Appendix F-1b

Geology & Hydrogeology Existing Conditions Report

APPENDIX A

Methodologies

Appendix A - Table of Contents

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A.1 INTRODUCTION

The adherence to a protocol program as part of the monitoring program is important in maintaining the accuracy, precision, and reliability of data. Since the study findings, conclusions, and recommendations are dependent on the collected database, consideration of the field protocols during monitoring is essential.

The protocols and procedures outlined herein are based on extensive experience and applicable standards that outline best practices for field monitoring and sampling used in the industry. Practices are reviewed and updated on an ongoing basis to ensure efficiency and effectiveness of WSP field staff.

The field monitoring protocols and procedures outlined below were used as a guideline for field activities completed as part of the current study.

A.2 HEALTH AND SAFETY CONSIDERATIONS

The following are basic precautionary work practices that were used by personnel involved in field activities.

- Before commencing the field work program, a Project Risk Assessment and Safety Plan (PRASP) was completed, signed by all personnel involved in the project and kept in the dedicated field book. The health and safety plan was readily available at all times during field activities.
- All staff undertaking field activities at the Site completed the required internal WSP training as well as site-specific training required by Walker.
- Basic safety PPE, including hard hat, safety glasses, safety vest, and CSA-approved footwear were worn at all times while on-site. A fire extinguisher and first aid kit were kept in the field vehicle.
- Eating, drinking, chewing gum or tobacco, smoking, or any practice which increases the probability of hand-to-mouth transfer of contamination was prohibited in the work area.
- Hands and face were thoroughly washed upon leaving the work area and prior to engaging in any activity indicated above.
- Contact with surfaces/materials either suspected or known to be contaminated were minimized to lessen the potential of contamination transfer to personnel, cross contamination and the need for decontamination.
- A personal gas detection meter was worn in areas where combustible gas could be encountered.
- Nitrile gloves were worn during sampling and changed at each sampling location to prevent potential cross-contamination.

A.3 DRILLING PROGRAM

Boreholes were advanced at seven monitoring well nest locations at the Walker South Landfill Phase 2 (Site). The locations of boreholes completed as part of this undertaking are shown in the **Site Plan, Figure 4-1**. Borehole logs and monitor construction details are included in **Appendix B**. A total of twenty-nine (29) wells were installed at the seven monitoring well nest locations. At each borehole location, a minimum of three monitoring wells were installed at varying depths in the Irondequoit, Rochester and Lockport Formation bedrock. The monitoring well that has the suffix “1” is the deepest monitoring well in the nest while the depth decreases as the suffix number increases.

The drilling program and monitoring well installations undertaken as part of the study were completed by Noll Drilling Inc. of Breslau, Ontario.

Boreholes were advanced through the overburden with hollow-stem augers (108 mm inner diameter). Following advancement through the overburden, a steel casing (140 mm inner diameter) was advanced into the bedrock to provide an effective seal between the overburden and bedrock surface.

The deep borehole was then advanced through the steel casing and into bedrock with an HQ (64 mm inner diameter) diamond drill bit. Start and end depths and time per run were recorded for each interval. Rock core was placed in sequence into wooden core boxes, notated, and stored at the Site for review by a senior geological engineer. Field descriptions included stratigraphy, percent recovery and rock quality designation (RQD). Following advancement of the HQ diamond drill bit, the borehole was over-drilled with a polycrystalline diamond compact (PDC) drill bit (133 mm outer diameter) to aid in the installation of the monitoring well materials. The subsequent, shallower boreholes at each borehole location were advanced using the PDC drill bit.

A.3.1 Bedrock Core Logging

A WSP senior geological engineer provided guidance throughout the borehole drilling and completed detailed logging of the rock core samples. In particular, the WSP senior geological engineer logged changes in the rock formations and probable zones of groundwater flow. Finalized borehole logs are provided in **Appendix B**.

A.3.2 Geophysical Borehole Logging

Geophysical logging was completed by ClearView Geophysics Inc. (ClearView) of Brampton, ON. Geophysical logging was completed at BH75 on December 5 and 6, 2024 and at BH76, BH77 and BH78 from February 14 through 17, 2025, using the following geophysical survey probes:

- 2PCA-1000 Three-Arm PolyCaliper Probe,
- 40LGR-1000 Lithology Gamma, Resistance (SPR) & Spontaneous Potential (SP) Probe,
- 2PIA-1000 Poly Induction Probe,
- QL40-FTC Fluid Temperature & Conductivity Probe, and
- QL40-OBI-2G Optical Televiewer Probe.

The geophysical logging was completed in the open boreholes prior to installation of the monitoring wells. A geophysicist from ClearView analyzed the data and provided analytical reports and geophysical borehole logs for the surveyed boreholes. Geophysical reports and logs are provided in **Appendix C**.

A.3.3 Monitoring Well Installation

Monitoring wells were constructed of 51 mm diameter PVC riser pipe and a 10 slot (0.25 mm) well screen of varying lengths to accommodate the interval screened. The borehole annulus around the screen was filled with number 2 silica sand to a nominal height above the screen to provide a filter pack. The remainder of the borehole annulus was sealed with bentonite pellets and / or grout. A lockable protective steel casing lid was secured to the steel casing. Cluster MECP well records were submitted for the separate borehole locations.

The monitoring wells were surveyed by Walker to establish ground surface and top of pipe elevations to a geodetic datum and UTM location coordinates. The elevation data is provided in **Table B-1, Appendix B**.

A.3.4 Well Development

Following well installation, dedicated inertial lift sampling equipment (Waterra) was installed and the wells were developed (i.e., purged) to set the filter pack and remove drilling fluid from the well. A minimum of three (3) well volumes were purged using the methodology summarized below. During development, field parameters were measured and recorded in the project field book for each well volume removed. Development was continued until visible signs of drilling fluid were not apparent and / or stable field parameter measurements were obtained.

A.4 HYDRAULIC TESTING PROGRAM

Multiple standard methods were used to perform the hydraulic conductivity testing for this study, as summarized below. The results of the testing program are provided in **Appendix D**.

A.4.1 Packer Tests

A total of seven (7) monitoring well nests were analyzed using the Lugeon packer testing method (Houlsby, November 1976) during advancement of the deep '1' series boreholes to assess the hydraulic conductivity along the depth of the borehole at 3 m (10') intervals.

A Lugeon packer test is an in situ constant head injection test used to estimate rock mass permeability over a short, isolated interval of an open borehole. Results are expressed in Lugeon (Lu) units (1 Lu ≈ 1.3x10-7 m/s) and commonly treated as an estimate of bulk horizontal hydraulic conductivity of the rock mass over that interval. Following completion of the borehole, a pneumatic straddle packer was lowered to the test interval and inflated to a pressure of 690 kPa (100 PSI) to seal the interval. Potable water was then injected at controlled but varying pressures over 5-minute time intervals, with the injection flow rate recorded for each minute during the test. Test pressures were monitored using a pressure gauge, while the flow rate was monitored using a totalizer.

The tests consisted of five pressure intervals, ascending during the first three intervals and descending during the final two intervals. A maximum pressure (i.e., P_{max}) of 414 kPa (60 PSI) was adopted to reduce potential hydrofracking of the bedrock formation. For shallower Lockport Formation test intervals where the permeability was anticipated to be relatively high, the Pmax was reduced to 276 kPa (40 PSI) to limit the flow volumes required to complete the test.

Average Lugeon values were computed for the five pressure intervals, and the pattern of the results was used to interpret the appropriate representative permeability for the test interval following guidance provided by (Houlsby, November 1976). A total of fifty-nine (59) packer tests were completed as part of this study.

A.4.2 Single Well Response Tests

In-situ single well response hydraulic conductivity (slug) tests have been completed at the twenty-nine (29) newly installed monitoring wells distributed around the SSA to confirm the hydraulic conductivity in the various bedrock units.

A slug test is a single well hydraulic test used to estimate the horizontal hydraulic conductivity of the geologic material adjacent to a well screen (Butler Jr., 2020). The test involves imposing a rapid, near instantaneous change in water level within a well and observing the subsequent recovery toward equilibrium over time. Because the stress is localized and short term, the response reflects conditions in a relatively small volume of formation surrounding the well.

For wells where the static water level was substantially above the well screen interval, rising-head tests were used where a volume of water was removed from the well and allowed to recover (i.e., rise) to static conditions. Where the static water level was relatively low, falling-head tests were used where a volume of water was added to the well and allowed to fall to static conditions. Very fast recoveries were noted at some wells, and in these cases the well was re-tested by rapidly lowering a slug of known volume into the well to induce a response. In all cases, consideration of when the water level crossed the transition from well screen to riser pipe was incorporated into the analysis of the data (i.e., the test interpretation was completed either before or after the transition, not across it).

Water level monitoring during the tests was accomplished using both manual and automated methods. Prior to the start of the tests, the Van Essen Diver data loggers equipped in each well were set to record water levels at appropriate time intervals. The pre-test static water level in the well was then confirmed using a manual water level measurement tape using the methodology below, and the time of measurement noted to align with the logger data. Displacement of the water level was then induced using one of the methods noted above, with the test time t=0 commencing immediately afterwards. Additional manual water level measurements were obtained periodically during the test to augment the logger data. All data was recorded in the project field book.

The recorded recovery curve (i.e., water level displacement versus time) was then interpreted using the Hvorslev analytical method that accounts for aquifer conditions, well construction, and test geometry.

A.5 BASELINE GROUNDWATER MONITORING PROGRAM

A.5.1 Water Level Monitoring

Continuous groundwater level monitoring using dataloggers installed at all twenty-nine (29) monitoring wells installed as part of the drilling program and three (3) private wells around the Site. The well locations are shown on the **Site Plan**, **Figure 4-1**. Loggers were programmed to collect data every six (6) hours. A barometric logger was installed to correct for atmospheric pressure changes over time.

Periodic manual water level measurements at each monitoring well and private well were made over the course of the baseline monitoring period, generally occurring on a quarterly basis and / or prior to sampling events. The manual measurements were used to confirm the datalogger water levels. The datalogger and manual water level measurements are depicted in the hydrographs included in **Appendix E**. Water level data notably affected by hydraulic testing are not included on the hydrographs for clarity.

Manual measurements of groundwater levels were made using a calibrated electronic water level meter with a stainless-steel probe and graduated cable to the nearest 0.01 m. The water level meter was decontaminated prior to use in accordance with the procedures below. During each measurement:

- Well protective casing, riser pipe and surface seals were inspected for integrity.
- The water level tape was turned on and tested for audibility.
- The water level tape probe was lowered down the well until the meter sounded. Contact with the water level was verified three times.
- The level where the meter intersects the highest point on the well riser pipe was recorded in the field data collection smart phone app and in the dedicated field book.

- The measured level was checked against historical values (where available) to assess consistency/accuracy in the readings.
- The probe was then decontaminated before continued use following the procedures below.

A.5.2 Well Purging

The intent of purging (removing standing water in a well prior to sampling) is to ensure that the water sample collected from the well is representative of the natural formation. Purging was accomplished using dedicated sampling equipment for each well following the methodology listed below.

- The protective well cover was unlocked and the PVC cap was carefully removed to avoid the introduction of any foreign material into the well.
- The water level was measured in accordance with procedures above.
- The standing well volume was calculated using the field data collection smart phone app or as noted on the Purge and Sampling sheet in the dedicated field book.
- Purging was completed via either of the following dedicated equipment types and continued until three (3) well volumes had been removed or the well was dried out twice. In some cases, slow recovering wells were sampled directly without purging to ensure sufficient sample volume.
  - Bailer - bottom filling Teflon (for low-yield or deep wells)
  - Inertial lift pump (Waterra tubing and foot valve)
- Purge water was collected into a graduated container to track volumes. The required field parameters were measured following each well volume purged in accordance with procedures below. Well volumes removed and field parameters were recorded using the field data collection app and in the dedicated field book, along with appearance and odour.

A.5.3 Measurement of Field Parameters

Accurate field measurements for parameters including pH, conductivity, temperature and dissolved oxygen were obtained using the methodology listed below. Where possible, water samples were kept out of direct sunlight while measuring field parameters.

- All field equipment and instruments were checked to ensure proper functioning prior to use in field.
- Equipment was calibrated according to the manufacturer's specifications before use each day. Occasional confirmatory calibration was completed throughout the day. Calibration results were recorded in the dedicated field book.
- The instrument probe was lowered into the water sample to the appropriate depth as described by the manufacturer.
- The probe reading was allowed to stabilize before recording the value in the field data collection app and the dedicated field book.
- The instrument probe was decontaminated as necessary in accordance with procedures below.

A.5.4 Groundwater Sampling

Four (4) groundwater sampling events were completed during the baseline monitoring period, occurring in June 2025, September 2025, December 2025 and March 2026. It is noted that monitoring wells 76-3, 77-1 and 77-3 were sampled once due to the slow recovery of the water level within the monitoring well. In addition, a total of nineteen (19) existing wells were included in this study's groundwater sampling events by adding additional parameters to the routine monitoring programs undertaken at the Campus. The groundwater chemical results are included in **Appendix G**.

