of this information suggests that the landfill area is in a ground water recharge zone, with a downward component of flow. This downward component is greatest in the upland areas and beneath the refuse, and least in the lowland areas along the North Service Road and along Falcon Creek. The downward gradients measured in monitors BH 14 and BH 15 within the Falcon Creek valley, indicate that leachate within the ground water flow system might be migrating downstream and parallel to the creek at a shallow depth below the ground surface. Although we did not actually observe leachate in the creek, it may surface during some seasons of the year.

Calculations based on Darcy's Law, the average hydraulic conductivities and estimated porosities presented in Section 4.2, and gradients calculated from the October 30, 1980 water level data indicate the following average flow component velocities.

(1) A lateral flow component to the southeast occurs over much of the site at a velocity of about 1 m/year.

(2) A lateral flow component to the southwest occurs along the edge of Falcon Creek valley with a velocity of about 5 m/year.

(3) A downward flow component occurs in the Uplands areas at a velocity of about 3 m/year to 15 m/year. This rate decreases rapidly with depth becoming negligible below elevation 100 m.

(4) Where saturated conditions exist within the refuse, lateral flow to the southeast will occur at a velocity of about 50 m/year.

It should be pointed out that due to the natural variability of permeability and porosity within these geologic units these flow component velocities are only order of magnitude estimates.

The Burlington Landfill has been operating approximately 10 years. The distribution of leachate contamination can therefore be used as a tracer to independently calculate ground water velocities and flow directions. Water quality data presented in the next Section 4.5 indicate that leachate has migrated to the southeast beyond BH 16 and BH 13, approximately 150 m from the landfill. This suggests a lateral velocity of 15 m/a, a figure that is 15 times the calculated value of 1 m/year using the average data.

Leachate has also migrated beyond the piezometer in BH 15. This suggests movement of approximately 250 m laterally in 10 years and hence a velocity of 25 m/a or more. This same piezometer is about 30 m below the base of the refuse indicating a downward component of flow at a velocity of 3 m/a or more.

Figure 11 shows two flow net cross-sections of the Burlington landfill site. They depict ground water flow paths based on the October 30, 1980 water level data. A possible leachate plume is also marked on these sections. This plume location, however, is based on an interpretation of water quality analyses, ground water flow configuration and landfilling history and is only approximate.

4.5 Ground Water Quality:

Table 3 summarizes ground water quality by presenting the concentration ranges of natural "background" and "leachate contaminated" ground water. Complete analyses are presented in Appendix B.

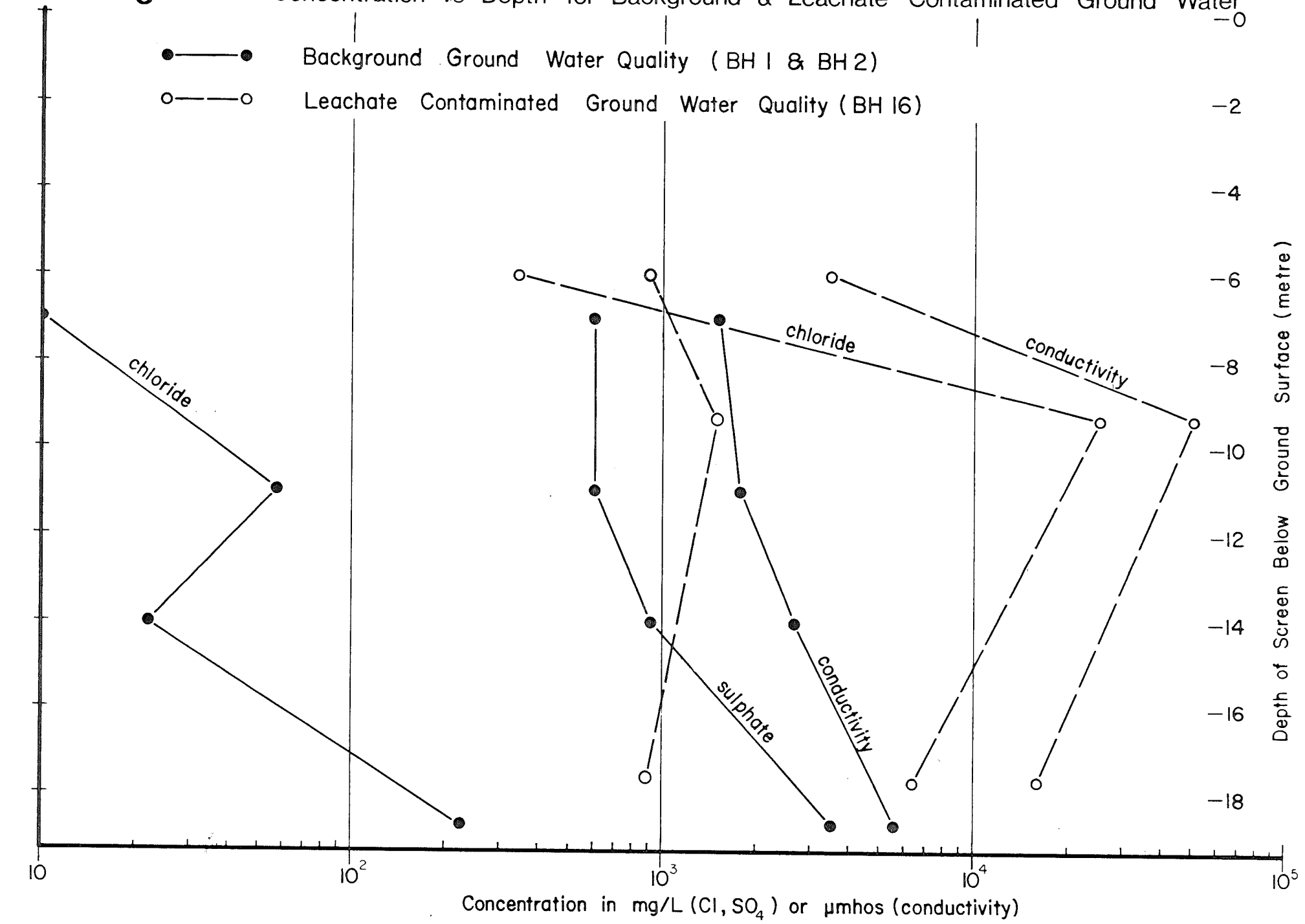
The natural "background" water quality in the shale bedrock as observed upgradient from the landfill is poor. The water is highly mineralized and at least locally does not comply with the Ministry of the Environment guidelines. The sulphate concentration in BH 1-I is fourteen times the permissible drinking water limit. Levels of hardness, sodium, iron and conductivity are also excessively high.

Figure 12 shows a plot of background and leachate contaminated ground water concentrations of conductivity, sulphate and chloride versus depth. Background conductivity and sulphate increase with depth. Chloride is more erratic but overall appears also to increase with depth. Water quality in the Queenston shale generally deteriorates with depth and varies

TABLE 3: - Concentration Ranges of 'Background' and 'Leachate Contaminated' Ground Water

PARAMETER	BACKGROUND GROUND WATER QUALITY		LEACHATE CONTAMINATED GROUND WATER		M.O.E. DRINKING WATER QUALITY CRITERIA
	LOW	HIGH	LOW	HIGH	
Conductivity (umhos)	1,500	5,500	2,000	53,000	-
Chloride	5	250	70	28,000	250
Sulphate	500	3,500	50	1,700	250
Chemical Oxygen Demand (COD)	20	100	50	12,000	
Biological Oxygen Demand (BOD)	3	50	5	6,500	
Phenols (ppb)	<1	2	<1	4,500	1

Figure 12: Concentration vs Depth for Background & Leachate Contaminated Ground Water



locally depending upon the hydraulic connection within the shale. Normally the better the hydraulic connection, the faster the ground water travels and the better the water quality.

The water quality concentration ranges for leachate and "leachate contaminated ground water" overlap the ranges of "background" water quality. This makes it difficult to distinguish between samples with naturally poor water quality and samples which are partially contaminated by leachate with the present data.

Raw leachate generally has significantly elevated concentrations of chemical oxygen demand (COD), biological oxygen demand (BOD), and phenols. These concentrations decrease with time as the leachate moves along with the ground water flow system, due to natural oxidation and decomposition processes. Levels of conductivity and chloride are also elevated but in many cases are not higher than the background levels in this area. Sulphate appears to be higher in deep natural ground water than it is in leachate.

Figure 13 presents in plan view what we believe to be the probable leachate plume from the Burlington Landfill Site. The leachate distribution is qualitatively based on the chemical analyses and ground water flow calculations. The boundaries are not exact because of the difficulty in distinguishing naturally poor water quality from diluted leachate and the complexity of the ground water flow system in the fractured shale bedrock.

There is no recorded ground water use in the immediate vicinity of the Burlington Landfill Site. The lands to the east are vacant and Highway 403 crosses south of the site. The property immediately south of Highway 403 is an undeveloped Canadian National Railway corridor. The industries located west of the landfill along the North Service Road are serviced with city water from Lake Ontario.

4.6 SURFACE WATER:

The Burlington Landfill Site is situated within the Falcon Creek watershed, and to a lesser extent within the Indian Creek watershed. Water quality data (Tables 4 and 5)and estimated flow data (Table 6) for Falcon Creek are presented in Appendices A and B. No information was collected in the Indian Creek watershed.

Falcon Creek in the vicinity of the landfill flows intermittently. "No flow" conditions were observed in July, 1979, and in February, March, October and December of 1980. Flows increase dramatically during spring runoff and after periods of heavy rainfall. The lack of flow during dry periods and the downward gradients measured in ground water monitors near the creek suggest that there is little ground water base flow contribution. Almost all the water in Falcon Creek appears to be direct runoff.

Analyses in Table 4 indicate a slight decrease in water quality downstream from the landfill. However, most parameters are within acceptable water quality standard ranges. It appears that the water quality varies more with the seasons of the year than due to any change caused by the landfill.

Bacteriological analyses are presented in Table 5. The SW3 total coliform count of 1600 per 100 ml exceeds the recommended limit of 1000 counts per 100 ml and indicates a slight decrease in water quality downstream. All other bacteriological parameters are at acceptable levels. These results are somewhat inconclusive since proper interpretation requires the analyses of a series of samples collected at various times and the calculation of a geometric mean.

Leachate springs along the stream bank or valley wall were not observed during the course of this study. Overland flow of leachate contaminated runoff from the north end of the existing fill down an erosional gully and into Falcon Creek was observed on February 25, 1981 after a period of heavy rainfall. This flow was small relative to that of the creek.

In general water quality in Falcon Creek is quite good and appears to be only slightly affected by the landfill. Additional surface water quality data should be collected to allow a more detailed assessment of seasonal variations and the landfill's impact. Tributaries of Indian Creek should also be sampled to provide background data prior to filling the northern expansion area. Two sampling stations would be picked after field checking the amount of flow in these tributaries.

4.7 Gas:

Methane, a combustible gas generated in landfills due to the decomposition of organic refuse, can under certain conditions migrate off site and pose a safety hazard.

