Gartner Lee Associates Limited

Consulting Engineering Geologists and Hydrogeologists

Toronto-Buttonville Airport ■ Markham, Ontario ■ L3P 3J9 ■ 416-297-4600

MONITORING PROGRAM REPORT
BURLINGTON REGIONAL LANDFILL SITE
FOR
THE REGIONAL MUNICIPALITY OF HALTON

DRAFT COPY

PROJECT NO: 80-39

APRIL, 1980

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April 18th, 1980

The Regional Municipality of Halton,
1151 Bronte Road,
P.O. Box 7000,
Oakville, Ontario.

Attention: M. D. Morrier, P.Eng.,
Manager,
Operations and Maintenance

Dear Sirs:

Re: Monitoring Program Report
Burlington Regional Landfill Site

As per your request, we respectfully submit our report for a proposed monitoring program at the Burlington Regional Landfill Site.

The report contains information related to both ground and surface water monitoring at this site as well as gas monitoring. Specifically, we have provided details on the location, type and number of monitoring stations; sampling frequency; geochemical parameters; and presentation and reporting of results.

The proposed program is an extension of the current monitoring and is designed to satisfy the requirements of the Ministry of the Environment. However, changes may be required depending on the outcome of the Hearing and the Certificate of Approval for the Phase II, expansion.

continued -

We thank you for the opportunity to be of service.

Yours very truly,

GARTNER LEE ASSOCIATES LIMITED

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

DEJ/sv

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1.0 INTRODUCTION:

Gartner Lee Associates Limited was retained by The Regional Municipality of Halton to prepare a monitoring program for the Burlington Regional Landfill Site. Authorization was received on Purchase Order Number 32-755.

A ground and surface water monitoring program is required by the Ministry of the Environment as part of their approval for expansion of the site towards the south and southwest. Also monitoring is required for the proposed site expansion to the north of the existing fill area.

The purpose of the ground water monitoring program is to assess the impact of both the expanded and existing landfill site on ground water quality in the shale bedrock. In particular the program should measure conditions between the landfill site and the North Service Road and should provide information regarding leachate movement through the shale towards Falcon Creek. As well the monitoring data can be used to assess any possible impact of the proposed northerly site expansion on the ground water environment.

The purpose of the surface water monitoring program is to assess the impact of the landfill site operations on the water quality of Falcon Creek. As well, the monitoring should provide an indication of the effectiveness of the toe-drain leachate collection system in mitigating surface leachate flow to the creek.

The following sections of the report describe the details of the suggested programs. The text is supplemented by a site plan at the back of the report and technical data in the Appendix.

2.0 GROUND WATER MONITORING PROGRAM:

2.1 SAMPLING STATIONS:

Ground water sampling stations have been selected around and within the landfill site to monitor water quality and to determine site impacts on the ground water regime. The location of these stations is shown in Figure 1 enclosed at the back of this report. Some of these stations, as identified on the plan, are installed and functional at this time. Details of these existing stations are appended. Other stations are proposed for future installation. Following is a summary of the sampling stations and their function.

The piezometers in Borehole 1 are hydraulically up-gradient to both the existing waste disposal area and the proposed expansion area. Thus these installations can be used to establish background water quality as a basis for comparison with other data.

Once development commences in the Phase II expansion area, then the monitors in Boreholes 2 and 6 will provide information on possible movement of leachate through the shale bedrock both easterly, and westerly towards Falcon Creek respectively. The monitoring at Borehole 6 should identify at an early time if there is a potential for leachate discharge to the creek and the possible need for contingency measures.

Boreholes 8 and 11 were located in the landfill area and contained monitors screened in the waste and in the shale bedrock under the waste. Since these installations were destroyed, we suggest they be replaced, preferably after landfilling is complete so that data on leachate levels and strengths in the waste, and water quality below the waste can be monitored.

In order to assess leachate migration away from the site in an easterly and southerly direction, we propose monitoring the installations in Boreholes 10, 12 and 13. In addition two additional sampling stations south of the landfill are suggested to better document water quality at depth in the shale between the site and the North Service Road. These stations should be about 30 metres deep with piezometers at 10 metre intervals. Installation of these monitors should be as soon as practical.