The following procedures were used when obtaining the groundwater samples:

- Sampling was commenced as quickly after purging as practical.
- Samples were prioritized according to sensitivity to volatilization. Where possible, the order of sampling was as follows:
  - VOCs,
  - dissolved metals, and
  - general chemistry.
- When sampling VOCs, laminar flow was ensured when filling the sample vials. The vial was filled such that a reverse meniscus formed at the mouth. After screwing on the cap, the vial was inverted to ensure no headspace was present.
- For dissolved metals, DOC and mercury, the sample was field-filtered prior to the addition of preservative, as follows:
  - Field filtration of groundwater samples was completed using a disposable 0.45 micron in-line (Waterra) filter.
  - The filter was removed from the protective wrapping and attached to the dedicated sampling equipment, ensuring the correct direction of flow.
  - For low-yield wells, it was occasionally necessary to decant the sample water from the general chemistry bottle before filtering. In such cases, a small length of unused or decontaminated Waterra tubing was attached to the filter for sampling.
  - Up to one litre of sample water was slowly pumped through the filter unit and discharged directly into the laboratory-prepared bottle.
  - The used filter was detached from the sampling equipment and discarded appropriately.
- The sampling information (date/time, ambient conditions, number of bottles, filtered samples, etc.) was recorded using the field data collection app and in the dedicated field book.
- The sample bottles were placed in laboratory-provided Ziploc bags and placed in an ice-filled cooler stored in the field vehicle out of direct sunlight.

All samples were submitted under standard chain-of-custody procedures to Bureau Veritas of Mississauga, Ontario, for analysis of the comprehensive list for groundwater and leachate included as Schedule 5 of Landfill Sites O. Reg. 232/98 under the Environmental Protection Act, R.S.O. 1990.

For quality assurance / quality control (QA / QC) purposes, blind duplicate samples were collected for every ± 10 samples and given pseudo names to avoid potential laboratory bias. For VOC sampling, a trip blank was prepared by the lab for transport to the field during the event and returned unopened upon completion.

A.5.5 Equipment Decontamination Procedures

Equipment decontamination procedures were used for water sampling equipment or any other equipment used when completing field activities in order to eliminate potential contamination between wells.

- Equipment was thoroughly washed with Liqui-Nox™ (or equivalent) detergent and distilled or de-ionized water, using a brush to remove any particulate matter or surface film when observed.
- Equipment was rinsed thoroughly three times with distilled or de-ionized water and allowed to air dry, or dried with clean paper towel.
- Sampling equipment decontamination was completed after each sample was collected and placed into the proper storage containers when not in use.
- Protective equipment was discarded accordingly based on level of contamination.

A.6 PRIVATE WELL SURVEY

To confirm the local groundwater users within the LSA, a search of the MECP Water Well Record database was undertaken to identify well records located outside of the existing service areas (per Niagara Region 2016 Master Servicing Plan). A water well survey of this area was conducted by WSP staff in 2025 in accordance with the MECP technical guidance (MECP, April 2008).

Attempts were made to deliver surveys to fourteen (14) parcels with a municipal address that were identified within the LSA. This total does not include other lands owned by WAI. Parcels which either did not have a mailbox / residence associated with them and were not accessible or were vacant could not be surveyed. It is noted that eight of the surveyed properties have known private wells which are currently or have historically been part of the on-going routine monitoring program for the Southeast Quarry.

At least two attempts at contact were made during the door-to-door survey: once during daytime hours, and a follow-up attempt during evening or weekend hours, where no response was received during the first attempt. If no contact had been established by the second attempt, a pre-stamped return envelope and survey package was left in the mailbox. The results of the private well survey are included in **Appendix F**.

Based on well owner permission, logger installation was performed on the following private wells:

- 3457 / 3551 / 3557 Thorold Townline Road (Niagara Region Thorold Works Yard) to the west of the Campus;
- 2155 Garner Road (Res13) northeast of the Campus; and
- 8865 Mountain Road (Gauld Nurseries Ltd.) (Res14) northeast of the Campus.

REFERENCES

Butler Jr., J. (2020). *The Design, Performance, and Analysis of Slug Tests, 2nd Ed.* Boca Raton, FL: CRC Press, Taylor & Francis Group.

Houlsby, A. C. (November 1976). Routine Interpretation of the Lugeon Water Test. *The Quarterly Journal of Engineering Geology*, 303-313.

MECP. (April 2008). *Technical guidance document for hydrogeological studies in support of Category 3 applications for Permit to take Water.* Ministry of the Environment.

APPENDIX B

Borehole Logs and Monitor Construction Details

GRAPHICS, SYMBOLS AND ABBREVIATIONS ON LOGS

SAMPLE TYPES and TESTS

SS	Split Spoon Sample		
SN	Non-Standard Split Spoon Sample		
ST	Shelby Tube Sample : (unconfined compression or unconsolidated undrained test)	-	◆
DS	Denision Type Sample		
PS	Piston Type Sample		
CS	Continuous Sample		
GS	Grab Sample		
WS	Wash Sample		
BQ	BQ Core Sample		
HQ	HQ Core Sample		
NQ	NQ Core Sample		
DT	Dynamic Penetration Test		
VT	Field Vane Test (undisturbed)	-	⊙
VT	Field Vane Test (remoulded)	-	⊕

PENETRATION RESISTANCES

Standard Penetration Resistance(N Value)

The number of blows by a 63.6 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) Split Spoon Sampler for a distance of 300 mm (12 in.).

ABBREVIATIONS

DTPL: Drier Than Plastic Limit
APL: About Plastic Limit
WTPL: Wetter Than Plasic Limit
K: Hydraulic Conductivity (m/s)
C_u: Undrained Shear Strength (kPa)
% REC : Percentage of Sample Recovered
% RQD : Indirect Measure of the Number of Fractures and Soundness of Rock Mass
▼ Approximate Water Table

GRAIN SIZE CLASSIFICATION

	%
trace, "eg. trace sand"	1 - 10
some, "eg. some sand"	10 - 20
adjective, "eg. sandy"	20 - 35
and, "eg. and sand"	35 - 50
noun, "eg. sand"	>50

Note: Classification Divisions Based on Modified M.I.T. Grain Size Scale

SOIL DESCRIPTIONS

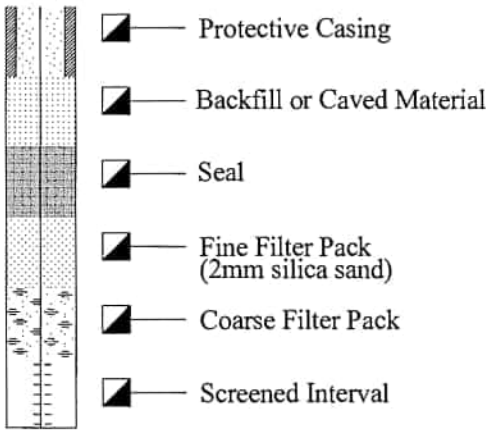
Cohesionless Soils

Relative Density	N Value
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	over 50

Cohesive Soils

Consistency	C_u(kPa)	N Value
Very soft	0 to 12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	over 200	over 30

MONITOR DETAILS



Gartner Lee Limited

BOREHOLE NO. 1

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit)
PROJECT NO.
CLIENT Walker Brothers Quarries Limited
DATE Nov. 23, 1976
BOREHOLE TYPE 3¼' I.D. Hollow Stem Augers and NX Rock Core
GEOLOGIST G.W.J.
ELEVATION 596.7' asl
TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT.	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0'		Lacustrine Clayey Silt Brown stratified clayey silt odd grits, rust fissures D.T.P.L.						
			SS	37	18			
17.0		Calcitic Dolomite to Dolomite Light to dark grey; massively bedded; fossiliferous, well jointed 17.0'-26.5' and 45.0'-51.0'; porous and vuggy 22.0'-42.5					▲	Refusal to augers at 17.0'
			NX			100		
			NX			100	▲	
			NX			100		
			NX			100		
			NX			100		
			NX			100		
51.0			NX			100	●	Discontinuity at 51.0'
		Shale Dark grey thinly bedded; calcite seams 56.0'-59.0' and 79.0'-83.7'; porous from 79.0'-83.7'	NX			100		
			NX			100		
			NX			100		
			NX			100		
			NX			100		
			NX			93		
			NX			100		
83.7			NX			100	●	
		Borehole terminated at 83.7' in shale.						

BOREHOLE NO. 2

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO. ____

CLIENT Walker Brothers Quarries Limited DATE Nov. 23, 1976

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers and NX Rock Core GEOLOGIST G.W.J.

ELEVATION 599.1' asl. TECHNOLOGIST ____

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT.	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0'		Lacustrine Clayey Silt Brown stratified clayey silt odd grits add rust fissures DTPL	SS	27	16			
		Becoming silter with clay lenses and sturated	SS	14	11		▲	
29.8								Refusal to augers at 29.8'
		Calcitic Dolomite to Dolomite Light to dark grey; massively bedded; fossiliferous, joints 32.0'-36.0' and 41.5'-46.0'; minor shale partings throughout	NX			95		
			NX			94	▲	
							●	
			NX			96		
61.0			NX			97		Discontinuity at 61.0'
		Shale Dark grey, thinly bedded; calcareous and porous zone at 68.0' and 87.5'-91.3'.	NX			100		
			NX			100		
			NX			96		

BOREHOLE NO. 2 continued

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO.

CLIENT Walker Brothers Quarries Limited DATE Nov. 23, 1976

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers and NX Rock Core GEOLOGIST G.W.J.

ELEVATION 599.1' asl. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
		Borehole terminated at 91.3' in shale.						

BOREHOLE NO. 3

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO.

CLIENT Walker Brothers Quarries Limited DATE Dec. 2, 1976

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers and NX Rock Core GEOLOGIST G.W.J.

ELEVATION 589.9' asl. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0'								
		Till Brown silt till, fractured, moist						
7'			SS	32	14			
		Lacustrine Clayey Silt Brown clayey silt with odd grits, rust fissures and pockets of very fine sand and silt, DTPL becoming grey and WTPL from 18±	SS	45	15			
			SS	45	14			
23'			SS	8	27			
25.5		Till: Brown silt till, saturated	SS	20/6	9		▲	Refusal to augers at 25.5'
		Calcitic Dolomite to Dolomite Light to dark grey; massively bedded; fossiliferous; well jointed and vuggy 25.5'-40.5'	NX			56		
			NX			94		
			NX			95		
49.3							▲ ●	Discontinuity at 49.3'
		Shale Very dark grey; thinly bedded; porous zone at 78.0'	NX			-		
			NX			-		
			NX			-		
79.5							●	
		Borehole terminated at 79.5' in shale.						

BOREHOLE LOG

PROJECT: 96-105

BOREHOLE: 3-V 1 of 1

WEST QUARRY LANDFILL SITE
Thorold, Ontario
FOR: Niagara Waste Systems Limited

DATE: 26 March 1996
GEOLOGIST YS
ELEVATION 180.75 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
		CLAYEY SILT Brown clayey silt, trace sand, very stiff, DTPL										
1												
2				1		SS	24		100			
2.6		**SANDY SILT TILL** Brown sandy silt till, trace gravel, localized reddish staining, dark grey fracture faces, compact to dense, moist becoming wet with depth										
3				2		SS	27		100			
4												
5				3		SS	38		100			
5.6												
6		**SILTY CLAY** Brown silty clay, stiff, WTPL										
7.2	7			4		SS	13		100			
		SILT TILL										
8.1	8	Brown silt till, trace clay and gravel, dense, saturated		5		SS	34		100			
		Borehole terminated at 8.08 m at the assumed bedrock surface										

Printed: 23 SEP 98

Gartner Lee Limited

BOREHOLE NO. 4

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO.

CLIENT Walker Brothers Quarries Limited DATE Dec. 8, 1976

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers and NX Rock Core GEOLOGIST G.W.J.

ELEVATION 591.0' asl. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/F	SAMPLE M/C	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.0								
		Till Brown, silt till, moist						
7'			SS	55	11			
		Lacustrine Clayey Silt Brown clayey silt, odd grits, random very fine sand seams, fractured, rust fissures DTPL						
			SS	55	12			
			SS	22	12			
		Becoming grey and WTPL from 25'±						
33'			SS	15	25		▲	
		Till Brown silt till, stony, saturated.	SS	77/9	4			
36.5			NX			94		Refusal to augers at 36.5'
		Cacitic Dolomite to Dolomite Light to dark grey; massively bedded; fossiliferous; well jointed 36.5'-40.0' and 45.5'-51.3'.	NX			99		
51.3							●	Discontinuity at 51.3'
		Shale Dark grey; thinly bedded; calcareous zone 51.3'-56.0' and 78.0'-83.0'; porous 78.0'-83.0'.	NX			99		
			NX			100		
			NX			99		
			NX			98	●	
85.0		Borehole terminated at 85.0'						

BOREHOLE NO. 5

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO. _____

CLIENT Walker Brothers Quarries Limited DATE Dec. 10, 1976

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers and NX Rock Core GEOLOGIST G.W.J.