The hydrogeological conditions at the Burlington Landfill, however are not conducive to off-site gas migration. Combustible gas measurements made on February 25, 1981, indicated that only standpipes screened within the refuse (i.e. 8A-II) had detectable gas concentrations. Standpipes in till soils and/or shale bedrock only 5 metres from the refuse had no detectable gas. It appears that these dense geologic materials severely retard lateral gas migration.

No engineered venting or conventional gas monitoring is required at this time. If development encroaches near the site in the future gas monitoring should be undertaken and the need for gas venting determined.

5.0 LEACHATE CONTROL SYSTEM ASSESSMENT:

A toe-drain leachate collection system connected to the Burlington sanitary sewer system was installed in 1979-1980 along the perimeter of the existing fill at the south end of the property (see Figure 1). This toe-drain will be extended north along the western periphery connecting with the Phase II expansion area under-drain system in 1981.

Visual ground checks for leachate springs were carried out in June, August and November of 1980, and in February of 1981. The existing toe-drain appears to be working quite well. There are still some small springs along the eastern slopes, some of which are likely related to perched conditions. The toe-drain has, however, either stopped or greatly reduced flows of most of the previously noted springs along the southern, eastern and south-western perimeters of the landfill.

Along the extreme north western edge of the existing fill, beyond the present toe-drain some leachate springs and leachate contaminated runoff were observed discharging towards the Falcon Creek ravine. These features should be corrected when the toe-drain is extended.

No flow data was available for the toe-drain at the time of report writing. Only very limited leachate quality data were available. Consistent flow records and repeated chemical analysis of leachate in the toe-drain would provide valuable data for the design and operation of the landfill, sanitary sewer system and the sewage treatment plant.

6.0 CONCLUSIONS AND RECOMMENDATIONS:

6.1 CONCLUSIONS:

Based on the information collected in this study and combined with the results analysed from our previous work, the following conclusions are warranted.

a) The Burlington Landfill site and its environs is situated in a ground water recharge zone. Ground water flow is downward and to the southeast, with a component of flow trending south-west into the Falcon Creek valley environment. We suspect that this flow also parallels the Falcon Creek valley below ground surface down towards Highway 403.

b) A plume of leachate contaminated ground water exists beneath the filled area, and extends downgradient of the site for a distance of about 150 m south of the fill. There is evidence that this plume may be moving below Falcon Creek and parallel to it. While we have not detected leachate discharge directly into the Creek, there may be a seasonal discharge.

c) Calculated velocities of ground water within the shale bedrock are in the order of 1 m/a to 25 m/a.

d) The natural quality of the ground water within the shale is poor, and this causes some difficulty in determining the extent of landfill ground water contamination using the parameters tested to date.

e) Using the data available to date, it appears that contaminants have migrated off-site. At this time, the impact does not appear serious based on the limited parameters tested.

f) The toe-drain leachate collection system installed in 1979 along the south periphery of the existing fill has effectively reduced leachate discharging from springs at the toe of the landfill. However, some springs north

of the toe-drain and surface water runoff from the fill, do discharge leachate into Falcon Creek during seasonally wet periods of the year. The impact of these discharges on Falcon Creek water quality is minimal and appears to be less than the changes caused by natural seasonal variations. Leachate springs emanate from the east side of the fill towards the tributary for Indian Creek.

g) No evidence of off-site methane gas migration was found during the study.

6.2 RECOMMENDATIONS:

Recognizing that the Burlington Landfill is a continuing operation , and in view of the results of this monitoring study, we make the following recommendations.

a) The current monitoring program should be continued but reduced somewhat in the frequency of sampling required.

b) All ground water monitors listed in Table 1, Appendix C, should be sampled twice a year and these samples analysed for the parameters listed in Table 2. The ground water levels in the monitors should be recorded at the time of sampling and related to the geodetic elevation.

c) All three surface water stations on Falcon Creek should be sampled quarterly, and the samples analysed for the parameters listed on Table 2, Appendix C.

d) Two additional surface water sampling stations should be established on the tributaries to Indian Creek on the east side of the fill to determine potential impact on this creek system. These stations should be sampled quarterly and the samples appropriately analysed.

e) Surface water flows should be estimated at the time of the quarterly sampling. In addition, a staff gauging station should be constructed on Falcon Creek where the creek passes under the North Service Road. Once

constructed, flow measurements should be taken every two weeks for a period of one year. Data should be reviewed and the program re-assessed at that time.

f) Portable gas probe sampling should be carried out once a year during the winter months to gather preliminary gas movement information.

g) All monitoring results and their significances should be assembled in an annual report. Significant problems should be reported immediately to the Region.

APPENDIX A

BOREHOLE LOGS

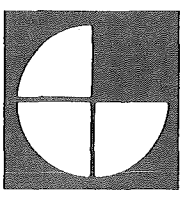
GROUND WATER MONITOR DETAILS

GROUND WATER ELEVATIONS

HYDROGRAPHS

FIELD PERMEABILITY TEST RESULTS

SURFACE WATER FLOWS



BOREHOLE LOGS

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

Standard Penetration Resistance 'N' - The number of blows required to advance a standard split spoon sampler 30 cm into the subsoil, driven by means of a 63.5 kg hammer falling freely a distance of 75 cm.

Dynamic Penetration Resistance - The number of blows required to advance a 5 cm, 60 degree cone, fitted to the end of drill rods, 30 cm into the subsoil, the driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described as follows:

Consistency	'N' Blows / .3 m	Denseness	'N' Blows / .3 m
Very Soft	0-2	Very Loose	0-4
Soft	2-4	Loose	4-10
Firm	4-8	Compact	10-30
Stiff	8-15	Dense	30-50
Very Stiff	15-30	Very Dense	> 50
Hard	> 30		

W.T.P.L.	-	Wetter than Plastic Limit
D.T.P.L.	-	Drier than Plastic Limit
A.P.L.	-	About Plastic Limit

DESCRIPTION OF ROCK

$$\% \text{ Recovery} = \frac{\text{Total Length of Core Recovered/Run}}{\text{Total Length of Drilling Run}} \times 100$$

TYPE OF SAMPLE.

SS	-	Split Spoon
AS	-	Auger Sample
ST	-	Shelby Tube Sample
NX	-	Rock Core 56 mm ø

SYMBOLS

▲	-	Water Table Monitor (Standpipe Tip)
●	-	Piezometer Tip
	-	Water Level
	-	Piezometric Head

BOREHOLE NO. 1

PROJECT NAME BURLINGTON LANDFILL SITE — PROJECT NO. 78-92

CLIENT M.M. DILLON LIMITED — DATE JANUARY 23, 1979

BOREHOLE TYPE BOMBADIER 0.1 m I.D. Hollow Stem Augers NX Rock Core — GEOLOGIST A.B.

ELEVATION 183.4 m — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
		TILL: Medium brown clayey silt till becoming grey brown at 9.1 m hard, A.P.L. Fractures to 6.4 m becoming W.T.P.L. at depth	SS	70	13			Sample 3.8-4.6 m 6% gravel 10% sand 48% silt 36% clay
			SS	33	17		▲	
			SS	30				
			SS	60	11			
			SS	92				
12.5								
		SHALE: Red and green crypto-crystalline, massive bedded shale: weathered, with mud seams to 15.2 m					●	
			NX			70		
			NX			70		
			NX			100		
18.3							●	
		Borehole terminated at 18.3 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 2

PROJECT NAME BURLINGTON LANDFILL SITE — PROJECT NO. 78-92

CLIENT M.M. DILLON LIMITED — DATE JANUARY 16, 1979

BOREHOLE TYPE BOMBADIER, 0.1 m I.D. HOLLOW STEM AUGERS, NX ROCK CORE — GEOLOGIST A.B.

ELEVATION 171.2 m — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
		TILL: Red brown clayey silt till, D.T.P.L. hard, minor vertical fracturing to 4.6 m	SS	61	13			
			SS	65	7			
4.6								
		SHALE: Red with green bands and green mottling, cryptocrystalline massive to thick bedded shale soft, fracturing at an angle to the core, green bands are hard.	NX			100	▲	
			NX			100	●	
11.0								
		Borehole terminated at 11.0 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 3

PROJECT NAME BURLINGTON LANDFILL SITE **PROJECT NO.** 78-92

CLIENT M.M. DILLON LIMITED **DATE** JANUARY 19,22, 1979

BOREHOLE TYPE BOMBADIER 0.1 m I.D. HOLLOW STEM AUGERS, NX ROCK CORE **GEOLOGIST** A.P.

ELEVATION 167.6 m **TECHNOLOGIST**

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
		TILL: Medium brown clayey silt till, hard, A.P.L. horizontal fracturing	SS	71	15			
2.4		WEATHERED SHALE: Red brown shale hard, DTPL	SS	121	9			
4.0		SHALE: Red with green beds and soft mud seams to 7.0 m, weathered	NX			100	▲	
		Green shale from 7.0 m to 10.7 m with minor red mottling; shale is cryptocrystalline, massive bedded throughout	NX			100	●	
10.7		Borehole terminated at 10.7 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 4

PROJECT NAME BURLINGTON LANDFILL SITE — **PROJECT NO.** 78-92

CLIENT M.M. DILLON LIMITED — **DATE** JANUARY 15, 1979

BOREHOLE TYPE BOMBADIER 0.1 m I.D. HOLLOW STEM AUGERS, ROCK CORE — **GEOLOGIST** A.B.

ELEVATION 174.2 m — **TECHNOLOGIST**

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3E	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
		TILL: Clayey silt till changing from mottled red-brown to grey with depth, hard, minor vertical fracturing to 4.9 m seepage at 4.0 m D.T.P.L.	SS	24	14			
			SS	63	13			
			SS	80	13			
			SS	>100	12			
			SS	75	14			
			SS	52	14			
			SS	65	13			
7.8		SHALE: Red, with green bands and green mottling, crypto-crystalline, massive to thick bedded shale, soft, fracturing at an angle to the core, green bands are hard	NX			100	▲	
			NX			100		
14.0							●	
		Borehole terminated at 14.0 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 5

PROJECT NAME BURLINGTON LANDFILL SITE **PROJECT NO.** 78-92

CLIENT M.M. DILLON LIMITED **DATE** JANUARY 18, 1979

BOREHOLE TYPE BOMBADIER, 0.1 m I.D. HOLLOW STEM AUGERS NX ROCK CORE **GEOLOGIST** A.B.

ELEVATION 164.7 m. **TECHNOLOGIST**

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.1		TOPSOIL:						
		WEATHERED SHALE: Red brown weathered shale - minor green mottling, moist very stiff to hard, seepage at 3.0 m.	SS	23	13			
			SS	68	10			
			NX			85	▲	
5.2		SHALE: Red with green bands and green mottling, cryptocrystalline variable bedded shale, thin bedded and weathered to 6.4 m high green shale content	NX			100	●	
			NX			100	●	
12.2		Borehole terminated at 12.2 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 6

PROJECT NAME BURLINGTON LANDFILL SITE **PROJECT NO.** 78-92

CLIENT M.M. DILLON LIMITED **DATE** JANUARY 17, 1979

BOREHOLE TYPE BOMBADIER 0.1 m I.D. HOLLOW STEM AUGERS NX ROCK CORE **GEOLOGIST** A.B.