Two new sampling stations, Borehole 15 and 16, are proposed between the current southwest expansion and Falcon Creek. Monitors would be relatively shallow, about 10 metres maximum in order to detect any leachate movement through the shale bedrock towards the creek. These monitors should also be installed as soon as practical.

2.2 FREQUENCY:

Background water quality should be established in all installations described in Section 2.1 above, where such data are not available. Confirmatory testing is suggested within sixty days. Once background is established, then the sampling and testing should be carried out every three months at least for the first year. A suggested schedule is March, July, October and December. More frequent sampling may be required if a problem develops.

2.3 PARAMETERS:

The geochemical parameters to be included in the background water quality testing program in all installations are conductivity, pH, chloride, sulphate, phenol and BOD. The routine monitoring completed every three months thereafter could consist of conductivity, pH, COD and phenol. If this indicator testing showed a potential concern, then a more extensive analysis should be carried out.

2.4 WATER LEVELS:

Water levels should be measured and recorded at each station both during the background and the routine monitoring, prior to the development and sampling of the monitors. These data should be converted to geodetic elevations and recorded for analysis purposes, possibly on a hydrograph.

Vandalism and accidental damage are continuing problems with the ground water monitors. We therefore suggest that precautions be taken to protect these installations. Protective steel casing with a locked cap should be considered.

3.0 SURFACE WATER MONITORING PROGRAM:

3.1 MONITORING STATIONS:

Falcon Creek flows in the floor of the ravine below and west of the landfill site. Based on limited data flow may be intermittent at least during very dry years.

We suggest that three monitoring stations be established on Falcon Creek. As shown on Figure 1, one station should be up-stream of the landfill, one station down-stream near Highway 403 and one station opposite the fill area. Thus the impact of the landfill on surface water quality can be established by comparing up and down-stream data. Visual examination of the landfill toe area for springs should be carried out during the field sampling program to check the effectiveness of toe drain designs and operations.

3.2 FREQUENCY:

Initially background water quality should be established at each surface water monitoring station and confirmed about thirty days later by re-sampling and testing. Thereafter, we propose sampling and testing be carried out quarterly at each station. Field work may be co-ordinated with the ground water monitoring program. Therefore monitoring would be in March, when water flow is high, in July when water flow is the lowest, in October during normally moderate flow conditions, and in December prior to winter freeze-up. It should be noted that the creek may dry-up during the summer, and thus eliminate the July monitoring. Also it may be necessary to increase the sampling frequency if a problem develops.

3.3 PARAMETERS:

Background analysis should include conductivity, pH, BOD, hardness, kjeldahl nitrogen, total dissolved solids, COD, iron, phosphorus, ammonia, phenol and nitrate. As well, these geochemical parameters should be analysed once a year, probably in October when flow conditions normally represent an average condition.

The quarterly testing should consist of conductivity, pH, phenol and BOD. If this indicator testing shows that there is a problem, then more extensive testing may be necessary.

3.4 STREAM FLOW:

In order to measure stream flow, we recommend that a V-notch weir be constructed on Falcon Creek near Highway 403, and a continuous recorder installed. These data should be supplemented with estimates of stream flow at SW1 taken every sampling period.

4.0 GAS MONITORING PROGRAM:

We are of the opinion that methane gas migration is not a major problem at this location. No development exists in the immediate area at the present time. As such no gas monitors are recommended. However, visual observations should be made with regards to vegetation stress as an indicator during summer months. Portable gas probe sampling should be carried out once yearly during the winter months to gather preliminary gas movement information.

5.0 DATA PRESENTATION AND REPORTING:

We recommend that accurate and complete records be maintained for all monitor results. In this regard tables should be prepared to record geochemistry results and water levels for each monitoring station. If data can not be obtained because an installation is dry for example, then this information should also

be recorded. Also a yearly hydrograph of the Falcon Creek water flow should be prepared from the gauge readings as an effective means of portraying discharge as related to precipitation events.

Climate data should be obtained from the Burlington Climatological Station on a monthly basis so that water budgets can be prepared. Results of water level fluctuations, stream flow and water quality can then be related to the water budget for interpretation purposes.