ELEVATION 577.1' asl. TECHNOLOGIST _____

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.0		**Till** Brown silt till, rust fissures, fractured, moist numerous fine sand seams around 10'±.	SS	60	9			
			SS	43	10			
			SS	43	9		▲	Refusal to augers at 17.7'
17.7		**Calcitic Dolomite to Dolomite** Light to dark grey, massively bedded; fossiliferous; jointed and porous zone 22.0'-24.0'	NX			100		
			NX			100		
							●	
32.0		**Shale** Dark Grey; thinly bedded; calcareous, fossiliferous and porous zones 40.0'-41.0', 49.5'-51.0' and 60.5'-64.0'.	NX			98		Discontinuity at 32.0'
			NX			96		
			NX			100		
			NX			96		
							●	
65.3		Borehole terminated at 65.3' in shale.						

BOREHOLE NO. 6

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO.

CLIENT Walker Brothers Quarries Limited DATE Dec. 15, 1976

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers and NX Rock Core GEOLOGIST G.W.J.

ELEVATION 594.0' asl. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.0'								
		Fill Mixed brown and dark brown silt till and clayey silt fill moist	SS	21	12			
12'			SS	27	23			
		Till Brown silt till, rust fissures, fractured moist	SS	50	11			
18.5'			NX			98	▲	Refusal to augers at 18.5'
		Calcitic Dolomite to Dolomite Light grey; massively bedded; fossiliferous; jointed porous zones 31.5'-35.0' and 41.0'-42.5'	NX			91		
			NX			82		Discontinuity at 42.5'
42.5'							●	
		Shale Dark grey; thinly bedded; fossiliferous; jointed and porous 71.0'-74.0' and 77.0' to 81.5'	NX			95		
			NX			95		
			NX			99		
							●	
			NX			95		
			NX			100		
84.0'		Borehole terminated at 84.0' in shale						

BOREHOLE NO. 7

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO.

CLIENT Walker Brothers Quarries Limited DATE Dec. 16, 1976

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers and NX Rock Core GEOLOGIST G.W.J.

ELEVATION 603.2' asl. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.0'								
		Fill - Mottled brown clayey silt fill, moist.						
7'			SS	23	18			
		Till - Brown silt till, odd seams of silt and clayey silt wet to saturated						
			SS	24	15			
			SS	22	15			
			SS	15	25			
39.5			AS	-	22		▲	Refusal to augers at 39.5'
		Calcitic Dolomite to Dolomite Light to dark grey; massively bedded; well jointed 41.0'-44.5' and 47.5'-49.0'	NX			99	●	
50.7		Shale Dark grey; thinly bedded; calcareous, fossiliferous and gypsum nodules in some sections; jointed 67.0'-60.5'; gypsum filled joints 78.8'-83.0'	NX			100		Discontinuity at 50.7'
			NX			95		
			NX			99		
			NX			97		
		Borehole terminated at 89.5' in					●	

BOREHOLE NO. 8

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO.

CLIENT Walker Brothers Quarries Limited DATE Jan. 3, 1977

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers and NX Rock Core GEOLOGIST G.W.J.

ELEVATION 545.0' asl. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.0		Fill					▲	Refusal to augers at 4.5'
4.5		Shale Dark grey; thinly bedded; gypsum and fossiliferous calcareous zones; thin gypsum filled joints 8.5'-10.0' and 24.5'-31.0'	NX			90		
			NX			87		
			NX			88		
			NX			84		
			NX			85		
31.0		Borehole terminated at 31.0' in shale.					●	

BOREHOLE NO. 9

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO.

CLIENT Walker Brothers Quarries Limited DATE Dec. 23, 1976.

BOREHOLE TYPE NX Rock Core GEOLOGIST G.W.J.

ELEVATION 538.4' asl. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.0		Shale Dark to very dark grey; thinly bedded; some gypsum nodules and fossiliferous calcareous zones; well jointed 6.9'-7.1'; gypsum filled joints 15.2'-30.6'	NX			98	▲	
			NX			97		
			NX			93		
			NX			66	●	
31.0		Borehole terminated 31.0' in shale						

BOREHOLE NO. 10

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO. ____

CLIENT Walker Brothers Quarries Limited DATE Jan. 4, 1977

BOREHOLE TYPE NX Rock Core GEOLOGIST G.W.J.

ELEVATION 556.0' asl. TECHNOLOGIST ____

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.0		Fill Brown silt fill-pockets of fine sand and silt, frequency increasing with depth moist to wet					▲	Refusal to augers at 19.0'
19.0			NX			84		
		Shale Dark grey; thinly bedded; fossiliferous, calcareous zone with thin gypsum filled joints from 39.8'-44.0'	NX			92		
			NX			100		
44.0							●	
		Borehole terminated at 44.0' in shale.						

BOREHOLE NO. 11

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO. ____

CLIENT Walker Brothers Quarries Limited DATE Jan. 5, 1977

BOREHOLE TYPE NX Rock Core GEOLOGIST G.W.J.

ELEVATION 546.6' asl. TECHNOLOGIST ____

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.0		Fill Broken stone fill					▲	Refusal to augers at 14.5'
14.5		Shale Dark grey; thinly bedded; fossiliferous, calcareous zone with thin gypsum filled joints 29.8'-36.4'.	NX			87		
			NX			91		
			NX			84	●	
37.5		Borehole terminated at 37.5' in shale.						

BOREHOLE NO. 11A

PROJECT NAME WALKER BROS. QUARRY LANDFILL SITE (WEST PIT) — PROJECT NO.

CLIENT WALKER BROS. QUARRIES LIMITED — DATE FEB. 15, 1978

BOREHOLE TYPE 3¼" I.D. HOLLOW STEM AUGERS, NX ROCK CORE — GEOLOGIST A.B.

ELEVATION 545.5' — TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	SAMPLE BLOWS/FT.	SAMPLE % WATER	GROUND WATER	REMARKS
0.0								
		FILL Brown Stony clayey silt fill turning to grey at 13.0' and W.T.P.L. at 14.0'					▲	
16.5								
		SHALE Dark grey, aphanitic crystalline massive bedded platy shale very fossiliferous from 29.8' to 38.0'.	NX			100		refusal to augers at 19.0' shale highly fractured to ± 24.0'
			NX			100		
38.0							●	
		Borehole terminated at 38.0' in shale.						

BOREHOLE NO. 12

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO. ____

CLIENT Walker Brothers Quarries Limited DATE Dec. 22, 1976

BOREHOLE TYPE NX Rock Core GEOLOGIST G.W.J.

ELEVATION 552.9' asl. TECHNOLOGIST ____

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.0'								
		Fill Reddish-brown clayey silt, fill, stony						
14.0'								Refusal to augers at 14.0'
		Shale Dark to very dark; thinly bedded; calcareous zone 31.2'-44.0'; fossiliferous 43.5'-44.0'	NX			38	▲	
			NX			90		
			NX			78		
			NX			99		
44.0'							●	
		Borehole terminated at 44.0' in shale.						

BOREHOLE NO. 13

PROJECT NAME Walker Brothers Quarry Landfill Site (West Pit) PROJECT NO.

CLIENT Walker Brothers Quarries Limited DATE Jan. 7, 1977

BOREHOLE TYPE 3¼" I.D. Hollow Stem Auger GEOLOGIST G.W.J.

ELEVATION 579.3' asl. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.0'								
		Fill Brown mixed silt and clay silt fill						
8.0		Garbage Black, mostly wood waste, moist						Methane gas noted. Strong odour of hydrogen sulphide
34.5'		Borehole terminated at 34.5' on assumed bedrock.					▲	Refusal to augers at 34.5'

BOREHOLE NO. 14

PROJECT NAME Walker Brothers Quarry Landfill Site(East Quarry) PROJECT NO. 77-61

CLIENT Walker Brothers Quarries Limited DATE July 4-5 1977

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers, NX Rock Core 3" Tricone GEOLOGIST A.B.

ELEVATION 592.3 Ft. ASL TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0								
0.4		Topsoil						
		Lacustrine Clayey Silt Mixed grey and brown clayey silt with lenses of fine sandy silt-odd stone and pebble - A.P.L. desiccated and fractured to ±15' changing to grey at ±10' and WTPL at ±17'. Increased clay content from ±25' stiff to very stiff	SS	22	23			
			SS	14	19			Sample 14.2'-15.7' Sand - 3% Silt 66% Clay 31%
			SS	14	25			
			SS	10	26		▲	
29.8		Sand and gravel						
30.0		Dolomite Medium grey, medium to coarse crystalline, medium bedded dolomite fossiliferous in zones dense	NX			100	▲	Refusal to auger at 30.0'
			NX			96		
47.4			NX			100	●	
		Dolomite Medium to dark grey, aphanitic crystalline thick bedded fractured dolomite vugs from 59.1-59.6'	NX			100		
63.2								
		Shale Dark grey aphanitic crystalline, massive bedded platy shale fossiliferous in zones	NX			100		
			NX			100		
							●	
			NX			100		

BOREHOLE NO. 15

PROJECT NAME Walker Brothers Quarry Landfill Site(East Quarry) PROJECT NO. 77-61

CLIENT Walker-Brothers Quarries Limited DATE July 5-6, 1977

BOREHOLE TYPE 3¼" I.D. Hollow Stem augers, NX Rock Core, 4" Tricone GEOLOGIST A.B.

ELEVATION 572.1 Ft. ASL TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0								
0.7		Topsoil						
		Lacustrine Clayey Silt Medium brown clayey silt-odd grit, desiccated to ±10' D.T.P.L. changing to grey clayey silt, W.T.P.L. at ±10' hard becoming firm with depth	SS	38	14			
			SS	5	25			
17.3								
18.0		Boulders=bowlders with sand and gravel saturated	NX			100	▲	refusal to augers at 18.0'
			NX			100		
		Dolomite Medium grey, medium crystalline, medium to thick bedded dolomite very fossiliferous porous some vugs	NX			100		
			NX			100	▲	
44.1							●	
		Dolomite Dark grey, aphanitic, crystalline medium bedded fractured dolomite uniform, dense	NX			100		
53.8								
		Shale Dark grey, aphanitic crystalline massive bedded platy shale	NX			98		
			NX			100		
			NX			100		
85.0							●	
		Borehole terminated at 85.0' in shale						

LOG OF BOREHOLE 15-1R

project | Walker Landfills
project no. | 131-22826-01
client | Walker Environmental Group
rig type | CME 75, track-mounted
date started | 2015/09/24
location | East Landfill Site
method | Hollow stem augers, 215 mm dia.
supervisor | LG
position |
coring | HQ core, OD=96mm, ID=64mm
reviewer | KJF

Elev / Depth (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
175.6	**GROUND SURFACE**			
175.2 / 0.4	Grey brown **GRAVEL FILL**, some sand, some silt, DTPL, very stiff.	1	SS	22
	Grey brown with orange mottling, becoming grey brown at 3m, becoming reddish grey brown at 6.1m **CLAYEY SILT TILL**, occasional to trace sand, occasional to trace gravel, DTPL becoming WTPL at 6.1m, stiff to very stiff becoming firm at 6.1m.	2	SS	13
		3	SS	26
		4	SS	13
168.7		5	SS	5
6.9	Light bluish grey fossiliferous Lockport Formation **DOLOSTONE**, with subtle grey banding, medium to coarse grained, medium to thin bedded, finely crystalline. 2% vugs up to 1 mm. Hard strong smooth core scratched with difficulty with a knife. Generally fresh appearance with broken core recovered to 7.6 m. Trace thin stylolytes, 1 to 2 per 2 metres. Becoming noticeably darker in colour, less fossiliferous and finer grained below 14.2 m. Good to excellent RQD.	R1		TCR = **118%** RQD = **85%**
		R2		TCR = **100%** RQD = **96%**
		R3		TCR = **100%** RQD = **100%**
		R4		TCR = **100%** RQD = **100%**
	Sharp lower contact below thin greenish grey glauconitic bed.	R5		TCR = **100%** RQD = **97%**
160.8		R6		TCR = **100%** RQD = **78%**
14.8	Medium grey argillaceous Decew Formation **DOLOSTONE**, dull appearance, wavy bedding, good to excellent RQD, scratched by knife, barren, minor pyrite at 17.8 m. Minor thin (<1mm) white gypsum seams. Gradational lower contact.	R7		TCR = **104%** RQD = **81%**
157.9		R8		TCR = **98%** RQD = **92%**
17.7	Dark grey to black Rochester Formation **DOLOMITIC SHALE**, fine grained, thinly bedded, scratched easily with a knife. Trace fossils. Thin white gypsum partings 1 to 2 mm thick typically 1 per 0.3 m. Fair to excellent RQD. Lighter grey fossiliferous and calcareous beds 0.1 m to 0.3 m thick below 23.3 m representing 50% of recovered core.	R9		TCR = **100%** RQD = **92%**
		R10		TCR = **100%** RQD = **100%**
		R11		TCR = **100%** RQD = **94%**
		R12		TCR = **100%** RQD = **67%**
		R13		TCR = **100%** RQD = **86%**
148.2		R14		TCR = **100%** RQD = **100%**
27.4	**END OF BOREHOLE**			

Unstabilized water level at 18.6 m below ground surface; borehole was open upon completion.