ELEVATION 173.7 **TECHNOLOGIST**

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
		TILL: Medium brown clayey silt till, D.T.P.L. hard, fractures to 2.0 m seepage at 3.4 m becoming grey brown at 6.1 m	SS	89	10			
			SS	81	9			
			SS	60	13			
			SS	47	15			Sample #4 1% gravel 8% sand 47% silt 44% clay
7.8		SHALE: Red, with green bands and green mottling, cryptocrystalline, massive to thick bedded shale minor fracturing at an angle to the core	NX			100		
			NX			100	▲	
			NX			100		
16.9		Borehole terminated at 16.9 m in shale					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 7

PROJECT NAME BURLINGTON LANDFILL SITE — PROJECT NO. 78-92

CLIENT M.M. DILLON LIMITED — DATE JANUARY 22, 1979

BOREHOLE TYPE BOMBADIER 0.1 m I.D. HOLLOW STEM AUGERS NX ROCK CORE — GEOLOGIST A.B.

ELEVATION 181.1 m — TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
		TILL: Medium brown clayey silt till with fractures to 6.4 m, becoming grey brown from 7.6 m hard D.T.P.L.	SS	77	12			
			SS	89	11			
			SS	60	9			
			SS	52	13		▲	
			SS	111	8			
			SS	126	5			
10.7		SHALE: Red with green bands and green mottling, cryptocrystalline, thin to medium bedded shale weathered and odd mud seams to 12.2 m	NX			100	●	
			NX			100		
15.2		Borehole terminated at 15.2 m in shale					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 8

PROJECT NAME BURLINGTON LANDFILL SITE — PROJECT NO. 78-92

CLIENT M.M. DILLON LIMITED — DATE JANUARY 24, 1979

BOREHOLE TYPE BOMBADIER, 0.1 m I.D. HOLLOW STEM AUGERS NX ROCK CORE — GEOLOGIST A.B.

ELEVATION 152.8 m — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0		GARBAGE: Alternate layers of garbage and earth fill, moist						
12.5		SHALE: Red, with green beds and green mottling, cryptocrystalline, medium bedded shale, soft, gypsum filled nodules throughout weathered to 13.7 m	NX			100	▲	
			NX			100		
			NX			100		
18.3		Borehole terminated at 18.3 m in shale					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 9

PROJECT NAME BURLINGTON LANDFILL SITE — PROJECT NO. 78-92

CLIENT M.M. DILLON LIMITED — DATE JANUARY 25, 1979

BOREHOLE TYPE BOMBADIER 0.1 m I.D. HOLLOW STEM AUGERS — GEOLOGIST A.B.

ELEVATION 141.9 m — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0								
		WEATHERED SHALE: Red brown weathered shale D.T.P.L.						
1.5								
		SHALE: Red and green crypto-crystalline shale green bands are hard					▲	
							●	
							●	
10.7		Borehole terminated at 10.7 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 10

PROJECT NAME BURLINGTON LANDFILL SITE — **PROJECT NO.** 78-92

CLIENT M.M. DILLON LIMITED — **DATE** JANUARY 30, 1979

BOREHOLE TYPE BOMBADIER, 0.1 m I.D. HOLLOW STEM AUGERS — **GEOLOGIST** A.B.

ELEVATION 134.5 m — **TECHNOLOGIST**

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0								
		FILL: Red brown silty clay fill, D.T.P.L.						
1.0								
		WEATHERED SHALE						
2.4								
		SHALE: Red with green bands, cryptocrystalline shale, green bands are hard					▲	
							●	
							●	
12.2								
		Borehole terminated at 12.2 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 11

PROJECT NAME BURLINGTON LANDFILL SITE — **PROJECT NO.** 78-92

CLIENT M.M. DILLON LIMITED — **DATE** JANUARY 24, 1979

BOREHOLE TYPE BOMBADIER 0.1 m I.D. HOLLOW STEM AUGERS NX ROCK CORE — **GEOLOGIST** A.B.

ELEVATION 134.4 m — **TECHNOLOGIST**

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0								
		FILL: Red brown clayey silt fill, wet						
3.1								
		GARBAGE: Garbage to 7.6 m saturated						
7.6							▲	
		SHALE: Red and green banded, cryptocrystalline, thin to thick bedded shale vugs and gypsum nodules throughout.	NX			100		
			NX			100		
			NX			100		
			NX			100		
							●	
13.7		Borehole terminated at 13.7 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 12

PROJECT NAME BURLINGTON LANDFILL SITE — **PROJECT NO.** 78-92

CLIENT M.M. DILLON LIMITED — **DATE** JANUARY 29, 1979

BOREHOLE TYPE BOMBADIER, 0.1 m I.D. STEM HOLLOW AUGERS NX ROCK CORE — **GEOLOGIST** A.B.

ELEVATION 127.4 m — **TECHNOLOGIST**

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.1		TOPSOIL						
		WEATHERED SHALE: Red brown weathered shale D.T.P.L.						
			SS	32	11		▲	
3.4		hard						
		SHALE: Red and green bands, cryptocrystalline, thick to massive bedded shale vugs and gypsum nodules throughout						
			NX			100		
			NX			100	●	
			NX			100		
			NX			100		
12.2							●	
		Borehole terminated at 12.2 m						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 13

PROJECT NAME BURLINGTON LANDFILL SITE — PROJECT NO. 78-92

CLIENT M.M. DILLON LIMITED — DATE JANUARY 29, 1979

BOREHOLE TYPE BOMBADIER, 0.1 m I.D. HOLLOW STEM AUGERS NX ROCK CORE — GEOLOGIST A.B.

ELEVATION 122.0 — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.1		TOPSOIL						
		WEATHERED SHALE: Red brown weathered shale D.T.P.L. saturated from 1.8 m.						
2.4		SHALE: Red, with green bands and green mottling, crypto-crystalline, massive bedded shale					▲	
			NX			100		
			NX			100		
9.1		Borehole terminated at 9.1 m in shale					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 8A

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 8, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST A.B.

ELEVATION 155.8 m (Ground) — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0		FILL: Red brown clayey silt fill, stones, moist						- borehole is back-filled with gravel from 15.80 m to 0.61 m - standpipe is slotted from 15.80 to 0.61 m
1.8		GARBAGE: Alternate layers of garbage and earth fill, moist - saturated at 11.6 m.						
15.8		SHALE: Red brown shale with green layers					▲	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 8A (cont'd)

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 8, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST A.B.

ELEVATION 155.8 m (Ground) — TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/ 0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
22.4		Borehole terminated at 22.4 m in shale.					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 11A

PROJECT NAME HALTON MONITORING — **PROJECT NO.** 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — **DATE** OCT. 9, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS — **GEOLOGIST** A.B.

ELEVATION 134.3 m (Ground) — **TECHNOLOGIST**

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0		FILL: Red brown clayey silt fill, moist						- borehole is back-filled with gravel from 5.33 m to 0.61 m.
2.8		GARBAGE: Garbage mixed with clayey silt and sand, saturated at 4.6 m.					▲	- standpipe is slotted from 5.33 m to 0.61 m.
6.1		SHALE: Red brown shale with green layers						
12.2		Borehole terminated at 12.2 m in shale.					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 14

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 10, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS — GEOLOGIST A.B.

ELEVATION 125.27 m (Ground) — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/ 0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
1.4		WEATHERED SHALE: Red brown weathered shale D.T.P.L.						- borehole is back-filled with gravel from 5.64 m to 0.61 m.
		SHALE: Red brown shale with green layers					▲	- standpipe is slotted from 5.64 m to 0.61 m.
10.7		Borehole terminated at 10.7 m in shale					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 15

PROJECT NAME HALTON MONITORING — **PROJECT NO.** 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — **DATE** OCT. 10, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS — **GEOLOGIST** A.B.

ELEVATION 121.0 m (Ground) — **TECHNOLOGIST**

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/ 0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL:						
		WEATHERED SHALE: Red brown weathered shale, D.T.P.L.						- borehole is back-filled with gravel from 5.27 m to 0.61 m.
		SHALE: Red brown shale with green layers.					▲	- standpipe is slotted from 5.27 m to 0.61 m.
10.7							●	
		Borehole terminated at 10.7 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 16

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 14, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST A.B.

ELEVATION (Ground) 123.1 m (I,II) and 123.0 (III,IIII) — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.5		FILL: Red brown clayey silt fill, D.T.P.L.						
		WEATHERED SHALE: Red brown weathered shale, D.T.P.L.						
2.1		SHALE: Red brown shale with green layers						- borehole is back-filled with gravel from 5.18 m to 0.61 m. - standpipe is slotted from 5.18 m to 0.61 m.

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 16 (cont'd)

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 14, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST A.B.

ELEVATION (Ground) 123.1 m (I,II) and 123.0 (III,IIII) — TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/ 0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
29.9		Borehole terminated at 29.9 m in shale.					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 17

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 15,16,17, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST A.B.

ELEVATION (Ground) 114.9 m (I,II) and 115.0 m (III,IIII) — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0		WEATHERED SHALE: Red brown clayey silt, D.T.P.L.						- borehole is back-filled with gravel from 5.43 m to 0.61 m - standpipe is slotted from 5.43 m to 0.61 m.
4.6		- 1.0 m W.T.P.L.					▲	
		SHALE: Red brown shale with green layers					●	
							●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 17

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 15, 16, 17, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST

ELEVATION (Ground) 114.9 m (I,II) and 115.0 m (III,IIII) — TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/ 0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
29.6		Borehole terminated at 29.6 m in shale.					●	