Once a year all data should be reviewed and analysed by an experienced hydrogeologist. The analysis should include an assessment of a) the site impact on the ground water regime in the area b) the performance of the leachate collection system c) the movement of leachate through the shale towards Falcon Creek and the need for contingency measures d) the impact of the site on Falcon Creek and e) gas movement aspects. Any changes in the program can be implemented at this time.

An annual monitoring report is recommended to document the findings, conclusions and recommendations. The report should be suitable for submission to the Ministry of the Environment for their review.

Prepared by:

GARTNER LEE ASSOCIATES LIMITED

D. E. Jagger, P.Eng.,
Senior Project Engineer

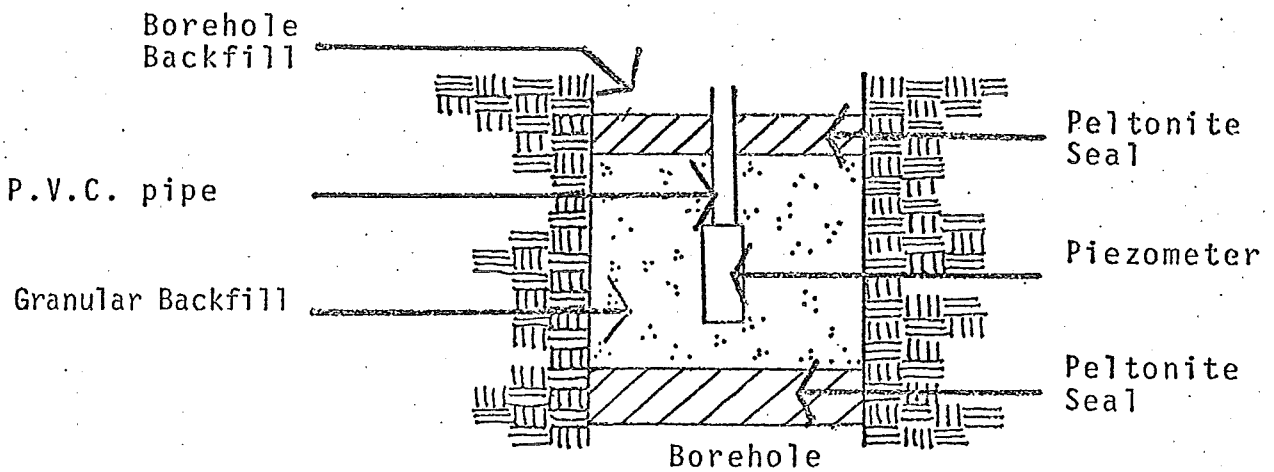
DEJ/sv

APPENDIX

GROUND WATER MONITOR DETAILS

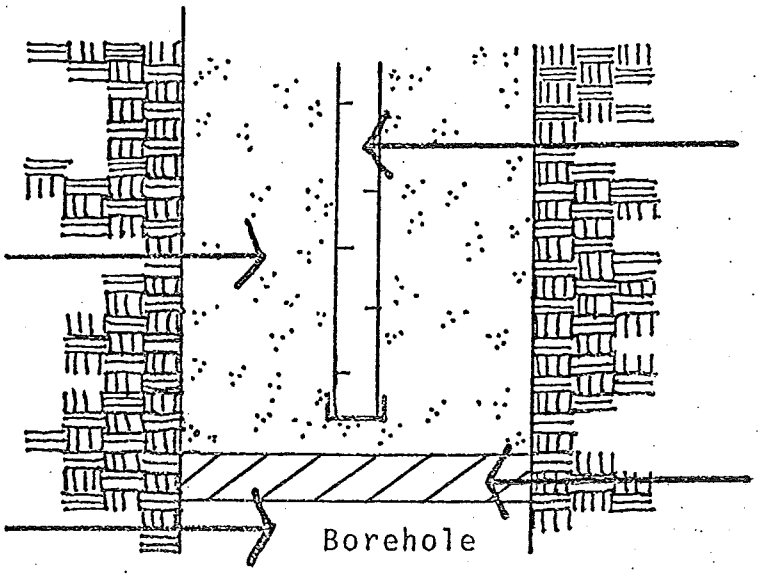
INSTALLATION DETAILS

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.