Penetration Test Values (Blows / 0.3m) — Dynamic Cone: 10, 20, 30, 40
Undrained Shear Strength (kPa) — Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40, 80, 120, 160
Water Content (%) & Plasticity — PL, MC, LL: 10, 20, 30; Water level on completion

Gasport and Goat Island members not positively distinguished from core.

Thin muddy infilling of fractures at 8.5 m, 14.2 m

WATER LEVEL MONITORING

Date	Depth (m)	Elevation (m)
Sep 25, 2015	18.6	157.0

library: genivar - library.glb report: gen log v1 file: walker landfill ver1.gpj

BOREHOLE LOG

PROJECT: 91-108

BOREHOLE: 15-V 1 of 2

Niagara Waste Systems Hydrogeologic Investigation
Thorold, Ontario
FOR: Niagara Waste Systems Limited

DATE: 20 June 1991
GEOLOGIST KTH
ELEVATION 175.74 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	N VALUE	% WATER	% REC	% RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
0.5		**FILL** Light grey sandy fine gravel, moist, loose.	V	1		SS	9	4	70			
1		**CLAYEY SILT** Medium brown clayey silt, some fine sand, weakly laminated, trace fine gravel, DTPL, stiff to very stiff. -Dark brown from about 0.5 to 1.3 m. -Numerous rusty brown sandy silt nodules with black organic matter between about 1.8 to 2.0 m. -Blue to rust coloured mottled appearance from about 2.1 to 2.5 m. -Numerous vertical fractures lined with blue clay below about 2.5 m. -Becomes WTPL below about 3.8 m.		2		SS	10	24	67			
2				3		SS	17	17	83			
3				4		SS	16	17	96			
				5		SS	16	16	87			
4				6		SS	12	25	91			
5				7		SS	9	25	100			
5.5		**CLAYEY SILT TILL** Reddish brown clayey silt, some fine sand to fine gravel, subangular to subrounded, WTPL, very stiff. -Becomes a sandy gravel at about 6.4 m.										
6												
6.7				8		SS	28	9	91			
7		**DOLOSTONE**(Lockport Formation - Goat Island Member) Medium grey fine to medium crystalline medium to thick bedded dolostone, argillaceous, highly fossiliferous, occasional shaly stringers and stylolites. -Light grey to buff, very fine crystalline, medium to thick bedded siliceous dolostone, slightly porous, moderately fossiliferous, trace occurences of chert nodules from about 8.4 to 9.1 m.		1		HQ			98	96		
8				2		HQ			97	90		
9.1				3		HQ			100	100		
10		**DOLOSTONE** (Gasport Member) Light grey, fine crystalline, thick to massive bedded dolostone, highly porous, moderately fossiliferous, occasional stylolites, locally vuggy.										
11				4		HQ			100	100		
12												
				5		HQ			100	100		
13												
14		-Becomes grey with pink fossils and dense below about 13.5 m.		6		HQ			100	82		
14.6												
15		**DOLOSTONE** (DeCew Formation) Dark grey very fine crystalline thick bedded argillaceous dolostone, dense, occasional shaly stringers, locally vuggy.		7		HQ			100	65		

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 91-108

BOREHOLE: 15-V 2 of 2

Niagara Waste Systems Hydrogeologic Investigation
Thorold, Ontario
FOR: Niagara Waste Systems Limited

DATE: 20 June 1991
GEOLOGIST KTH
ELEVATION 175.74 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
17			V	8		HQ			100	83		
17.8		-Lower contact marked by pyrite nodules, indistinct.										
18		SHALE (Rochester Formation) Dark grey interlaminated to interbedded calcareous shale and argillaceous dolostone.		9		HQ			100	82		
19												
19.4		Borehole terminated at 19.36 m in shale.										

Printed: 14 SEP 98

Gartner Lee Limited

BOREHOLE NO. 16

PROJECT NAME Walker Brothers Quarry Landfill Site (East Quarry) PROJECT NO. 77-61

CLIENT Walker Brothers Quarries Limited DATE July 12, 13, 1977

BOREHOLE TYPE 3¼" Hollow stem augers, NX Rock Core, 4" Tricone GEOLOGIST A.B.

ELEVATION 581.0 Ft. ASL 177 m TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0		Topsoil						
0.6		Lacustrine Clayey Silt						
1.4		Mixed grey and brown clayey silt, desiccated A.P.L.	SS	29	21			Sample 4.6'-6-1'
		changing to brownish grey with grey and reddish streaks, W.T.P.L. at ±10' very stiff becoming softer with depth						Sand 1%
10								Silt 61%
10.5								Clay 38%
			SS	18	20			
							▲	
20.5			NX			100		refusal to augers at 20.5
		Dolomite						
		Medium grey, medium to coarse bedded, medium to thick bedded fossiliferous dolomite						
		-extremely fossiliferous with many shale filled fractures	NX			100		
							▲	
			NX			100		
							●	
50.6			NX			100		
		Dolomite						
		Dark green grey changing at 51.1' to dark grey, aphanitic crystalline medium to thick bedded						
60.0		fractured dolomite	NX			100		
		Shale						
		Dark grey aphanitic crystalline massive bedded platy shale fossiliferous from 79.5' to 82.8'	NX			100		
			NX			100		
84.5							●	
		Borehole terminated at 84.5'						

BOREHOLE NO. 17

PROJECT NAME Walker Brothers Quarry Landfill Site(East Quarry) PROJECT NO. 77-61

CLIENT Walker Brothers Quarries Limited DATE July 20,21, 1977

BOREHOLE TYPE 3¼"I.D. Hollow Stem Augers, NXRock Core, 4" Tircone GEOLOGIST A.B.

ELEVATION 596.6 Ft. ASL 181.8 TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.4		Topsoil						
	11.6	Lacustrine Clayey Silt Grey brown clayey silt with lenses and pockets of fine sand friable, blocky, A.P.L. to D.T.P.L.	SS	34	28			
		Changing to grey clayey silt to silty clay at ±12' hard becoming stiff with depth W.T.P.L.	SS	10	29			Sample 15'-16.5' Silt 48% Clay 52%
21.5	9.5						▲	refusal to augers at 22.5'
23.5		Boulder till medium brown saturated, boulder till.	NX			100	▲	
		Dolomite Medium grey, coarse crystalline, thin to medium bedded dolomite porous from 23.5' to 43.5' fractures filled with gypsum from 45.5 to 48.5'	NX			100		K= 2×10^{-4} cm/sec.
			NX			100		K= 3×10^{-5} cm/sec
			NX			100	▲	
			NX			100	●	
58.8		Dolomite Dark grey, aphanitic crystalline medium bedded. Fractured dolomite.	NX			100		K= 9×10^{-6} cm/sec
72.2		Shale Dark grey, aphanitic crystalline massive bedded platy shale	NX			100		
			NX			100		K=4×10^{-5} cm/sec

BOREHOLE NO. 17

PROJECT NAME Walker Brothers Quarry Landfill Site(East Quarry) PROJECT NO. 77-61

CLIENT Walker Brothers Quarries Limited DATE July 20,21; 1977

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers, NX Rock Core, 4" Tricone GEOLOGIST A.B.

ELEVATION _____ TECHNOLOGIST _____

DEPTH ELEV. 90.0	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT.	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
94.5		Borehole terminated at 94.5' in shale					▽	

BOREHOLE NO. 18

PROJECT NAME Walker Brothers Quarry Landfill Site(East Quarry) PROJECT NO. 77-61
CLIENT Walker Brothers Quarries Limited DATE July 13,14 1977
BOREHOLE TYPE 3¼"I.D. Hollow Stem Augers, NX Rock Core 4" Tricone GEOLOGIST A.B.
ELEVATION 599.5 Ft. A.S.L. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0		Topsoil						
		Lacustrine Clayey Silt Grey brown clayey silt, odd grits and silt lenses and pockets, fractured D.T.P.L. becoming A.P.L with depth. Hard becoming softer with depth.	SS	34	21			
			SS	19	15			
16.8								
19.0		Till-Medium brown boulder till.	NX			100	▲	refusal to augers at 19.0'
		Dolomite Medium grey, coarse crystalline, thin to medium bedded, very porous dolomite, few fossils, irregular bedding	NX			100		
			NX			100	▲	K= 7×10^{-4} cm/sec.
			NX			100	●	
54.5								
		Dolomite Dark grey, aphanitic crystalline, medium bedded fractured dolomite	NX			97		K= 5×10^{-4} cm/sec
53.7		Shale Dark grey aphanitic crystalline massive bedded platy shale uniform	NX			100		
		Borehole terminated at 89.5' in						K= 5.6×10^{-5} cm/sec

BOREHOLE NO. 19

PROJECT NAME Walker Brothers Quarry Landfill Site (East Quarry) PROJECT NO. 77-61

CLIENT Walker Brothers Quarries Limited DATE July 15,18, 1977

BOREHOLE TYPE 3¼"I.D. Hollow Stem Augers, NX Rock Core, 4" Tricone GEOLOGIST A.B.

ELEVATION 604.5 Ft. A.S.L. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0		Topsoil						
0.4		Lacustrine Clayey Silt Mixed grey and brown clayey silt odd grits, silt pockets, desiccated and fractured, D.T.P.L. Hard.	SS	40	16			
14'		Till Mixed grey and red clayey silt till W.T.P.L., very stiff	SS	16	19			
23.3							▲	
24.7		Boulder Till	NX			100		refusal to augers at 24.7'
		Dolomite Light grey coarse crystalline, medium to thick bedded dolomite fossiliferous, porous and shaly in sections	NX			100		
			NX			100	▲	
50.8			NX			100	●	K= 2×10^{-5} cm/sec
		Dolomite Dark grey aphanitic crystalline medium bedded, fractured, sound dolomite.	NX			96		K= 2×10^{-5} cm/sec.
62.5		Shale Dark grey aphanitic crystalline massive bedded platy shale fossiliferous from 72.4' to 89.5'	NX			100		K= 1×10^{-5} cm/sec.
			NX			80		
							●	
89.5		Borehole terminated at 89.5' in						

BOREHOLE LOG	PROJECT: 70198	BOREHOLE: 19-1R 1 of 3
Decommissioning and Replacement of Monitoring Well Nest 19 Niagara Waste Systems Limited - South Landfill Site **FOR:** Niagara Waste Systems Limited		**DATE:** June 5, 2008 **LOGGED BY** AME **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.1		**TOPSOIL** Rootlets and organic debris.				CS			94		
0.7		**FILL** Light to dark brown sandy fill with rootlets and wood debris, dry.									
1		**CLAYEY-SILT TILL** Dark brown and gray clayey-silt till with sandy silt seams, some gravel, dry to moist, fractured. - Highly fractured between approximately 1.4 m and 1.9 m.				CS			100		
2		- Changes to brown colour at approximately 1.9 m.									
3		- Changes back to brown and gray colour at approximately 2.9 m..				CS			45		
4											
		- Becoming more saturated at approximately 4.4 m.				CS			48		
5											
6						CS			65		
6.8											
7		**GRAVEL** Subangular to angular.				CS			0		
7.3		**LOCKPORT DOLOSTONE** Light gray, coarse crystalline, medium to thick bedded, fossiliferous, some gypsum nodules and gypsum-filled cavities, trace pyrite, porous, stilolites and vugs throughout, some fracturing, shaly in sections. - Broken from approximately 8.0 m to 8.5 m.				HQ			84	100	
8						HQ			99	60	
9											
						HQ			125	100	

BOREHOLE LOG	PROJECT: 70198	BOREHOLE: 19-1R 2 of 3
Decommissioning and Replacement of Monitoring Well Nest 19 Niagara Waste Systems Limited - South Landfill Site **FOR:** Niagara Waste Systems Limited		**DATE:** June 5, 2008 **LOGGED BY** AME **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
11						HQ			102	100	
12						HQ			97	100	
13						HQ			97	100	
14						HQ			111	83	
15											
16						HQ			96	82	
16.2		**DECEW DOLOSTONE** Dark gray and green aphanitic crystalline dolostone with some interbedded brown aphanitic crystalline dolostone, thick to massive bedded, trace gypsum nodules, some fracturing.									
17											
17.7		**ROCHESTER SHALE** Dark gray, aphanitic crystalline, massive bedded, platy and easily broken, gypsum-filled joints and pyrite-filled cavities in sections, very little fracturing.									
18											
19						HQ			99	94	

BOREHOLE LOG	PROJECT: 70198	BOREHOLE: 19-1R 3 of 3
Decommissioning and Replacement of Monitoring Well Nest 19 Niagara Waste Systems Limited - South Landfill Site **FOR:** Niagara Waste Systems Limited		**DATE:** June 5, 2008 **LOGGED BY** AME **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
21						HQ			102	100	
22						HQ			99	100	
23						HQ			104	100	
24						HQ			100	100	
25		- Highly fossiliferous from approximately 24.9 m to 26.2 m.									
26						HQ			93	100	
27											
27.8		Borehole terminated at approximately 27.8 m in Rochester Shale.									