● Piezometer Tip ▲ Standpipe Tip

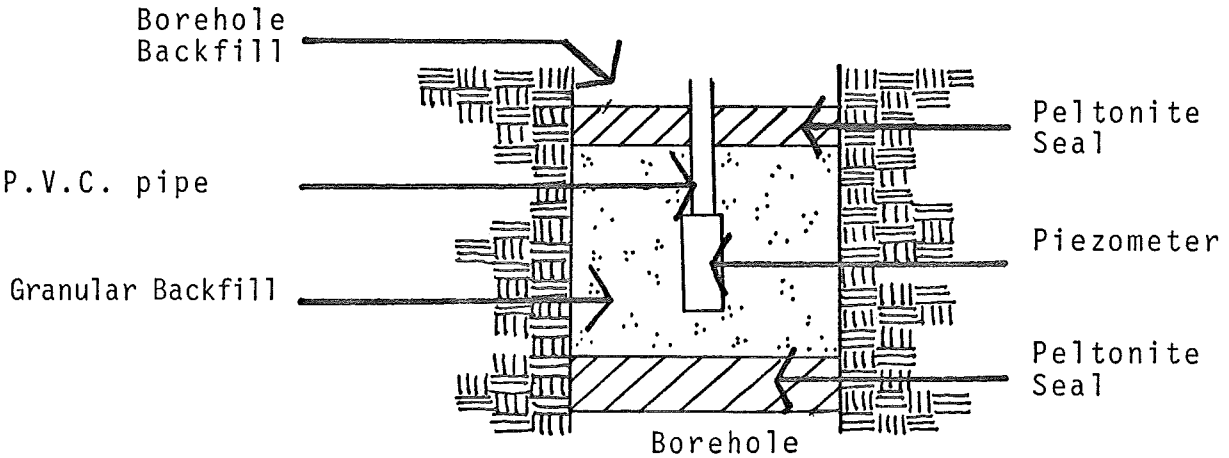
Gartner Lee Associates Limited

GROUND WATER MONITOR DETAILS

GROUND WATER MONITOR DETAILS

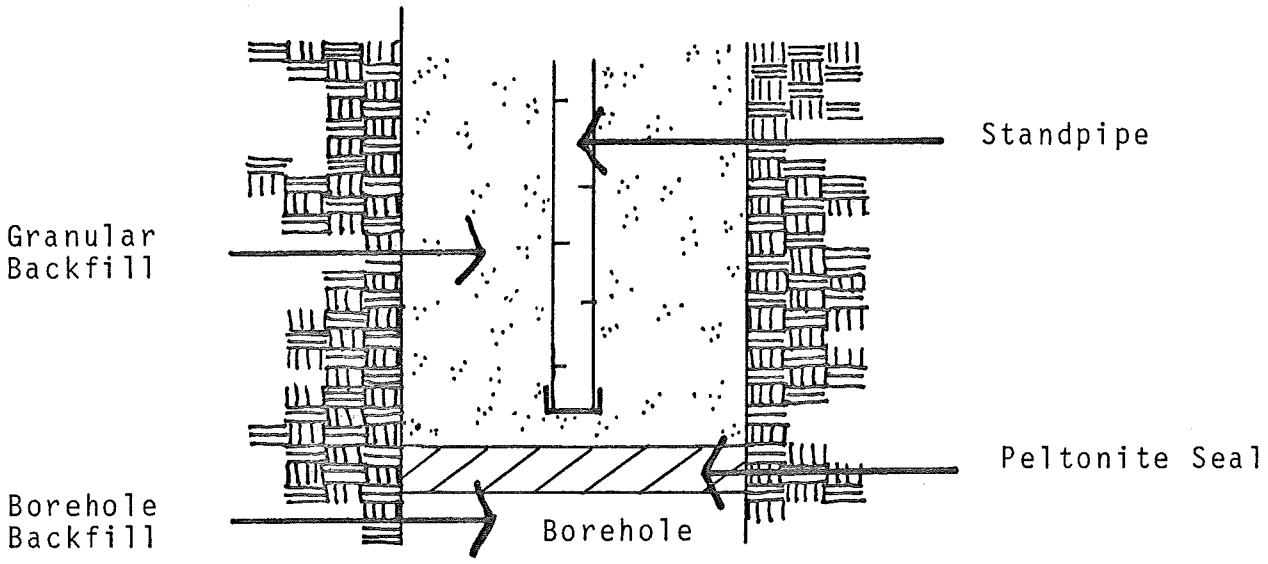
INSTALLATION DETAILS

A. PIEZOMETER: The piezometers consist of PVC pipe slotted and wrapped with fiberglass cloth over .5 m. Piezometers are used to measure the hydrostatic pressure, to obtain ground water samples and to measure in situ permeability.



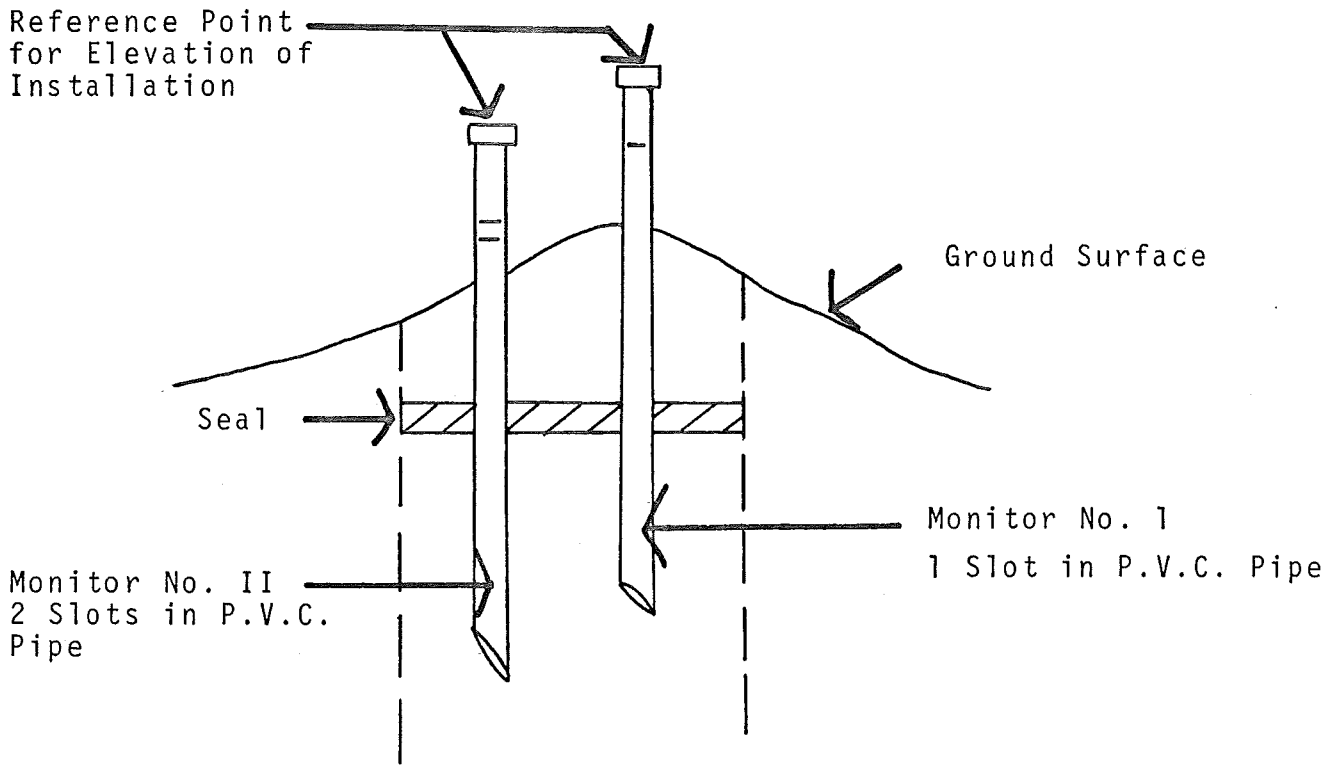
TYPICAL INSTALLATION

B. STANDPIPE: Standpipes consist of P.V.C. pipe with the bottom 2.4 m of each standpipe slotted every .3 m. Standpipes are used to measure the ground water table and to obtain ground water samples. Standpipes in boreholes 8A, 11A, 14, 15, 16 and 17 are slotted from the bottom of the monitor to 0.61 m below the surface.



TYPICAL INSTALLATION

SURFACE DETAILS



PROJECT 80-96-B TABLE 3 SHEET 1

GROUND WATER MONITOR DETAILS

BOREHOLE NO.	*MONITOR				LOCATION OF TIP		LOCATION OF SEAL	
	No.	Diameter mm	Type	Elev.	Depth	Elev.	Depth	Elev.
1	I	32	● trow	183.7	18.6	165.1	18.0	165.7
	II	32	●	184.0	14.0	170.0	14.0, 13.4	170.0, 170.6
	III	19	▲	183.7	6.1	177.6	3.1, 0.9	180.6, 182.8
2	I	19	●	171.7	11.2	160.5	10.6	161.1
	II	19	▲	171.4	7.0	164.4	4.8, 0.9	166.6, 170.5
3	I	19	●	168.2	10.9	157.3	10.3	157.9
	II	19	▲	167.9	6.1	161.8	3.7, 0.9	164.2, 167
4	I	19	●	174.5	14.3	160.2	13.7	160.8
	II	19	▲	174.5	8.5	166.0	5.8, 1.2	168.7, 173.2
5	I	32	● trow	164.8	12.7	152.6	11.9	153.4
	II	32	●	164.8	8.0	158.1	7.4	157.7
	III	19	▲	165.3	5.0	160.3	5.3, 1.2	160.0, 164.1
6	I	19	●	174.2	17.5	156.6	16.8	157.4
	II	19	▲	174.2	11.1	163.1	8.2, 1.1	166.0, 173.1
7	I	32	●	181.5	15.4	166.1	14.8	166.7
	II	32	●	181.8	10.9	170.9	10.8, 10.3	171.0, 171.5
	III	19	▲	181.4	6.1	175.3	6.1, 3.1, 0.9	175.3, 178.3 180.5
8A	I	31	●	156.45	22.89	133.56	21.37	135.08
	II	31	▲	157.00	17.07	139.93	17.07	139.93
							1.83	155.17
9	I	32	●	142.5	11.0	131.5	10.4	132.1
	II	19	●	142.7	8.4	134.3	8.4, 7.8	134.3, 134.9
	III	19	▲	142.9	6.1	136.8	4.0, 1.6	138.9, 141.3
10	I	32	●	134.7	11.9	122.8	11.3	123.4
	II	32	●	134.7	5.8	128.9	5.8, 5.2	128.9, 128.5
	III	19	▲	134.9	3.7	131.2	0.8	134.1
11A	I	31	●	135.33	13.11	122.22	12.04	123.29
	II	31	▲	135.00	6.10	128.9	6.10	128.90
							1.37	133.63
12	I	32	● trow	127.9	12.7	115.2	12.0	115.9
	II	32	●	127.7	7.3	120.4	7.3, 7.0	120.4, 120.7
	III	19	▲	127.9	2.5	125.4	1.1	126.8
13	I	19	●	122.6	9.8	112.8	9.1	113.5
	II	19	▲	122.6	6.1	116.5	3.0, 1.2	119.6, 121.4

* All elevations taken from the top of monitor.

GROUND WATER MONITOR DETAILS

BOREHOLE NO.	MONITOR				LOCATION OF TIP		LOCATION OF SEAL	
	No.	Diameter	Type	Elev.	Depth	Elev.	Depth	Elev.
14	I	31	●	125.73	10.97	114.76	9.91	115.82
	II	31	▲	125.74	6.10	119.64	6.10	119.64
							1.07	124.67
15	I	31	●	121.39	10.94	110.45	9.88	111.51
	II	31	▲	121.81	6.10	115.71	6.10	115.71
							1.43	120.38
16	I	31	●	123.61	28.86	94.75	27.04	96.57
	II	31	●	124.03	17.74	106.29	17.74	106.29
							16.22	107.81
	III	31	●	123.92	9.91	114.01	8.84	115.08
	IIII	31	▲	123.91	6.10	117.81	6.10,1.52	117.81,122.39
17	I	31	●	115.47	29.93	85.54	28.56	86.91
	II	31	●	115.74	17.62	98.12	17.62	98.12
							16.40	99.34
	III	31	●	115.70	9.20	106.50	7.99	107.71
	IIII	31	▲	115.67	6.10	109.57	6.10	109.57
							1.28	114.39

* All elevations taken from top of monitor.