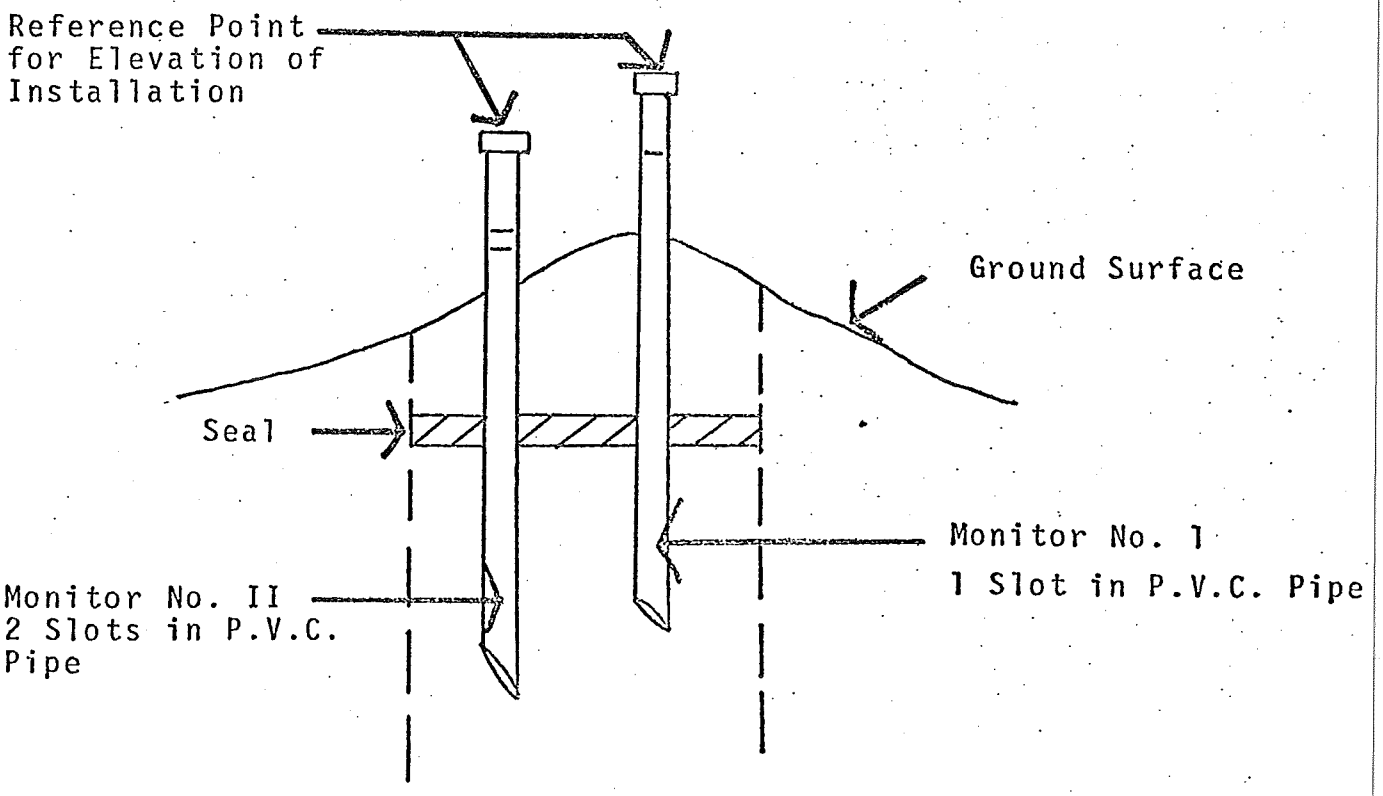
TYPICAL INSTALLATION

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.



TYPICAL INSTALLATION

SURFACE DETAILS



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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		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
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
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
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
12	I	32		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
13	I	19		122.6	9.8	112.8	9.1	113.5

Boreholes 8A, 11A, 14, 15, 16 and 17 are proposed

* All elevations taken from the top of monitor.

⊛ - Piezometer ⚠ - Standpipe

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