LOG OF BOREHOLE 19-1R2

project | Walker Landfills		**project no. |**	131-22826-01
client | Walker Environmental Group	**rig type |** CME 75, track-mounted	**date started |**	2015/09/22
location | East Landfill Site	**method |** Hollow stem augers, 215 mm dia.	**supervisor |**	LG
position |	**coring |** HQ core, OD=96mm, ID=64mm	**reviewer |**	KJF

Elev / Depth (m)	STRATIGRAPHY	Graphic Plot	Number	Type	SPT N-Value / Core Recovery
183.9 / 0	**GROUND SURFACE**				
	Brown with orange mottling, mottling becoming grey at 1.5m **SILT FILL**, clayey becoming trace clay at 1.5m, trace gravel, trace sand, APL becoming DTPL at 1.5m, firm becoming very stiff at 1.5m.		1	SS	7
181.9 / 2.0			2	SS	30
	Brown, becoming reddish brown at 4.6m, becoming reddish grey brown at 6.1m **CLAYEY SILT TILL**, occasional gravel becoming trace gravel at 3.2m, trace sand, DTPL becoming APL at 3.2m, becoming WTPL at 4.6m, stiff becoming firm at 4.6 m.		3	SS	19
			4	SS	8
177.1 / 6.8			5	SS	7
	Light bluish grey fossiliferous Lockport Formation **DOLOSTONE**, with subtle grey banding, medium to coarse grained, medium to thick bedded, finely crystalline. 2% vugs up to 1 mm. Hard strong smooth core scratched with difficulty with a knife. Generally fresh appearance with broken core recovered to 7.0 m. Trace thin stylolytes, 1 to 2 per 2 metres. The core is noticeably darker in colour, less fossiliferous and finer grained below 11.6 m. Fair to excellent RQD. Sharp lower contact below greenish grey 15 cm glauconitic bed.		R1		TCR = **115%** RQD = **52%**
			R2		TCR = **86%** RQD = **89%**
			R3		TCR = **104%** RQD = **97%**
			R4		TCR = **104%** RQD = **96%**
			R5		TCR = **100%** RQD = **99%**
169.0 / 14.9			R6		TCR = **105%** RQD = **100%**
	Medium grey argillaceous Decew Formation **DOLOSTONE**, dull appearance, wavy bedding, excellent RQD, scratched by knife, barren, minor pyrite at 16.1 m associated with shaley parting. Gradational lower contact.		R7		TCR = **98%** RQD = **97%**
166.4 / 17.5			R8		TCR = **102%** RQD = **100%**
	Dark grey to black Rochester Formation **DOLOMITIC SHALE**, fine grained, thinly bedded, scratched easily with a knife. Trace fossils. Thin white gypsum partings 1 to 2 mm thick typically 1 per 0.3 m. Excellent RQD. Lighter grey fossiliferous and calcareous beds 0.1 m to 0.3 m thick below 24.7 m representing 40% to 50% of recovered core. Mud infilling of fractures at 22.8 m for 5 cm, and at 27.4 m for 3 cm.		R9		TCR = **98%** RQD = **100%**
			R10		TCR = **102%** RQD = **97%**
			R11		TCR = **100%** RQD = **95%**
			R12		TCR = **98%** RQD = **100%**
			R13		TCR = **102%** RQD = **100%**
			R14		TCR = **99%** RQD = **99%**
156.2 / 27.7			R15		TCR = **112%** RQD = **0%**

END OF BOREHOLE

Unstabilized water level at 8.4 m below ground surface; borehole was open upon completion.

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane; 40 80 120 160

Water Content (%) & Plasticity: PL MC LL; 10 20 30; Water level on completion

PID Readings

Well Details

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Gasport and Goat Island members not positively distinguished from core .

Thin muddy infilling of fractures at 8.6 m, 8.9 m, 11.6 m, 12.0 m, 13.0 m

6 mm to 8 mm vugs for 5cm at 11.6 m

2 cm calcareous nodule at 16.1 m

WATER LEVEL MONITORING

Date	Depth (m)	Elevation (m)
Sep 23, 2015	8.4	175.5
Sep 24, 2015	13.7	170.2

library: genivar - library.glb report: gen log v1 file: walker landfill ver1.gpj

BOREHOLE LOG	PROJECT: 70198	BOREHOLE: 19-2R 1 of 2
Decommissioning and Replacement of Monitoring Well Nest 19 Niagara Waste Systems Limited - South Landfill Site **FOR:** Niagara Waste Systems Limited		**DATE:** June 11, 2008 **LOGGED BY** AME **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.1		**TOPSOIL** Rootlets and organic debris.									
0.7		**FILL** Light to dark brown sandy fill with rootlets and wood debris, dry.									Borehole advanced without sampling in overburden. Stratigraphy inferred from adjacent borehole 19-1R located approximately 2 m away. Contact depths verified by examining core.
1		**CLAYEY-SILT TILL** Dark brown and gray clayey-silt till with sandy silt seams, some gravel, dry to moist, fractured.									
2											
3											
4											
5											
6											
6.8		**GRAVEL** Subangular to angular.									
7											
8											
8.5		**LOCKPORT DOLOSTONE** Light gray, coarse crystalline, medium to thick bedded, fossiliferous, some gypsum nodules and gypsum-filled cavities, trace pyrite, porous, stilolites and vugs throughout, some fracturing, shaly in sections.									
9											

BOREHOLE LOG	PROJECT: 70198	BOREHOLE: 19-2R 2 of 2
Decommissioning and Replacement of Monitoring Well Nest 19 Niagara Waste Systems Limited - South Landfill Site **FOR:** Niagara Waste Systems Limited		**DATE:** June 11, 2008 **LOGGED BY** AME **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
11											
12											
13											
14											
14.7		**DECEW DOLOSTONE** Dark gray and green aphanitic crystalline dolostone with some interbedded brown aphanitic crystalline dolostone, thick to massive bedded, trace gypsum nodules, some fracturing.									
15											
16											
17.0 17		Borehole terminated at approximately 17.0 m in Decew Dolostone.									

BOREHOLE LOG	PROJECT: 70198	BOREHOLE: 19-3R 1 of 2
Decommissioning and Replacement of Monitoring Well Nest 19 Niagara Waste Systems Limited - South Landfill Site **FOR:** Niagara Waste Systems Limited		**DATE:** June 12, 2008 **LOGGED BY** AME **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.1		**TOPSOIL** Rootlets and organic debris.									Borehole advanced without sampling in overburden. Stratigraphy inferred from adjacent borehole 19-1R located approximately 5 m away. Contact depths verified by examining core.
0.7		**FILL** Light to dark brown sandy fill with rootlets and wood debris, dry.									
1		**CLAYEY-SILT TILL** Dark brown and gray clayey-silt till with sandy silt seams, some gravel, dry to moist, fractured.									
2											
3											
4											
5											
6											
6.8		**GRAVEL** Subangular to angular.									
7											
7.2		**LOCKPORT DOLOSTONE** Light gray, coarse crystalline, medium to thick bedded, fossiliferous, some gypsum nodules and gypsum-filled cavities, trace pyrite, porous, stilolites and vugs throughout, some fracturing, shaly in sections.									
8											
9											

BOREHOLE LOG	PROJECT: 70198	BOREHOLE: 19-3R 2 of 2
Decommissioning and Replacement of Monitoring Well Nest 19 Niagara Waste Systems Limited - South Landfill Site **FOR:** Niagara Waste Systems Limited		**DATE:** June 12, 2008 **LOGGED BY** AME **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
11											
12											
13											
14.0 14		Borehole terminated at approximately 14.0 m in Lockport Dolostone.									

BOREHOLE LOG

PROJECT: 70198

BOREHOLE: 19-4R 1 of 1

Decommissioning and Replacement of Monitoring Well Nest 19
Niagara Waste Systems Limited - South Landfill Site
FOR: Niagara Waste Systems Limited

DATE: June 5, 2008
LOGGED BY AME
GROUND ELEV m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.1		**TOPSOIL** Rootlets and organic debris.									Borehole advanced without sampling. Stratigraphy inferred from adjacent borehole 19-1R located approximately 1 m away.
0.7		**FILL** Light to dark brown sandy fill with rootlets and wood debris, dry.									
1		**CLAYEY-SILT TILL** Dark brown and gray clayey-silt till with sandy silt seams, some gravel, dry to moist, fractured. - Highly fractured between approximately 1.4 m and 1.9 m.									
2		- Changes to brown colour at approximately 1.9 m.									
3		- Changes back to brown and gray colour at approximately 2.9 m..									
4											
		- Becoming more saturated at approximately 4.4 m.									
5											
6											
6.8											
7.1	7	**GRAVEL** Subangular to angular.									
		Borehole terminated at approximately 7.1 m at presumed bedrock contact.									

Printed: Mar 19, 09
File Location:

AECOM

BOREHOLE NO. 20

PROJECT NAME Walker Brothers Quarry Landfill Site(East Quarry) PROJECT NO. 77-61

CLIENT Walker Brothers Quarries Limited DATE July 7, 1977

BOREHOLE TYPE 3" Tricone, NX Rock Core, Bicone GEOLOGIST A.B.

ELEVATION 549.6 FT. A.S.L. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY %	GROUND WATER	REMARKS
0.0'								
2.0'		Rubble broken dark grey dolomite and rock rubble						
		Shale	NX			100		
		Dark grey, aphanitic crystalline massive bedded platy shale, highly weathered from 2.0' to 4.0' fossiliferous from 20.0' to 28.4'	NX			98	▲	
			NX			100	●	
30.0		Borehole terminated at 30.0' in shale						

BOREHOLE NO. 21

PROJECT NAME Walker Brothers Quarry Landfill Site(East Quarry) PROJECT NO. 77-61

CLIENT Walker Brothers Quarries Limited DATE July 6-7, 1977

BOREHOLE TYPE NX Rock Core, 3" Tricone, bicone GEOLOGIST A.B.

ELEVATION 546.0 Ft. A.S.L. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0'								
2.0'		Rubble dark grey broken,weathered dolomite	NX			100		
		Shale Dark grey, aphanitic crystalline massive bedded platy shale extremely weathered from 0' to 7.2' thin fossiliferous zones from 19.0' to 29.0'	NX			100	▲	
			NX			100		
29.0							●	
		Borehole terminated at 29.0' in shale.						

BOREHOLE NO. 22

PROJECT NAME Walker Brothers Quarry Landfill Site(East Quarry) PROJECT NO. 77-61

CLIENT Walker Brothers Quarries Limited DATE July 8,11, 1977

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers, 4" Tricone, NX Rock Core GEOLOGIST A.B.

ELEVATION 590.2 Ft. A.S.L. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0'								
3.0'		Fill Crushed stone with medium brown sandy till	1	13	19			Sample 4.4'-5.9' Gravel 5% Sand 17% Silt 48% Clay 30%
11.3		Till Mixed brown silt till, friable, A.P.L. compact						
14.0'		Sand and Gravel boulders with grey sand and gravel, saturated	NX			100	▲	refusal to augers at 14.0'
		Dolomite Medium grey, medium crystalline, medium bedded, dolomite uniform very porous from 14.0'-17.0' becomes a crinoidal dolostone from 24.0' to 31.4'	NX			100	▲	* 31.4'-31.8' Conglomerate Medium to dark grey conglomerate with shale seams and interbed of dark grey aphanitic dolostone
31.4		See Remarks*					●	
31.8		Dolomite Dark grey, aphanitic crystalline medium bedded dolomite.	NX			100		
37.6		Shale Dark grey, aphanitic crystalline massive bedded platy shale minor gypsum filled nodules fossiliferous from 60.6-'64.0'.	NX			100		
			NX			100		
64.0							●	
		Borehole terminated at 64.0' in shale.						

BOREHOLE NO. 23

PROJECT NAME Walker Brothers Quarries Landfill Site(East Quarry) PROJECT NO. 77-61

CLIENT Walker Brothers Quarries Limited DATE July 7-8, 1977

BOREHOLE TYPE NX Rock Core, 3" Tricone, Bicone GEOLOGIST A.B.

ELEVATION 567.6 Ft. A.S.L. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0'								
1.5		Rubble	NX			100		
2.9		Dolostone	NX			98		
		Shale Dark grey, aphanitic crystalline massive bedded platy shale gypsum filled vugs from 20.3' to 29.5'	NX			100		
			NX			100		
29.5		Borehole terminated at 29.5' in shale.						