● = Piezometer ▲ = Standpipe

GROUND WATER ELEVATIONS

PROJECT 78-92

TABLE 4 SHEET 1

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Feb.26, 1979	Mar.19 1979	Apr.4, 1979	Apr.18, 1979	May 2, 1979	May 16, 1979	June 4, 1979	July 23, 1979			
1	I	●	173.4	173.3	173.4	173.1	173.2	173.2	173.3	173.4			
	II	●	181.0	181.3	181.5	181.6	181.4	181.4	181.4	181.6			
	III	▲	182.8	183.2	183.3	183.2	183.0	183.2	183.0	182.4			
2	I	●	168.0	168.3	168.3	168.6	168.4	168.5	168.4	167.5			
	II	▲	Frozen	Frozen	171.3	171.1	171.2	171.3	171.3	169.9			
3	I	●	163.8	163.0	163.0	163.7	163.5	163.5	163.4	162.4			
	II	▲	163.3	163.8	164.8	165.0	164.6	164.6	165.2	162.9			
4	I	●	171.2	170.8	170.5	167.9	167.9	166.4	166.6	166.4			
	II	▲	170.8	172.3	173.3	173.2	172.8	171.9	172.5	169.5			
5	I	●	163.1	163.4	163.2	161.5	155.0	154.0	154.2	154.6			
	II	●	Frozen	Frozen	Flowing	Flowing	Flowing	Flowing	Flowing	Destroyed			
	III	▲	Frozen	Frozen	165.0	165.0	165.0	165.0	164.9				
					Flowing	Flowing	Flowing	Flowing	Flowing				
					164.7	164.7	164.7	164.7	164.7	163.9			
6	I	●	160.5	160.2	160.8	160.9	160.9	161.0	161.4	157.8			
	II	▲	169.1	169.4	171.5	171.9	170.8	170.9	170.6	168.0			
7	I	●	177.8	176.8	176.9	176.8	177.8	177.0	177.4	177.5			
	II	●	179.0	179.7	180.0	179.3	180.2	180.3	180.2	178.0			
	III	▲	180.8	180.8	180.8	180.7	180.6	180.7	180.5	179.1			
8	I	●	136.9	135.5	137.2	136.0	135.3	135.7	135.3	136.5			
	II	▲	142.0	141.8	142.2	142.0	141.6	142.0	142.0	148.1			
9	I	●	Dry	Dry	Dry	131.8	Dry	Dry	Dry	Dry			
	II	●	Dry	Dry	Dry	135.9	135.5	134.8	135.7	Dry			
	III	▲	Dry	Dry	Dry	137.1	137.6	Dry	Dry	Dry			
10	I	●	128.2	128.5	128.5	129.1	129.0	128.9	129.1	128.2			
	II	●	132.7	132.6	132.6	132.9	133.1	132.7	133.0	132.0			
	III	▲	132.5	132.4	133.1	133.1	134.2	133.1	133.4	132.8			

● – Piezometer ▲ – Standpipe

Gartner Lee Associates Limited

PROJECT 78-92

TABLE 4 SHEET 2

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Feb.26, 1979	Mar.19, 1979	Apr.4, 1979	Apr.18, 1979	May 2, 1979	May 16, 1979	June 4, 1979	July 23, 1979			
11	I	●	128.5	128.6	128.9	127.2	127.3	125.9	126.3	129.6			
	II	▲	130.9	130.7	130.3	130.3	129.6	129.6	129.7	131.5			
12	I	●	121.4	121.5	122.1	122.3	122.2	122.1	122.0	121.2			
	II	●	122.3	124.9	125.8	124.6	125.2	125.3	125.2	124.3			
	III	▲	126.4	126.9	127.1	127.1	127.2	127.1	126.9	125.8			
13	I	●	119.5	120.0	120.6	120.5	120.0	120.0	119.9	119.2			
	II	▲	120.4	121.1	121.7	121.5	121.1	121.2	120.9	120.0			

● – Piezometer ▲ – Standpipe

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 4 SHEET 3

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Nov.7 1979	Dec.6 1979	Jan.17 1980	Feb.6 1980	Mar.7 1980	Apr.18 1980	Oct.30 1980	Dec.9 1980	Feb.25 1981	Apr. 8 1981	May 25 1981
1	I	●	173.25	172.97	173.00	173.50	173.45	174.13	173.51	172.82	172.80	173.20	173.87
	II	●	179.00	178.97	179.90	181.06	180.94	181.23	179.13	178.80	180.14	181.07	181.39
	III	▲	181.27	181.11	181.66	182.62	182.51	183.10	181.56	181.45	182.68	183.00	182.74
2	I	●	166.57	166.82	166.89	168.30	167.81	168.35	166.56	166.49	166.95	168.10	168.20
	II	▲	168.63	169.42	170.29	171.37	170.08	171.37	168.95	168.54	170.02	170.82	170.81
3	I	●	161.04	160.55	160.60	162.30	161.95	162.06	161.28	160.84	160.58	161.94	Sealed
	II	▲	161.77	162.02	612.86	163.52	163.00	164.50	-	-	162.35	163.08	Sealed
4	I	●	166.30	166.21	166.28	166.05	166.33	166.37	166.25	165.97	165.53	165.60	Destroyed
	II	▲	167.38	168.07	169.73	172.00	171.00	173.37	167.57	167.40	172.77	173.87	Destroyed
5	I	●	154.53	154.70	154.69	154.80	154.91	155.23	Destroyed	-	-	-	-
	II	●	Destroyed	-	-	-	-	-	-	-	-	-	-
	III	▲	161.90	162.16	162.97	164.25	164.25	164.68	162.35	162.82	Destroyed	-	-
6	I	●	160.39	160.45	160.69	160.10	160.30	160.45	160.55	160.47	160.15	160.25	Broken
	II	▲	166.30	167.07	168.17	169.90	168.63	171.25	166.48	166.41	169.24	170.58	Bent
7	I	●	175.26	174.98	175.20	175.00	176.67	176.85	175.28	174.72	175.23	176.28	176.34
	II	●	175.62	177.69	177.80	179.10	178.60	179.50	175.78	176.12	179.35	179.52	179.52
	III	▲	176.05	178.69	179.25	180.13	179.72	180.61	176.28	176.36	180.93	180.71	180.52
8	I	●	139.50	136.55	138.96	Destroyed or Burried	-	-	-	-	-	-	-
	II	▲	147.30	142.99	144.60		-	-	-	-	-	-	-
9	I	●	Destroyed	-	-	-	-	-	-	-	-	-	-
	II	●	Destroyed	-	-	-	-	-	-	-	-	-	-
	III	▲	Destroyed	-	-	-	-	-	-	-	-	-	-

● – Piezometer ▲ – Standpipe

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 4 SHEET 4

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Nov.7 1979	Dec.6 1979	Jan.17 1980	Feb.11 1980	Mar.7 1980	Apr.18 1980	Oct.30 1980	Dec.9 1980	Feb.25 1981	Apr. 8 1981	May 25 1981
10	I	●	127.73	128.36	128.50	128.50	128.07	128.86	127.60	127.85	Blocked	128.16	128.49
	II	●	132.27	132.38	132.23	132.25	131.90	132.39	131.72	131.83	131.97	132.2	132.13
	III	▲	133.12	133.50	133.42	133.42	133.08	133.59	133.25	Destroyed	-	133.06	133.33
11	I	●	128.25	125.70	126.37	126.75	-	-	-	-	-	-	-
	II	▲	130.55	130.18	130.13	130.00	Destroyed	-	-	-	-	-	-
12	I	●	121.41	121.41	121.67	121.75	121.50	121.87	120.91	121.01	121.05	121.35	121.58
	II	●	123.99	124.74	125.25	124.78	124.35	125.85	123.55	124.16	124.16	124.62	124.98
	III	▲	127.15	125.92	127.05	126.37	125.99	127.07	126.53	127.04	127.25	126.53	126.56
13	I	●	118.66	119.25	119.80	119.50	119.11	120.20	118.66	118.87	119.02	119.40	119.57
	II	▲	119.40	120.62	121.00	120.22	119.80	121.40	119.26	119.47	119.70	120.12	120.30

● – Piezometer ▲ – Standpipe

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 4 SHEET 5

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Oct.30 1980	Dec.9 1980	Feb.25 1981	Apr.8 1981	May 25 1981	Oct.20 1981	Nov.25 1981				
8A	1	●	136.79	135.75	136.15	137.43	136.43	136.19	136.33				
	II	▲	140.50	140.90	Blocked Ice	140.95	-	140.96	140.92				
11A	I	●	125.68	128.11	126.35	126.19	127.98	126.28	126.93				
	II	▲	Dry	130.43	129.95	129.05	129.13	dry	130.75				
14	I	●	124.18	124.31	124.47	124.34	124.38	124.34	124.39				
	II	▲	124.53	124.88	124.97	124.85	124.78	124.87	124.90				
15	I	●	119.92	120.23	120.46	120.16	120.16	120.20	120.29				
	II	▲	120.34	120.71	121.10	120.83	120.7	120.71	121.08				
16	I	●	115.37	115.28	115.34	115.11	114.98	114.85	115.06				
	II	●	115.71	115.71	115.70	115.81	116.14	115.95	116.19				
	III	●	117.17	118.75	118.73	118.94	119.19	118.94	119.32				
	IIII	▲	121.01	121.23	121.33	121.40	121.65	121.36	121.93				
17	I	●	113.89	114.09	114.06	114.01	114.06	113.72	113.93				
	II	●	113.84	114.04	114.01	114.07	114.13	113.94	114.15				
	III	●	114.56	114.88	Blck.Ice	114.88	114.90	114.82	115.09				
	IIII	▲	114.64	114.95	114.97	114.92	114.92	114.88	115.13				

● – Piezometer ▲ – Standpipe

Gartner Lee Associates Limited

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Oct.20 1981	Nov.23 1981									
1	1	●	173.82	173.71									
	11	●	180.28	180.6									
	111	▲	181.45	183.2									
2	1	●	167.17	167.62									
	11	▲	169.71	170.62									
6	1	●	bent	bent									
	11	▲	160.58	bent									
7	1	●	176.30	not									
	11	●	178.89	located									
	111	▲	180.77										
10	1	●	128.02	128.20									
	11	●	132.01	132.34									
	111	▲	132.53	133.19									
12	1	●	121.33	121.74									
	11	●	124.47	125.5									
	111	▲	126.39	127.3									
13	1	●	119.20	121.15									
	11	▲	119.60	121.12									