BOREHOLE LOG	PROJECT: 23-694	BOREHOLE: 23-Ir 1 of 1
Decommissioning/Reinstallation of Well Nest 32, 23 and 46-I Niagara Falls Landfill FOR: Niagara Waste System Limited		DATE: 2 October 2003 GEOLOGIST BW ELEVATION 174.6 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.1		**TOPSOIL** **CLAYEY SILT (FILL)** Brown clayey silt fill, occasional red mottling, firm, DTPL		1		SS			20		
				2		SS			60		
1.2		**SHALEY DOLOSTONE (DECEW FORMATION)** Grey to dark grey chaley dolostone, phaneritic to aphanitic, thick bedded, hard, broken to very broken.		3		HQ			100		
2.2		**SHALE (ROCHESTER FORMATION)** Dark grey shale, aphanitic, very thinly bedded, medium soft.		4		HQ			100		
				5		HQ			100		
				6		HQ			100		
				7		HQ			100		
				8		HQ			100		
9.1		Borehole terminated at 9.1 m in shale.									

Printed: 30 Mar 04

Gartner Lee Limited

BOREHOLE NO. 24

PROJECT NAME Walker Brothers Quarry Landfill Site(East Quarry) PROJECT NO. 77-61

CLIENT Walker Brothers Quarries Limited DATE July 21,22 1977

BOREHOLE TYPE 3¼"I.D. Hollow Stem Augers, NX Rock Core, 4" Tricone GEOLOGIST A.B.

ELEVATION 590.1 FT. A.S.L. TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.4		Topsoil						
		Till Reddish brown silt till, moist dense.	SS	39	13			
9.0								refusal to auger at 13.5'
13.5		Boulder Till Medium brown boulder till, saturated					▲	
		Dolomite Light to medium grey, coarse, crystalline, thin to medium bedded dolomite with shaley dolomite interbeds	NX			100	▲	
26.0			NX			100	●	
27.0		~~Dolomite interbed light grey~~ fossiliferous limestone						
		Dolomite Dark grey, aphanitic crystalline then to medium fractured dolomite	NX			100		
36.7								
		Shale Dark grey, aphanitic crystalline massive bedded platy shale fossiliferous zones and gypsum seams from 50.3' to 64.5'	NX			100		
			NX			100		$K = 4 \times 10^{-6}$ cm/sec
64.5							●	
		Borehole terminated at 64.5' in shale						

BOREHOLE NO. 25

PROJECT NAME WALKER BROTHERS QUARRY LANDFILL SITE (EAST QUARRY) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE FEB. 20, 1978

BOREHOLE TYPE 3¼" I.D. HOLLOW STEM AUGERS NX ROCK CORE GEOLOGIST A.B.

ELEVATION 559.7' TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0		FILL Brown gravelly sand till moist						refusal to augers at 4.5'
4.5		SHALE	NX			97		
		Dark grey aphanitic crystalline, massive bedded platy shale slightly fossiliferous throughout very fossiliferous from 24.5' to 29.8'	NX			100		
			NX			100	▲	
			NX			100	●	
39.5		Borehole terminated at 39.5' in shale						

BOREHOLE NO. 26

PROJECT NAME WALKER BROTHERS QUARRY LANDFILL SITE (EAST QUARRY) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE FEB. 13, 14, 1978

BOREHOLE TYPE 3¼" I.D. HOLLOW STEM AUGERS, NX ROCK CORE, 4" TRICONE GEOLOGIST A.B.

ELEVATION 552.7' TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0								
0.4		TOPSOIL						
1.0		TAR AND GRAVEL PAVEMENT	NX			93		
		DOLOMITE						
6.2		Medium dark grey, aphanitic crystalline dolomite, highly fractured	NX			83		
		SHALE						
		Dark grey aphanitic crystalline, massive bedded platy shale very fossiliferous in zones	NX			100		
			NX			100	▲	
			NX			100	●	
			NX			100		
			NX			100		
			NX			100		
61.2		LIMESTONE						
		Slightly pink to light grey, thin to medium bedded, medium to coarse crystalline, fossiliferous	NX			100		
69.0							●	
70.0		DOLOMITE light grey with green grey sandy lenses, fine crystalline dolomite						
		Borehole terminated at 70.0' in limestone						

BOREHOLE LOG	**PROJECT:** 70720	**BOREHOLE:** 26-1R 1 of 2
Decommissioning and Replacement of Monitoring Well Nest 26 Walker Industries Holdings Limited, Thorold **FOR:** Niagara Waste Systems Limited		**DATE:** September 12, 2007 **LOGGED BY** JEL/HA **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.1		**TOPSOIL** Grass, organic debris, rootlets.				SS	10		33		
0.6		**FILL** Light brown sandy gravel fill with a silty-clay matrix interbedded with some reddish-brown silty-sand, moist.				SS	5		48		
1						SS	12		52		
2		**CLAYEY-SILT** Dark brown, some gravel, compact, moist.				SS	12		0		
3.0		**SILTY-CLAY** Greyish-brown silty-clay with trace gravel, massive, wet, stiff.				SS	6		47		
4						SS	4		41		
5						SS	5		3		
5.5		- Dark brown silty-clay with gravel becoming greyish-brown silty-clay with gravel after approximately 5.0 m.				SS	6		50		
6		**CLAY** Greyish-brown clay, thinly laminated, slightly mottled with grey and reddish-brown clay lenses, trace organic matter, very stiff.				SS	26		39		
7						SS	3		48		
8		- Becoming more saturated at approximately 6.4 m depth.				SS	3		58		
8.5		**SANDY GRAVEL** Greyish-brown coarse sand with dolomitic angular to subangular gravel, saturated.				SS	3		62		
9.2						SS	2		85		
9.8		**GRAVELLY SAND** Dark grey subangular to angular dolomitic gravel with sand, wet becoming moist becoming dry.				SS	2		79		
10						SS	35		39		
11		**GRAVEL** Dark grey subangular to subrounded gravel, aphanitic, massive, dry.				SS	33		27		
12						SS	50		9		
12.5		**ROCHESTER SHALE** Dark-grey with thin flakes of gypsum throughout, massive, thick bedded, very hard, blocky fractures.				HQ			100	81	
13											
14						HQ			43	57	
15											
16						HQ			100	85	
17						HQ			88	88	
18											

BOREHOLE LOG	**PROJECT:** 70720	**BOREHOLE:** 26-1R 2 of 2
Decommissioning and Replacement of Monitoring Well Nest 26 Walker Industries Holdings Limited, Thorold **FOR:** Niagara Waste Systems Limited		**DATE:** September 12, 2007 **LOGGED BY** JEL/HA **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
19		- Becoming highly fossiliferous with some gypsum nodules at approximately 19.0 m, thick bedded.				HQ			100	100	
20						HQ			91	100	
21											
22						HQ			100	100	
23						HQ			100	100	
24											
25						HQ			100	100	
26						HQ			100	100	
27											
28.1 28		**IRONDEQUOIT LIMESTONE** Light grey with some pinkish to light grey crystals, fossiliferous, phaneritic, very coarse crystalline, massive, hard.				HQ			100	100	
29						HQ			91	100	
30 30.4		- Highly fossiliferous from approximately 28.8 m to 30.4 m. Borehole terminated at approximately 30.4 m in Irondequoit Limestone.									

BOREHOLE LOG	**PROJECT:** 70720	**BOREHOLE:** 26-2R 1 of 2
Decommissioning and Replacement of Monitoring Well Nest 26 Walker Industries Holdings Limited, Thorold **FOR:** Niagara Waste Systems Limited		**DATE:** September 11, 2007 **LOGGED BY** JEL/HA **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.1		**TOPSOIL** Grass, organic debris, rootlets.									Borehole advanced without sampling. Stratigraphy inferred from adjacent borehole 26-1R.
0.6		**FILL** Light brown sandy gravel fill with a silty-clay matrix interbedded with some reddish-brown silty-sand, moist.									
1		**CLAYEY-SILT** Dark brown, some gravel, compact, moist.									
2											
3.0		**SILTY-CLAY** Greyish-brown silty-clay with trace gravel, massive, wet, stiff.									
3											
4											
5		- Dark brown silty-clay with gravel becoming greyish-brown silty-clay with gravel after approximately 5.0 m.									
5.5											
6		**CLAY** Greyish-brown clay, thinly laminated, slightly mottled with grey and reddish-brown clay lenses, trace organic matter, very stiff. - Becoming more saturated at approximately 6.4 m depth.									
7											
8											
8.5		**SANDY GRAVEL** Greyish-brown coarse sand with dolomitic angular to subangular gravel, saturated.									
9.2											
9											
9.8		**GRAVELLY SAND** Dark grey subangular to angular dolomitic gravel with sand, wet becoming moist becoming dry.									
10											
11		**GRAVEL** Dark grey subangular to subrounded gravel, aphanitic, massive, dry.									
12											
12.5		**ROCHESTER SHALE** Dark-grey with thin flakes of gypsum throughout, massive, thick bedded, very hard, blocky fractures.									
13											
14											
15											
16											
17											
18											

BOREHOLE LOG	**PROJECT:** 70720	**BOREHOLE:** 26-2R 2 of 2
Decommissioning and Replacement of Monitoring Well Nest 26 Walker Industries Holdings Limited, Thorold **FOR:** Niagara Waste Systems Limited		**DATE:** September 11, 2007 **LOGGED BY** JEL/HA **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
19		- Becoming highly fossiliferous with some gypsum nodules at approximately 19.0 m, thick bedded.									
20											
20.8		Borehole terminated at approximately 20.8 m in Rochester Shale.									

BOREHOLE LOG

PROJECT: 91-108

BOREHOLE: 26-IV 1 of 1

Niagara Waste Systems Hydrogeologic Investigation
Thorold, Ontario
FOR: Niagara Waste Systems Limited

DATE: 18 June 1991
GEOLOGIST KTH
ELEVATION 172.58 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
		OPEN MANHOLE	IV									
4.0				1		HQ			100	40		
4.3		GRAVEL PAD										
		DOLOSTONE (DeCew Formation?) Medium grey very fine crystalline thin to medium bedded argillaceous dolostone, numerous fractures. Weathered to about 5.0 m.		2		HQ			100	59		
		-Increasingly argillaceous below about 6.2 m.		3		HQ			100	100		
8.0				4		HQ			100	86		
		SHALE (Rochester Formation) Dark grey thinly laminated calcareous shale with interlaminated to interbedded medium grey argillaceous dolostone, occasional gypsum nodules and seams, locally fossiliferous.		5		HQ			100	93		
		-Dolostone content decreases with depth.		6		HQ			100	90		
		-Fossiliferous zone, higher dolostone content with numerous gypsum nodules and seams from about 13.0 m to about 14.8 m.		7		HQ			100	90		
14.8				8		HQ			100	70		
		Borehole terminated at 14.80 m in shale.										

Printed: 14 SEP 98

Gartner Lee Limited

BOREHOLE LOG	**PROJECT:** 70720	**BOREHOLE:** 26-4R 1 of 1
Decommissioning and Replacement of Monitoring Well Nest 26 Walker Industries Holdings Limited, Thorold **FOR:** Niagara Waste Systems Limited		**DATE:** September 12, 2007 **LOGGED BY** JEL/HA **GROUND ELEV** m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.1		**TOPSOIL** Grass, organic debris, rootlets.									Borehole advanced without sampling. Stratigraphy inferred from adjacent borehole 26-1R.
0.6		**FILL** Light brown sandy gravel fill with a silty-clay matrix interbedded with some reddish-brown silty-sand, moist.									
1											
2		**CLAYEY-SILT** Dark brown, some gravel, compact, moist.									
3.0		**SILTY-CLAY** Greyish-brown silty-clay with trace gravel, massive, wet, stiff.									
3											
4											
5											
5.5		- Dark brown silty-clay with gravel becoming greyish-brown silty-clay with gravel after approximately 5.0 m.									
6		**CLAY** Greyish-brown clay, thinly laminated, slightly mottled with grey and reddish-brown clay lenses, trace organic matter, very stiff. - Becoming more saturated at approximately 6.4 m depth.									
7											
8											
8.5		**SANDY GRAVEL** Greyish-brown coarse sand with dolomitic angular to subangular gravel, saturated.									
9.2											
9											
9.8		**GRAVELLY SAND** Dark grey subangular to angular dolomitic gravel with sand, wet becoming moist becoming dry.									
10											
11		**GRAVEL** Dark grey subangular to subrounded gravel, aphanitic, massive, dry.									
12											
12.5		**ROCHESTER SHALE** Dark-grey with thin flakes of gypsum throughout, massive, thick bedded, very hard, blocky fractures.									
13											
14											
15											
16											
16.8		Borehole terminated at approximately 16.8 m in Rochester Shale.									

Printed: Apr 22, 08
File Location:

Gartner Lee Limited

BOREHOLE NO. 27

PROJECT NAME WALKER BROTHERS QUARRY LANDFILL SITE (EAST QUARRY) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE FEB. 10, 1978

BOREHOLE TYPE 3¼" I.D. HOLLOW STEM AUGERS GEOLOGIST A.B.

ELEVATION 601.7' TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0		TOPSOIL						
0.3		FILL Brown silty clay pebbly fill D.T.P.L. becoming grey in colour and saturated ± 29.0' and stoney From 54.5' to 62.5'					▲	refusal to augers at 62.5'
62.5		Borehole terminated at 62.5' on bedrock.						

BOREHOLE NO. 28

PROJECT NAME WALKER BROTHERS QUARRY LANDFILL SITE (EAST QUARRY) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE FEB. 22, 1978

BOREHOLE TYPE NX ROCK CORE GEOLOGIST A.B.

ELEVATION 550.7' TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0								
2.2		DOLOMITE Dark grey, aphanitic crystalline, strongly fractured dolomite.	NX			93		
			NX			100		
		SHALE Medium dark grey, aphanitic crystalline, massive bedded platy shale, slightly fossiliferous throughout.	NX			100		
			NX			100	▲	
30.0							●	
		Borehole terminated at 30.0' in shale.						

BOREHOLE NO. 29

PROJECT NAME WALKER BROTHERS QUARRY LANDFILL SITE (EAST QUARRY) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE FEB. 22, 1978

BOREHOLE TYPE NX ROCK CORE GEOLOGIST A.B.

ELEVATION 548.7' TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0								
0.5		BROKEN ROCK						
1.5		DOLOMITE - light grey	NX			93		
		DOLOMITE - dark grey						
			NX			85		
6.9								
		SHALE	NX			96		
		Dark grey, aphanitic crystalline, massive bedded platy shale slightly fossiliferous throughout cavities present						
			NX			96	▲	
31.0		gas at 31.0'	NX			100	●	
		Borehole terminated at 31.0' in shale.						

BOREHOLE NO. 30

PROJECT NAME WALKER BROTHERS QUARRY LANDFILL SITE (EAST QUARRY) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE FEB. 20,21, 1978

BOREHOLE TYPE 3¼" I.D. HOLLOW STEM AUGERS, NX ROCK CORE, 4" and 3" TRICONE GEOLOGIST A.B.

ELEVATION 543.5' TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0								
		BROKEN ROCK						
4.0		Broken rock and rubble	NX			100		refusal to augers at 4.0'
8.0		DOLOMITE Medium dark grey, aphanitic crystalline, strongly fractured dolomite						
		SHALE Dark grey, aphanitic crystalline, massive bedded platy shale fossiliferous in zones throughout.	NX			100		
			NX			100	▲	
							●	
			NX			100		
			NX			100		
							●	
62.6			NX			100		
		LIMESTONE Light medium grey medium to coarse crystalline, thin bedded limestone, pink crinoids, slightly porous						
69.0		Borehole terminated at 69.0' in limestone.						

BOREHOLE NO. 31

PROJECT NAME WALKER BROTHERS QUARRY LANDFILL SITE (EAST QUARRY) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE FEB. 15,16, 1978

BOREHOLE TYPE 3¼" I.D. HOLLOW STEM AUGERS, NX ROCK CORE, 3" TRICONE GEOLOGIST A.B.

ELEVATION 600.8' TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
0.0								
0.5		TOPSOIL						
		LACUSTRINE CLAYEY SILT Brown clayey silt with lenses of red brown fine sand, odd pebble A.P.L. to D.T.P.L. changing to red brown fine sandy silt at 14.5' dense, very dense, W.T.P.L.	SS	15	24			
			SS	65	9		▲	
19.5			NX			100		refusal to augers at 19.5'
		DOLOMITE Medium grey, medium crystalline, thin to medium bedded dolomite, porous, slightly argillaceous from 19.7'-22.3' becoming medium to thick bedded with depth	NX			100		
			NX			100	▲	
			NX			100	●	
			NX			100		
58.7								
		DOLOMITE Medium dark grey, aphanitic crystalline, fractured dolomite	NX			100		
70.6								
		SHALE Dark grey, aphanitic crystalline, massive bedded platy shale fossiliferous throughout	NX			100		
			NX			100		

BOREHOLE NO. 31

PROJECT NAME WALKER BROTHERS QUARRY LANDFILL SITE (EAST QUARRY) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE FEB. 15, 16, 1978

BOREHOLE TYPE 3¼" I.D. HOLLOW STEM AUGERS, NX ROCK CORE, 3" TRICONE GEOLOGIST A.B.

ELEVATION 600.8' TECHNOLOGIST

DEPTH ELEV.	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE M/C %	SAMPLE RECOVERY	GROUND WATER	REMARKS
94.5		Borehole terminated at 94.5' in shale.					●	

BOREHOLE LOG	PROJECT: 23-694	BOREHOLE: 32-Ir 1 of 2
Decommissioning/Reinstallation of Well Nest 32, 23 and 46-I Niagara Falls Landfill **FOR:** Niagara Waste System Limited		**DATE:** 3 October 2003 **GEOLOGIST** PJAM **ELEVATION** 177.1 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.1		**TOPSOIL** **CLAYEY SILT FILL** Brown clayey silt fill, soft, trace rootlets, wet.		1		SS			50		
				2		SS			60		
1.2		**CLAYEY SILT TILL** Brown clayey silt till with some grey mottling, very stiff, APL.		3		SS			80		
				4		SS			90		
				5		SS			60		
				6		SS			60		
				7		SS			100		
		- Becoming grey brown below 4.2 m depth.		8		SS			100		
				9		SS			100		
				10		SS			100		
		- Some red mottling below 6.09 m depth.		11		SS			100		
6.9				12		SS			100		
		SAND Reddish-brown fine sand, wet, loose.									
7.3		**DOLOSTONE (LOCKPORT FORMAITON)**		13		SS			100		
				14		HQ			100	66	
7.7		Light grey dolostone, phaneric, thin bedded, hard, broken to very broken, light weathering of fracture faces. - Fossiliferous zones present below 7.36 m depth.		15		HQ			100	52	
		DOLOSTONE Light grey to grey dolostone, fine crystalline to aphanitic, hard, very broken to broken, fresh to slight weathering of fracture faces, some fossiliferous zones, becoming vuggy below 8.1 m depth, some infilling of vugs with calcite.		16		HQ			100	87	

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BOREHOLE LOG	PROJECT: 23-694	BOREHOLE: 32-Ir 2 of 2
Decommissioning/Reinstallation of Well Nest 32, 23 and 46-I Niagara Falls Landfill **FOR:** Niagara Waste System Limited		**DATE:** 3 October 2003 **GEOLOGIST** PJAM **ELEVATION** 177.1 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
11				17		HQ			100	92	
12		- Occasional shale parting below 12.2 m depth.		18		HQ					
13		- Shale content increasing below 13.1 m depth.									
13.6		Borehole terminated at 13.6 m in dolostone.									

BOREHOLE LOG	PROJECT: 23-694	BOREHOLE: 32-2r 1 of 1
Decommissioning/Reinstallation of Well Nest 32, 23 and 46-I Niagara Falls Landfill **FOR:** Niagara Waste System Limited		**DATE:** 7 October 2003 **GEOLOGIST** TMS/MB **ELEVATION** 177.0 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	COMMENTS
0.1		**TOPSOIL**		1		SS			50		
		CLAYEY SILT FILL Brown clayey silt fill, soft, trace rootlets, wet.		2		SS			60		
1.2	1										
		CLAYEY SILT TILL Brown clayey silt till with some grey mottling, very stiff, APL.		3		SS			80		
	2			4		SS			90		
				5		SS			60		
	3			6		SS			60		
				7		SS			100		
	4	- Becoming grey brown below 4.2 m depth.		8		SS			100		
	5			9		SS			100		
				10		SS			100		
	6	- Some red mottling below 6.09 m depth.		11		SS			100		
6.9				12		SS			100		
	7	**SAND** Reddish-brown fine sand, wet, loose.									
7.3		**DOLOSTONE (LOCKPORT FORMATION)**		13		SS			100	66	
7.7		Light grey dolostone, phaneric, thin bedded, hard, broken to very broken, light weathering of fracture faces. - Fossiliferous zones present below 7.36 m depth.		14		HQ			100		
	8			15		HQ			100	52	
		DOLOSTONE Light grey to grey dolostone, fine crystalline to aphanitic, hard, very broken to broken, fresh to slight weathering of fracture faces, some fossiliferous zones, becoming vuggy below 8.1 m depth, some infilling of vugs with calcite.									
	9			16		HQ			100	100	
9.9											
		Borehole terminated at 9.9 m depth in dolostone.									

Printed: 30 Mar 04

Gartner Lee Limited

BOREHOLE NO. 36

PROJECT NAME WALKER BROTHERS QUARRIES LANDFILL SITE (WEST PIT) PROJECT NO. 81-6

CLIENT Walker Brothers Quarries Limited DATE May 16, 1980

BOREHOLE TYPE 4¼" I.D. Hollow Stem Augers GEOLOGIST P.P.

ELEVATION 600.5 TECHNOLOGIST

DEPTH ELEV. ft.	STRATIGRAPHY	DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	SAMPLE BLOWS/FT.	SAMPLE % WATER	GROUND WATER	REMARKS
0.0								
		Fill, clayey silt with stones, brown						Seal
6			1	SS	65			
		Flue dust, black, loose to very loose, fine textured						13 ft to 15 ft. Saturated
			2	SS	5			
			3	SS	5			
			4	SS	6			15 ft to 25 ft. moist
			5	SS	7			
			6	SS	2			
			7	SS	5			
			8	SS	3			25 ft. to 60 ft. wet
			9	SS	5			
			10	SS	3			
			11	SS	6			
			12	SS	6			60 ft. to 64 ft. Saturated
64								
66.5		Assumed shale bedrock					▲	
		Borehole terminated at 66.5 feet in assumed shale bedrock						Borehole backfilled with 3/8" crushed stone

BOREHOLE LOG

PROJECT: 91-240

BOREHOLE: 36-II 1 of 1

Niagara Waste Systems Hydrogeologic Investigation
Thorold, Ontario
FOR: Niagara Waste Systems Limited

DATE: 24 June 1991
GEOLOGIST KTH
ELEVATION 183.22 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
0.2		**TOPSOIL** Medium to dark brown sandy silt with rootlets, trace clay.	II	1		SS	65/ 0.15m	11	80		■	
1		**FILL** Medium to dark brown clayey silt, trace fine sand and fine gravel, rootlets, DTPL to APL, firm to stiff.		2		SS	13	23	91		■	
2.5		**INDUSTRIAL WASTE** Dark brown to black finely crystalline material(possible fly ash), moist, loose to compact.		3		SS	19	34	100		■	
3												
4		-Becomes wet below about 4.6 m.		4		SS	7	17	100		■	
5												
6				5		SS	4	19	100		■	
7												
8				6		SS	6	21	100		■	
9												
10		**INDUSTRIAL WASTE**(continued)		7		SS	7	22	100		■	
11				8		SS	5	25	100		■	
12												
13				9		SS	15	15	100		■	
14												
15		-Becomes saturated below about 15.0 m.		10		SS	4	26	100		■	
16				11		SS	14	25	100		■	
17.2				12		SS		30	100		■	
17		Borehole terminated at 17.22 m in industrial waste.										

Printed: 23 SEP 98

Gartner Lee Limited

BOREHOLE NO. 37A & B

PROJECT NAME: WALKER BROTHERS QUARRIES LANDFILL SITE (WEST PIT)
PROJECT NO. 81-6
CLIENT: Walker Brothers Quarries Limited
DATE: May 17, 1980
BOREHOLE TYPE: 4¼" I.D. Hollow Stem Augers
GEOLOGIST: P.P.
ELEVATION: 604.4 & 604.7
TECHNOLOGIST:

DEPTH ELEV. ft.	STRATIGRAPHY	DESCRIPTION Borehole 37A	SAMPLE NO.	SAMPLE TYPE	SAMPLE BLOWS/FT.	SAMPLE % WATER	GROUND WATER 37A	GROUND WATER 37B	REMARKS
0.0									
		Fill, silty clay, light brown							Seals
5.5		Sand, black, fine to medium, loose sand mixed with yellow foundry sand castings	1	SS	20				
			2	SS	12				
			3	SS	21				
									Seal
			4	SS	4				20 ft to 29 ft. Saturated
			5	SS	8				
29		Fill, silty clay, light yellow brown, hard, only slightly moist	6	SS	36			▲	
35		Refuse, wood waste and very light grey ash							Borehole backfilled with 3/8" crushed stone
54		Assumed shale bedrock							Very hard augering
60		Borehole terminated at 60 feet in assumed shale bedrock					●		

BOREHOLE NO. 38

PROJECT NAME WALKER BROTHERS QUARRY - (EAST PIT) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE June 12, 13 1979

BOREHOLE TYPE NX Rock Core GEOLOGIST A.B.