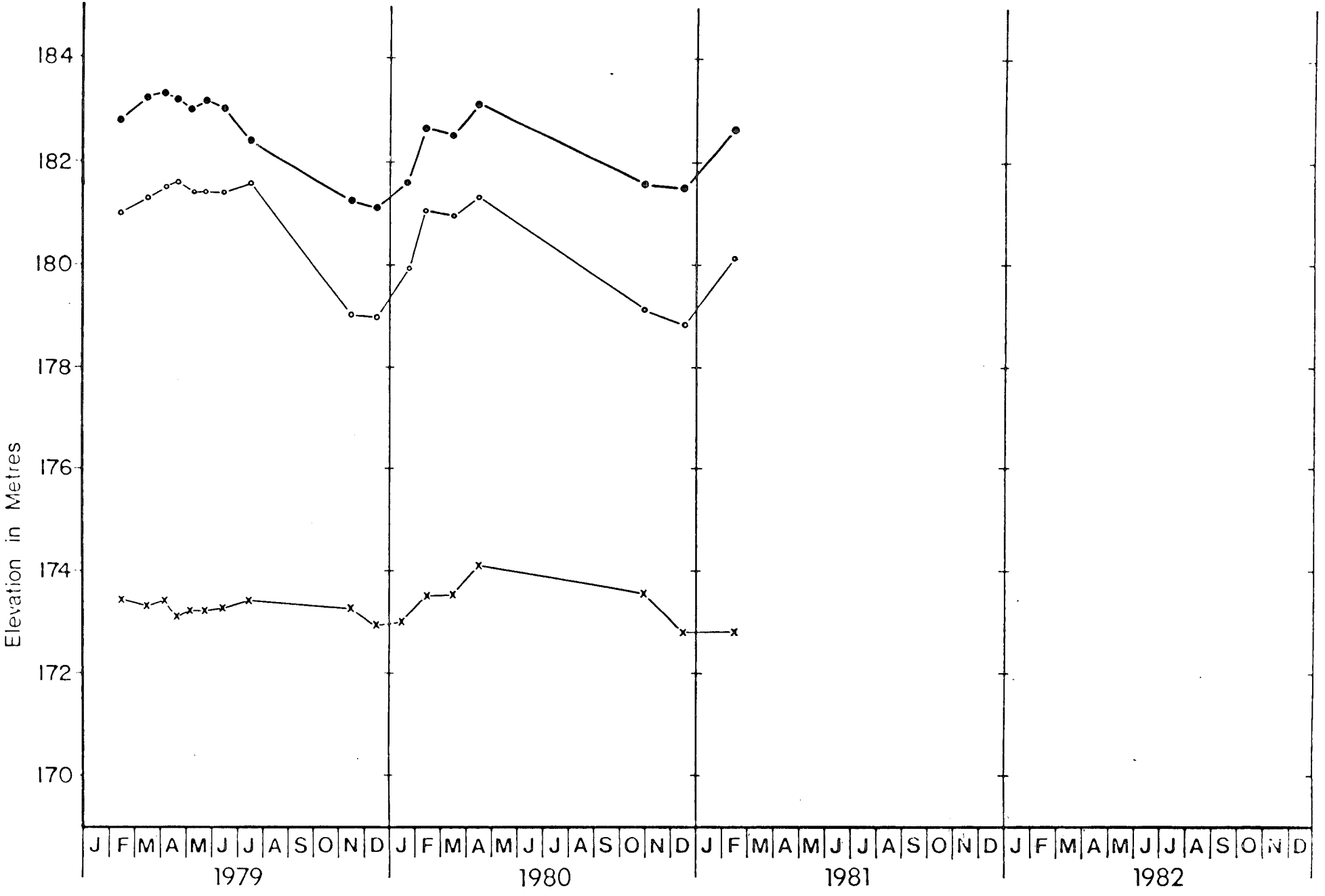
● – Piezometer ▲ – Standpipe

HYDROGRAPHS

FIGURE 6

Hydrograph

Project 79-120

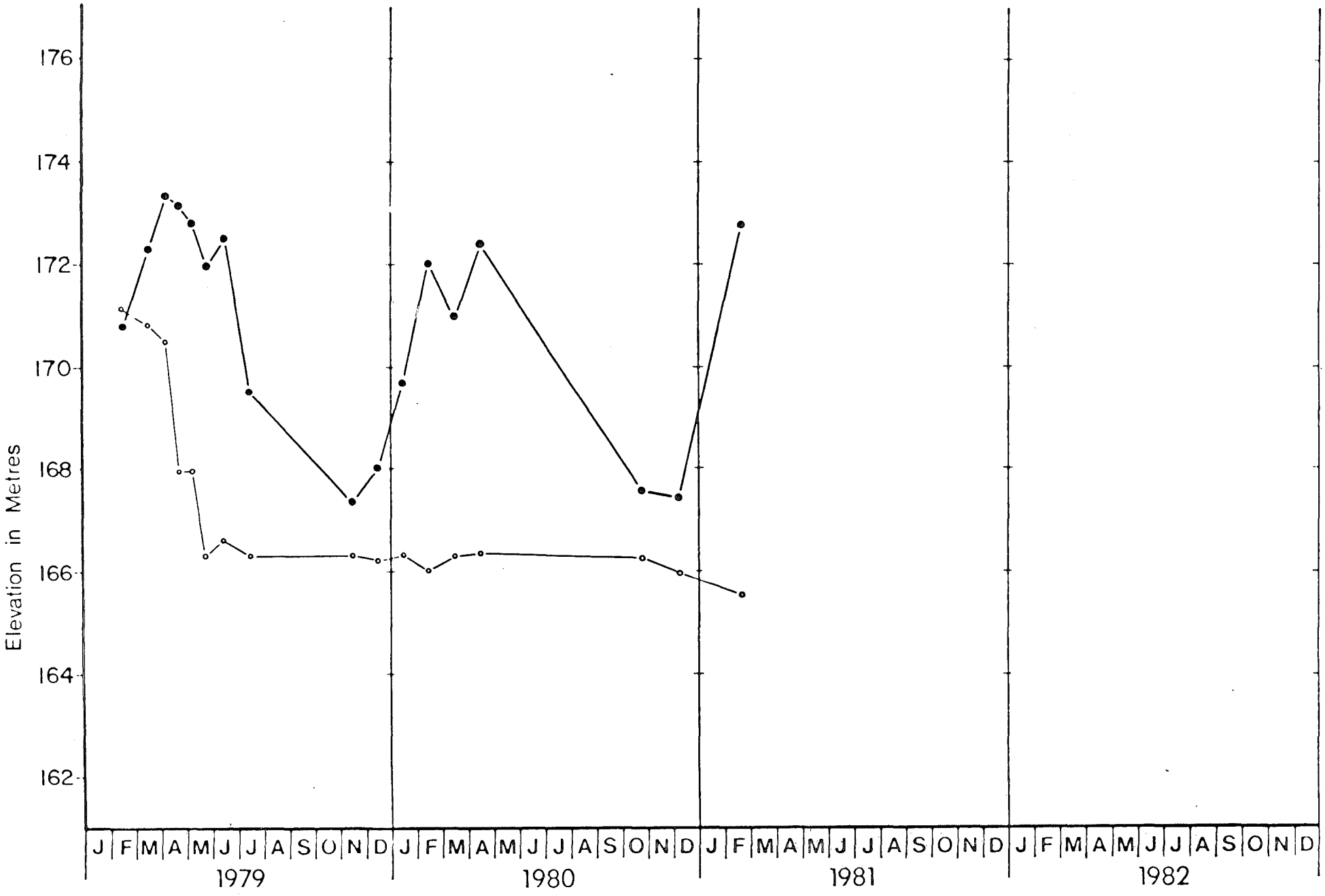


BURLINGTON LANDFILL SITE : Borehole 1 , Monitors I ×——× , II ○——○ III ●——●

FIGURE 7

Hydrograph

Project 79-120

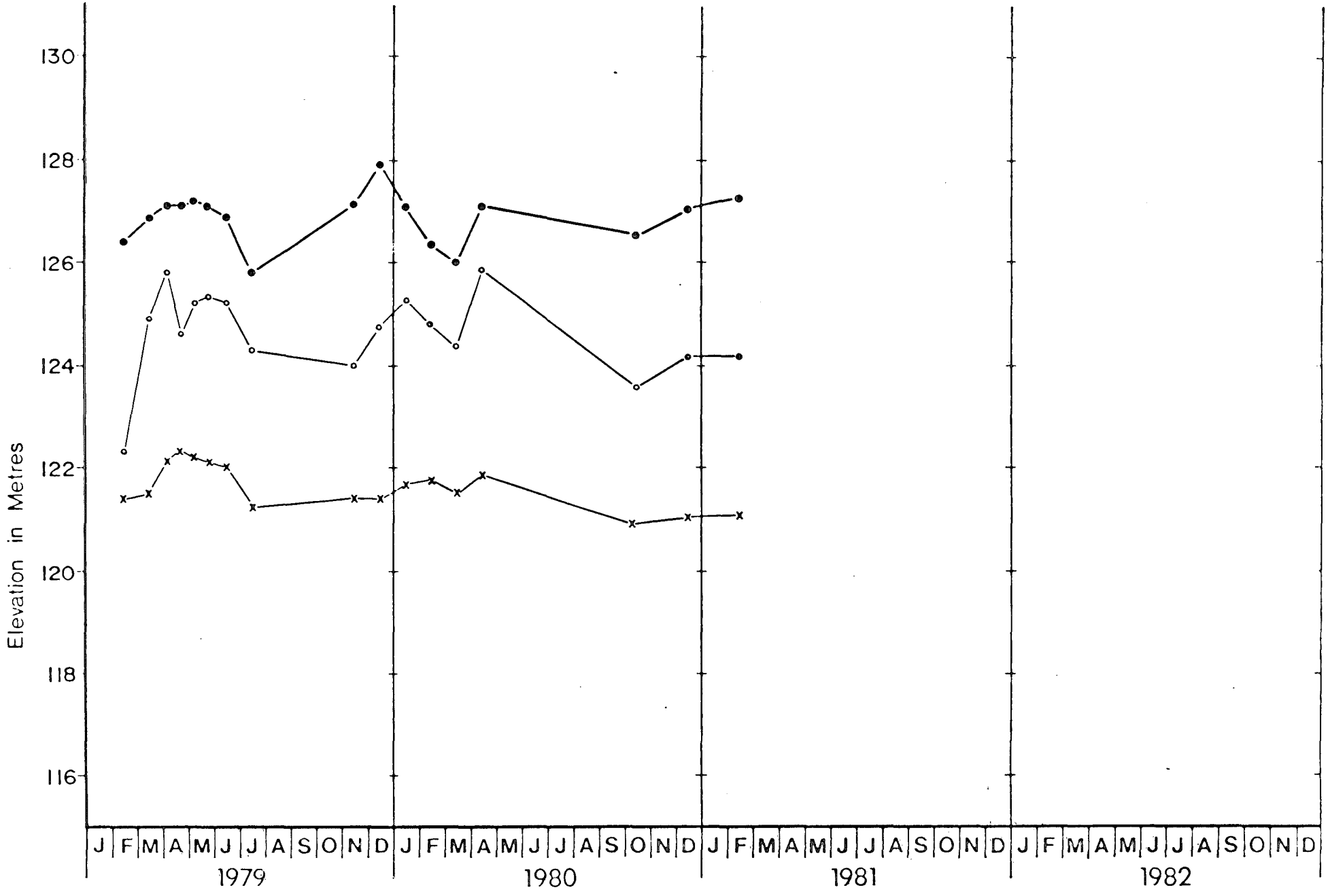


BURLINGTON LANDFILL SITE : Borehole 4 , Monitors I •—• , II •—•

FIGURE 8

Hydrograph

Project 79-120



BURLINGTON LANDFILL SITE : Borehole 12 , Monitors I ×—× , II ∘—∘ , III •—•

FIELD PERMEABILITY TEST RESULTS

FIELD PERMEABILITY TEST RESULTS

BOREHOLE	DEPTH (m)	PERMEABILITY (cm/sec)		
		Pressure Packer	Slug Test	Material
1	12.8-13.4		1.22×10^{-6}	Shale
	16.8-18.3	1.49×10^{-5}		Shale
	16.8-18.3	1.60×10^{-5}		Shale
	17.7-18.3		2.45×10^{-6}	Shale
5	6.9-7.5		9.40×10^{-7}	Shale
	7.6-9.1	1.33×10^{-5}		Shale
	7.6-9.1	1.46×10^{-5}		Shale
	10.7-12.2	8.50×10^{-6}		Shale
	10.7-12.2	9.10×10^{-6}		Shale
	11.3-12.0		7.24×10^{-7}	Shale
7	9.6-10.2		3.47×10^{-7}	Clayey Silt Till
12	6.1-7.6	5.2×10^{-6}		Shale
	6.4-7.0		1.11×10^{-6}	Shale
	9.1-10.7	1.00×10^{-6}		Shale
	9.1-10-7	1.10×10^{-6}		Shale
	10.6-12.2	1.80×10^{-6}		Shale
	10.6-12.2	1.10×10^{-6}		Shale
	11.6-12.2		1.05×10^{-6}	Shale
16	19.5-21.3	3.29×10^{-6}		Shale
	19.5-21.3	8.34×10^{-6}		Shale
	25.6-27.4	2.70×10^{-6}		Shale
	25.6-27.4	2.78×10^{-6}		Shale
	28.0-29.9	1.09×10^{-6}		Shale
	28.0-29.9	1.39×10^{-6}		Shale
17	21.0-22.9	6.76×10^{-7}		Shale
	21.0-22.9	7.97×10^{-7}		Shale
	22.6-24.4	4.23×10^{-6}		Shale
	22.6-24.4	5.70×10^{-6}		Shale
	24.1-25.9	9.45×10^{-7}		Shale
	24.1-25.9	9.10×10^{-7}		Shale

ESTIMATED SURFACE WATER FLOWS

ESTIMATED SURFACE FLOWS - FALCON CREEK

Station		Apr. 18 1980	Oct. 30 1980	Dec. 5 1980	Feb. 25 1981	Apr.8 1981	May 21 1981	Oct.20 1981	Nov.23 1981			
1	Upstream	4800	Dry	Dry	2600	500	1000	200	2000			
2	Adjacent	-	Dry	Dry	3000	600	1500	200	2300			
3	Downstream	4500	Dry	Dry	4000	800	2500	200	2800			

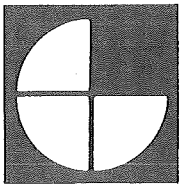
● – Piezometer ▲ – Standpipe

APPENDIX B

GROUND WATER QUALITY ANALYSES

SURFACE WATER QUALITY ANALYSES

SURFACE WATER BACTERIOLOGICAL ANALYSES



GROUND WATER QUALITY ANALYSES

ONTARIO MINISTRY OF THE ENVIRONMENT

DRINKING WATER QUALITY CRITERIA FOR THE

SUBSTANCES ANALYZED

SUBSTANCE	CONCENTRATION mg/L
Chloride (C1)	250.0
Sulphate (SO_4)	250.0
Organic Nitrogen (Total Kjeldahl minus Free Ammonia)	0.15
Nitrate (N)	10.0
Iron (Fe)	0.3
Phenols	0.001

PROJECT 80-96-B

TABLE 11 SHEET 1

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 1 PIEZOMETER I

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	Feb. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980	April 1981		Mean
CONDUCTIVITY µMHOS CM		5020	5900	4900	5500	5700	5600	5600	5600	5750		5480
pH								7.3	7.5	-		7.4
HARDNESS ($CaCO_3$)										1945		
COD								58	44	50		51
CHLORIDES (Cl)								210	240	230		225
SULPHATES (SO_4)								3400	3600	3850		3500
PHOSPHOROUS AS P	Total									.14		
	Soluble									.1		
NITROGEN (N)	Total Kjeldahl									1.2		
	Free Ammonia									<.1		
	Nitrite									.01		
	Nitrate									<.1		
METALS	Potassium (K)	46	51	43	49	49	50					48
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)		880									880
	Iron (Fe)	3.0	3.0	7.5	4.8	2.2	2.0			4.4		3.8
Phenol (ppb)		2	2	<1	1	<1	1	<1	<1	<1		1
BOD		12.0	6.0	44	3.0	4.0	4.5	26	15	9.0		14
DOC		9.2	1.8	3.2	3.4	3.4	2.0					3.8

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 2

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 1 PIEZOMETER II

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY µMHOS CM		2600	2750									2675
pH		7.7	7.5									7.6
HARDNESS ($CaCO_3$)												
COD		47	51									49
CHLORIDES (Cl)		25	18									22
SULPHATES (SO_4)		930	900									915
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		2	1									1.5
BOD		5.0	7.5									6.3
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 3

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 2 PIEZOMETER I

PROPERTY		Oct. 1980										
CONDUCTIVITY μMHOS CM		1750										
pH		7.7										
HARDNESS ($CaCO_3$)												
COD		83										
CHLORIDES (Cl)		57										
SULPHATES (SO_4)		600										
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		1										
BOD		10										
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 4

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 2 STANDPIPE II

PROPERTY		Oct. 1980										
CONDUCTIVITY μMHOS CM		1525										
pH		7.7										
HARDNESS ($CaCO_3$)												
COD		24										
CHLORIDES (Cl)		5										
SULPHATES (SO_4)		600										
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN N	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		2										
BOD		9.0										
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 5

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 3A PIEZOMETER I

PROPERTY		Oct. 1980										
CONDUCTIVITY μMHOS CM		2150										
pH		7.0										
HARDNESS ($CaCO_3$)												
COD		1120										
CHLORIDES (Cl)		71										
SULPHATES (SO_4)		760										
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		16										
BOD		360										
DOC												

NOTE concentrations in p.p.m unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 6

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 8A_STANDPIPE II

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS CM		8600	8800									8700
pH		6.3	6.4									6.4
HARDNESS ($CaCO_3$)												
COD		12000	7400									9700
CHLORIDES (Cl)		690	733									712
SULPHATES (SO_4)		81	65									73
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		4500	3000									3750
BOD		6400	6400									6400
DOC												

NOTE concentrations in p.p.m. unless otherwise noted

PROJECT 80-96-B TABLE 11 SHEET 7

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 10 PIEZOMETER I

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	Feb. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980			Mean
CONDUCTIVITY μMHOS CM		3500	3500	3040	3730	3800	3600	3575	3600			3540
pH								7.1	7.0			7.1
HARDNESS ($CaCO_3$)												
COD								240	68			154
CHLORIDES (Cl)								348	370			360
SULPHATES (SO_4)								1440	1420			1430
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)	6.2	56	135	49	48	46					57
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)		330									330
	Iron (Fe)	3.6	6.0	18	4.2	2.9	3.8					6.4
Phenol (ppb)		11	1	<1	<1	<1	1	<1	<1			1
BOD		>170	70	80	17	10	8.0	32	16			50
DOC		82	56	41	12	9.8	6.2					34.5

NOTE concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 8

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 10 PIEZOMETER II

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	Feb. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980			Mean
CONDUCTIVITY μMHOS CM		2775	2750	2070	3000	3160	2760	2850	2675			2755
pH								7.7	7.8			7.8
HARDNESS ($CaCO_3$)												
COD								81	85			83
CHLORIDES (Cl)								155	150			153
SULPHATES (SO_4)								1040	1000			1020
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN N	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)	33	31.5	30	31	30	28					31
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)		340									340
	Iron (Fe)	4.5	5.0	25	11.2	4.8	6.7					9.5
Phenol (ppb)		2	<1	<1	2	1	1	1	<1			1
BOD		62	34	4.0	4.0	3.0	4.5	12	10			16.7
DOC		27	31	15	12.6	12.8	11.4					18.3

NOTE concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 9

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 10 STANDPIPE III

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	Feb. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980			Mean
CONDUCTIVITY μMHOS CM		1779	2150	2750	2250	2730	2860	1340	2675			2320
pH								7.8	7.8			7.8
HARDNESS (Ca CO_3)												
COD								180	85			133
CHLORIDES (Cl)								64	150			107
SULPHATES (SO_4)								330	1000			665
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)	25	23	24	18	21	20					22
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)		135									135
	Iron (Fe)	325	105	42.5	14.5	300	22					135
Phenol (ppb)		<1	<1	5	7	<1	70	1	<1			10
BOD		80	12	66	20	16	140	18	10			45
DOC		19.2	26	120	27.5	18.8	40					42

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 10

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 11A PIEZOMETER I

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS CM		5050	3680									4365
pH		7.4	7.0									7.2
HARDNESS ($CaCO_3$)												
COD		250	130									190
CHLORIDES (Cl)		1420	660									1040
SULPHATES (SO_4)		255	1040									648
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		2	<1									1
BOD		40	66									53
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 11

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 11A STANDPIPE II

PROPERTY		Dec. 1980										
CONDUCTIVITY μMHOS CM		4180										
pH		7.1										
HARDNESS ($CaCO_3$)												
COD		210										
CHLORIDES (Cl)		950										
SULPHATES (SO_4)		1040										
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		<1										
BOD		14										
DOC												

NOTE concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 12

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 12 PIEZOMETER 1

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980				Mean
CONDUCTIVITY μMHOS CM		2888	7700	7600	9350	9180	9400	9500				7950
pH							7.2	7.2				7.2
HARDNESS ($CaCO_3$)												
COD							180	61				121
CHLORIDES (Cl)							2610	2740				2675
SULPHATES (SO_4)							1620	1540				1580
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)	19	65	67	64	65						56
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)		1100									1100
	Iron (Fe)	3.0	8.0	25	3.1	1.5						8.1
Phenol (ppb)		<1	1	<1	<1	<1	1	<1				<1
BOD		11	8.0	3.5	4.0	4.5	20	4.0				7.9
DOC		6.2										6.2

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 14

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 12 STANDPIPE III

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	April 1980							Mean
CONDUCTIVITY μMHOS, CM.		3450	3650	3700	4610							3850
pH												
HARDNESS ($CaCO_3$)												
COD												
CHLORIDES (Cl)												
SULPHATES (SO_4)												
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)	32	54	52	35							43
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)		325									325
	Iron (Fe)	153	24	25	3.9							51.5
Phenol (ppb)		<1	<1	1	2							1
BOD		28	5.0	2.5	7.0							10.6
DOC		8.0	15.0	5.2	12.4							10.2

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 15

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 13 PIEZOMETER I

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980				Mean
CONDUCTIVITY μMHOS/CM		11620	14800	13700	16400	14300	14800	15500				14450
pH												
HARDNESS ($Ca\ CO_3$)												
COD							400	470				435
CHLORIDES (Cl)							4880	6240				5560
SULPHATES (SO_4)							1440	1600				1520
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)	63	77	78	80	71						74
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)		2120									2120
	Iron (Fe)	7.4	11	20	3.1	3.0						8.9
Phenol (ppb)		8	<1	<1	1	<1	<1	<1				1
BOD		28	16	13	5.0	3.5	9.0	7.0				11.6
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 16

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 13 STANDPIPE II

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	March 1980	April 1980						Mean
CONDUCTIVITY µMHOS/CM		4160	2250	2750	2440	2050						2730
pH												
HARDNESS ($CaCO_3$)												
COD												
CHLORIDES (Cl)												
SULPHATES (SO_4)												
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)	22	11.4	13	10	9.1						13.1
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)	63	8.9	15	8.0	3.4						19.7
Phenol (ppb)		<1	1	<1	<1	<1						<1
BOD		11	4.0	3.5	5.0	2.0						5.1
DOC			7.4	4.1	7.0	4.0						5.6

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 17

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 14 , PIEZOMETER I

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS/CM.		5800	5825									5810
pH		7.1	7.3									7.2
HARDNESS ($CaCO_3$)												
COD		270	150									210
CHLORIDES (Cl)		1390	1313									1352
SULPHATES (SO_4)		1440	1480									1460
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		<1	<1									<1
BOD		26	15									20.5
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 18

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 14 STANDPIPE II

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS/CM		3400	2925									3160
pH		7.4	7.3									7.4
HARDNESS ($CaCO_3$)												
COD		71	110									91
CHLORIDES (Cl)		428	256									342
SULPHATES (SO_4)		1080	1100									1090
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		1	1									1
BOD		12	4.5									8.3
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 19

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 15 PIEZOMETER I

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS/CM.		3575	3500									3540
pH		7.3	7.4									7.4
HARDNESS ($CaCO_3$)												
COD		260	74									167
CHLORIDES (Cl)		947	957									952
SULPHATES (SO_4)		270	320									295
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		1	1									1
BOD		28	17									22.5
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 20

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 15 STANDPIPE II

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS/CM		2225	2200									2213
pH		7.2	7.0									7.1
HARDNESS ($CaCO_3$)												
COD		34	780									407
CHLORIDES (Cl)		207	200									204
SULPHATES (SO_4)		590	680									635
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		<1	1									1
BOD		3.0	7.0									5.0
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 21

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 16 PIEZOMETER I

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS/CM.		500	440									470
pH		7.4	7.5									7.5
HARDNESS ($CaCO_3$)												
COD		760	320									540
CHLORIDES (Cl)		<1	43									22
SULPHATES (SO_4)		49	52									51
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		17	21									19
BOD		36	36									36
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 23

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 16 PIEZOMETER III

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS, CM		52700	50600									51650
pH		6.9	7.0									7.0
HARDNESS ($Ca\ CO_3$)												
COD		1400	56									728
CHLORIDES (Cl)		27840	25400									26620
SULPHATES (SO_4)		1400	1500									1450
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		3	9									6
BOD		9.0	6.0									7.5
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 24

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 16 STANDPIPE IIII

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS/CM		3900	2950									3425
pH		7.5	7.2									7.3
HARDNESS ($CaCO_3$)												
COD		47	56									52
CHLORIDES (Cl)		496	346									421
SULPHATES (SO_4)		820	900									860
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		1	1									1
BOD		3.5	3.5									3.5
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 25

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 17 PIEZOMETER I

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS/CM		585	535									560
pH		7.6	7.6									7.6
HARDNESS ($CaCO_3$)												
COD		550	120									335
CHLORIDES (Cl)		86	80									83
SULPHATES (SO_4)		48	50									49
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		1	4									3
BOD		16	12									14
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 26

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 17 PIEZOMETER II

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS/CM		555	1220									890
pH		7.6	7.7									7.7
HARDNESS ($CaCO_3$)												
COD		170	120									145
CHLORIDES (Cl)		73	209									141
SULPHATES (SO_4)		57	160									109
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		<1	<1									<1
BOD		6.0	4.0									5.0
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 11 SHEET 27

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 17 PIEZOMETER III

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS CM		1600	1510									1555
pH		7.5	6.9									7.2
HARDNESS ($CaCO_3$)												
COD		120	76									98
CHLORIDES (Cl)		237	230									234
SULPHATES (SO_4)		240	260									250
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		<1	<1									<1
BOD		3.0	2.0									2.5
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 11 SHEET 28

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 17 STANDPIPE IIII

PROPERTY		Oct. 1980	Dec. 1980									Mean
CONDUCTIVITY μMHOS/CM		1800	1900									1850
pH		7.1	7.8									7.8
HARDNESS ($CaCO_3$)												
COD		110	69									90
CHLORIDES (Cl)		222	235									229
SULPHATES (SO_4)		365	380									373
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN (N)	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)											
Phenol (ppb)		.1	.1									<1
BOD		1.5	3.0									5.3
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

SURFACE WATER QUALITY ANALYSES

ONTARIO MINISTRY OF THE ENVIRONMENT

PROVINCIAL WATER QUALITY OBJECTIVES [1]

and

DRINKING WATER QUALITY CRITERIA [2] FOR

THE SUBSTANCES ANALYZED

SUBSTANCE	CONCENTRATION
pH	6.5-8.5 [1]
Dissolved Oxygen (DO)	>4 mg/L (minimum)[1] dependent on temperature
Chloride (Cl)	250 mg/L [2]
Sulphate (SO_4)	250 mg/L [2]
Total Phosphorous (P)	0.3 mg/L [1]
Free Ammonia (N)	dependent on pH and Temperature
Nitrate (N)	10 mg/L [2]
Iron (Fe)	0.3 mg/L [2]
Phenols	0.001 mg/L [2]

PROJECT 80-96-B TABLE 4 SHEET 1

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS SW 1 - FALCON CREEK (UPSTREAM)

PROPERTY		Apr.4 1979	May 2 1979	June 4 1979	Nov.7 1979	Dec.6 1979	Jan.17 1980	Apr.18 1980	Feb.26 1980			
CONDUCTIVITY μMHOS, CM		300	500	540	799	740	490	450	423			
pH									8.0			
HARDNESS ($CaCO_3$)									203			
COD									<10			
CHLORIDES (Cl)									38			
SULPHATES (SO_4)									45			
PHOSPHOROUS AS P	Total								.04			
	Soluble								<.02			
NITROGEN (N)	Total Kjeldahl								.4			
	Free Ammonia								<.1			
	Nitrite								<.01			
	Nitrate								.5			
METALS	Potassium (K)				5.4	3.8	2.2	2.4				
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)				2.0	.2	1.4	0.5	.17			
Phenol (ppb)					<1	<1	4	1	<1			
BOD					2.5	0.6	0.8	3.0	<.2			
DOC					9.4	4.6	2.7	3.2				

NOTE: concentrations in p.p.m. unless otherwise noted.

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PROJECT 80-96-B TABLE 4 SHEET 2

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS SW 2 FALCON CREEK

PROPERTY		Feb. 1981										
CONDUCTIVITY μMHOS CM		454										
pH		7.9										
HARDNESS ($CaCO_3$)		212										
COD		14										
CHLORIDES (Cl)		36										
SULPHATES (SO_4)		50										
PHOSPHOROUS AS P	Total	.04										
	Soluble	<.02										
NITROGEN (N)	Total Kjeldahl	.4										
	Free Ammonia	<.1										
	Nitrite	<.01										
	Nitrate	.5										
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)	.21										
Phenol (ppb)		<1										
BOD		.8										
DOC												

NOTE: concentrations in p.p.m. unless otherwise noted

PROJECT 80-96-B

TABLE 4 SHEET 3

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS SW 3 FLACON CREEK (DOWNSTREAM)

PROPERTY		Apr.4 1979	May 2 1979	June 4 1979	Nov.7 1979	Dec.6 1979	Jan.17 1980	Apr.18 1980	Feb.26 1981			
CONDUCTIVITY μMHOS/CM		540	630	690	970	820	580	496	492			
pH		7.9	8.0	8.4					8.0			
HARDNESS ($CaCO_3$)		254	314	351					251			
ALKALINITY ($CaCO_3$)		185	245									
CHLORIDES (Cl)		35	35	28					34			
SULPHATES (SO_4)		53		61					65			
PHOSPHOROUS AS P	Total								.04			
	Soluble								<.02			
NITROGEN (N)	Total Kjeldahl	0.6		0.4					.4			
	Free Ammonia								<.1			
	Nitrite								.01			
	Nitrate								.4			
METALS	Potassium (K)			3.3	7.4	3.9	2.9	2.7				
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)	18		23								
	Iron (Fe)	.95	0.40	0.27	1.20	.95	1.4	.7	.7			
Phenol (ppb)		<1	1.0		<1	<1	4	1	<1			
BOD		0.6		1.40	2.5	0.8	0.6	2.5	.8			
DOC or *(COD)					10.2	4.6	2.2	4.4	*10			

NOTE: concentrations in p.p.m. unless otherwise noted.

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SURFACE WATER BACTERIOLOGICAL ANALYSES

TABLE 5

SURFACE WATER
BACTERIOLOGICAL ANALYSES
FALCON CREEK

STATION	DATE	PARAMETER					
		TOTAL COLIFORM	BACKGROUND	FECAL COLIFORM	FECAL STREP	PSEUDOMONAS AERUGINOSA	PSEUDOMONAS BACKGROUND
SW 1 (Upstream)	Feb.26/81	280	1900	A20	120	L10	L10
SW 2 (Adjacent)	Feb.26/81	300	1250	L10	A40	L10	L10
SW 3 (Downstream)	Feb.26/81	1600	4000	L10	A40	L10	L10

* - Counts per 100 ml.

A - About

L - Lower than

APPENDIX C

PROPOSED GROUND WATER MONITORING STATIONS

PROPOSED WATER QUALITY PARAMETERS

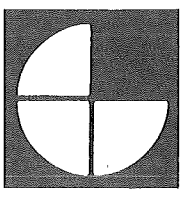

TABLE 1: PROPOSED GROUND WATER MONITORING STATIONS

BH 1 - I	BH 12 - I
1 - II	12 - II
	12 - III
BH 2 - I	
2 - II	BH 13 - I
	13 - II
BH 6 - I	
6 - II	BH 14 - I
	14 - II
BH 7 - I	
7 - II	BH 15 - I
	15 - II
BH 8A - I	
8A - II	BH 16 - I
	16 - II
BH 10 - I	16 - III
10 - II	16 - IIII
BH 11A- I	BH 17 - I
11A- II	17 - II
	17 - III
	17 - IIII

PROPOSED WATER QUALITY PARAMETERS

TABLE 2: PROPOSED CHEMICAL AND BACTERIOLOGICAL WATER MONITORING PARAMETERS

PARAMETERS	GROUND WATER	SURFACE WATER
A. Routine		
BOD	*	*
COD	*	*
TKN	*	*
NH_3	*	*
NO_2	*	*
NO_3	*	*
Tot. P.	-	*
Sol. P.	-	*
SO_4	*	*
Tot. Fe	*	*
Chlorides	*	*
Conductivity	*	*
Hardness	*	*
Phenols	*	*
Total Coliforms		*
Fecal Coliforms		*
Fecal Streptococci		*
Pseudomonas aeruginosa		*