ELEVATION 553.3' TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE R.Q.D. %	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.0								
1.5		RUBBLE Broken, weathered Rochester shale						
		ROCHESTER SHALE Dark grey, aphanitic crystalline, massive bedded shale platy, weathered in upper 17.0' Fossiliferous from 36.0' to 47.0' some grey limestone interbeds present from 34.1'-35.0'.	NX		52	91		
			NX		96	100	▲	
			NX		94	100		
			NX		100	100		
47.0		IRONDEQUOIT DOLOMITIC LIMESTONE Light brown grey, coarse crystalline, thin to medium bedded dolomitic limestone, fossiliferous, pink crinoids	NX		69	100		
54.1		REYNALES DOLOMITE Light grey, fine to aphanitic crystalline, medium bedded dolomite, minor green silt and grey shale seams from 58.5' - 69.0', lower zone mineralized	NX		79	100	●	
69.0		NEAHGA SHALE Green, aphanitic, thin bedded shale with limestone at 69.0-71.0'	NX		96	100		
71.0		THOROLD SANDSTONE Light green to white, medium bedded sandstone, minor green shale seams from 71.0'-77.4'	NX		91	100		
80.0		Borehole terminated at 80.0' in sandstone						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 39

PROJECT NAME WALKER BROTHERS QUARRY - (EAST PIT) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE June 14,15,18, 1979

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers, NX Rock Core GEOLOGIST A.B.

ELEVATION 580.8' 177 TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE R.Q.D. %	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.5		TOPSOIL						
		LACUSTRINE CLAYEY SILT Brown, turning grey and becoming saturated with depth						
21.0		GOAT ISLAND AND GASPORT DOLOMITE Light grey, fine crystalline, thin to medium bedded dolomite fossiliferous, slightly weathered in upper section	NX		67	100		
			NX		58	100		
			NX		100	100		
			NX		99	100	▲	Lost water at 40.0' in borehole during drilling
50.1		DECEW DOLOMITE Dark grey, aphanitic crystalline, fractured dolomite	NX		94	100		
60.7		ROCHESTER SHALE Dark grey, aphanitic crystalline, massive bedded shale Platy Fossiliferous from 105.0' to 113.9'	NX		98	100		
			NX		92	100		
			NX		100	100		

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 39

PROJECT NAME WALKER BROTHERS QUARRY - (EAST PIT) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE June 14,15,18, 1979

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers, NX Rock Core GEOLOGIST A.B.

ELEVATION 580.8' TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE R.Q.D. %	SAMPLE %RECOVERY	GROUND WATER	REMARKS
90.0'		Rochester shale continued	NX		95	100		
			NX		97	100		
113.9		IRONDEQUOIT DOLOMITIC LIMESTONE Light brown grey, coarse crystalline, medium to thick bedded dolomitic limestone, porous	NX		80	100		
121.2		REYNALES DOLOMITE Light grey, fine to aphanitic crystalline, medium to thick bedded dolomite slightly shaly; lower portion mineralized	NX		100	100	●	
133.4		NEAHGA SHALE Green, aphanitic, thin to medium bedded shale with limestone from 133.4'-144.0'	NX		95	100		
138.3		THOROLD SANDSTONE Light green to white, medium bedded sandstone minor green siltstone and shale seams throughout.	NX		100	100		
147.2		GRIMSBY SANDSTONE-SHALE Mottled green and red interbedded sandstone and shale.						
154.0		Borehole terminated at 154.0' in sandstone						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 40

PROJECT NAME WALKER BROTHERS QUARRY - (EAST PIT) PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE June 19,20,21, 1979

BOREHOLE TYPE 3¼" I.D. Hollow Stem Augers, NX Rock Core GEOLOGIST A.B.

ELEVATION 604.9 184.3 TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE R.Q.D. %	SAMPLE %RECOVERY	GROUND WATER	REMARKS
0.5		TOPSOIL						
		LACUSTRINE CLAYEY SILT Grey brown clayey silt becoming saturated at ±12.0'						
19.0		GOAT ISLAND AND GASPORT DOLOMITE Light grey, medium to fine crystalline, medium bedded dolomite, porous from 19.0' to 34.0'	NX		97	84		
			NX		96	100		
			NX		96	100		
			NX		87	100	▲	lost water at 42.0' in borehole during drilling
55.7			NX		100	100		
		DECEW DOLOMITE Dark grey, aphanitic crystalline, fractured dolomite	NX		91	100		
68.2		ROCHESTER SHALE Dark grey, aphanitic crystalline, massive bedded shale platy, fossiliferous from 114.0'	NX		98	100		
			NX		97	96		

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 40

PROJECT NAME WALKER BROTHERS QUARRY - EAST PIT — PROJECT NO. 81-6

CLIENT WALKER BROTHERS QUARRIES LIMITED — DATE June 19,20,21, 1979

BOREHOLE TYPE 3¼" I.D. Hollow Stem Auger, NX Rock Core — GEOLOGIST A.B.

ELEVATION 604.9 — TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOWS/FT	SAMPLE R.Q.D. %	SAMPLE %RECOVERY	GROUND WATER	REMARKS
90.0		Rochester shale continued	NX		100	100		
			NX		100	100		
			NX		100	100		
121.9		IRONDEQUOIT DOLOMITIC LIMESTONE Light brown grey, coarse crystalline, medium to thick bedded dolomitic limestone	NX		97	100		
129.1		REYNALES DOLOMITE Light grey, aphanitic to fine crystalline, medium to thick bedded dolomite, slightly shaly, mineralized in lower portion	NX		97	100	●	
142.3		NEAHGA SHALE Green, aphanitic, medium bedded shale	NX		95	100		
147.7		THOROLD SANDSTONE Light green to white, thick to medium bedded sandstone, minor green shale seams from 147.1'-151.2'						
154.0		Borehole terminated at 154.0' in sandstone						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

LOG OF BOREHOLE 40-1r

WSP

project |	South Landfill			**project no. |**	131-22826-01
client |	Walker Aggregates Inc.	**rig type |**	CME 75	**date started |**	2016/12/05
location |	Thorold, ON	**method |**	Rock coring	**supervisor |**	SK
position |		**coring |**	HQ core, OD=96mm, ID=64mm	**reviewer |**	KJF

Depth Scale (m)	Elev / Depth (m)	STRATIGRAPHY	Graphic Plot	SAMPLE Number	Type	SPT N-Value / Core Recovery	Elevation Scale (mASL)
0	184.3	**GROUND SURFACE**					184
1							183
2		Brown **Fill**, silty clay to clayey silt with trace gravel, sand and wood, very hard, DTPL		S1	SS	44	182
3	180.6	...at 3.0 m, Reddish brown with trace red silt, firm to soft, ATPL to 3.7 m		S2	SS	38	181
4	3.7	Grey **SILTY CLAY**, trace gravel, soft, ATPL					180
5				S3	SS	10	179
6	177.6	*at 6.7m below grade*		S4	SS	96	178
7	6.7	Grey to light grey medium grained fossiliferous Gasport Formation **DOLOSTONE**, medium to thickly bedded. Hard core, scratched with difficulty with a knife. Light coloured crinoidal grainstone beds give the core a blotchy appearance. Reddish staining and red mud infilling to 7.9 m. Moderate RQD to 8.8 m then good to excellent RQD. Vuggy; up to 5% vugs typically 3 to 5 mm to 11.0 m. Shaley partings 2 mm to 6 mm thick, typically 5 per 1.5 m below 14.9 m.		5	R5	TCR = **100%**	177
8	176.1			6	R6	TCR = **100%**	176
9	8.2 / 174.6			7	R7	TCR = **100%**	175
10	9.7 / 173.1			8	R8	TCR = **100%**	174
11	11.2 / 171.8			9	R9	TCR = **100%**	173
12	12.5 / 170.2			10	R10	TCR = **100%**	172
13	14.1 / 168.6			11	R11	TCR = **100%**	171
14	15.7 / 167.1	...Sharp lower contact on change in texture					170
15	17.2	Medium to dark grey, fine grained argillaceous Decew Formation **DOLOSTONE**, barren. The core displays wavy soft sediment deformation.		12	R12	TCR = **98%**	169
16	165.6	...Gradational lower contact on change in texture					168
17	18.7	Dark grey, very fine grained Rochester Formation **DOLOMITIC SHALE**, with numerous, thin, lighter coloured, fine to medium grained bioclastic calcarenite beds up to 150 mm thick. Calcarenite beds represent 20% of the recovered core but increase to 50% below 35.3 m. Very poor RQD; core typically recovered at 25 mm pieces. Scratched easily with a knife.		13	R13	TCR = **100%**	167
18	164.1						166
19	20.2 / 162.8			14	R14	TCR = **100%**	165
20	21.5 / 161.3			15	R15	TCR = **100%**	164
21							163

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined ● Pocket Penetrometer + Field Vane ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

Fracture Frequency

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

Vertical fractures from 10.8 to 11.2 m

Vertical fractures from 13.6 to 14.1 m

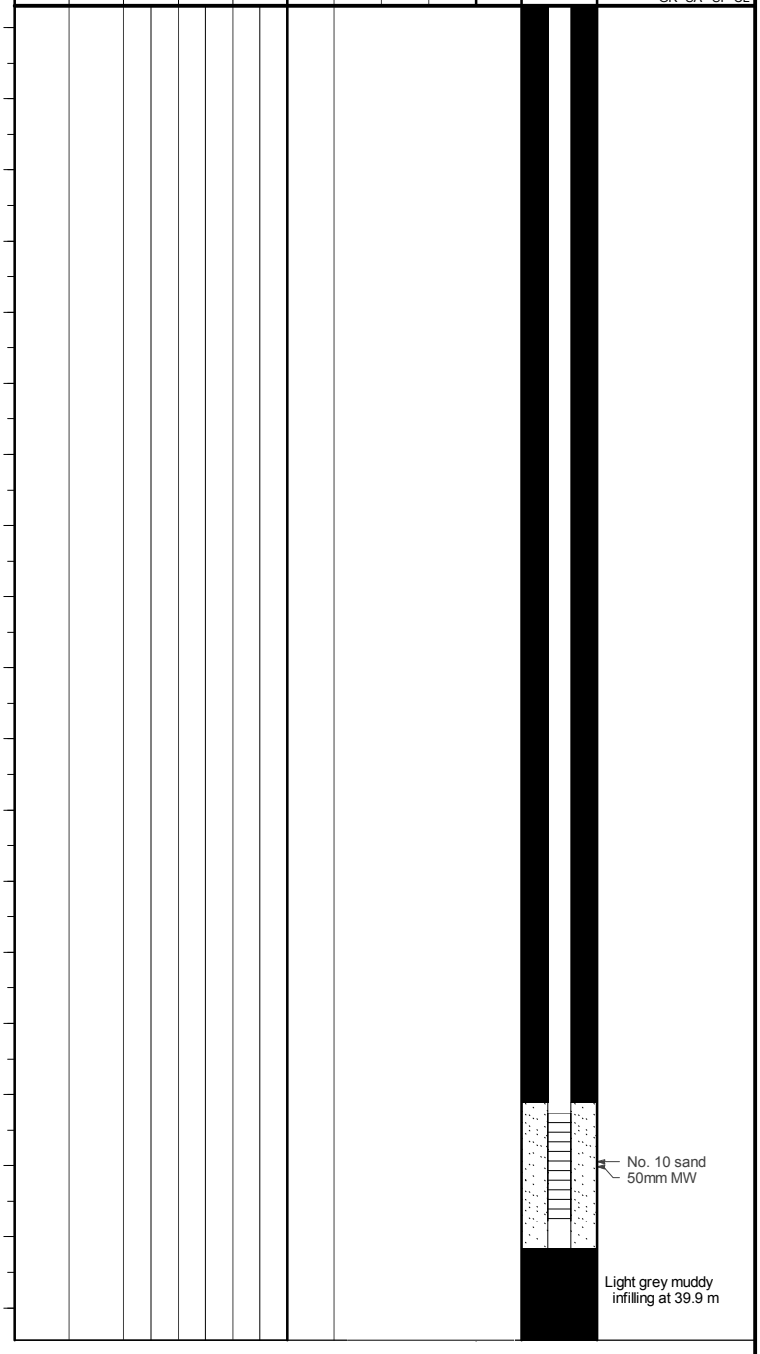
(continued next page)

LOG OF BOREHOLE 40-1r

project | South Landfill
project no. | 131-22826-01
client | Walker Aggregates Inc.
rig type | CME 75
date started | 2016/12/05
location | Thorold, ON
method | Rock coring
supervisor | SK
position |
coring | HQ core, OD=96mm, ID=64mm
reviewer | KJF

Depth Scale (m)	Elev / Depth (m)	STRATIGRAPHY (continued)	Graphic Plot	Sample Number	Sample Type	SPT N-Value / Core Recovery	Elevation Scale (mASL)
22		Dark grey, very fine grained Rochester Formation **DOLOMITIC SHALE**, with numerous, thin, lighter coloured, fine to medium grained bioclastic calcarenite beds up to 150 mm thick. Calcarenite beds represent 20% of the recovered core but increase to 50% below 35.3 m. Very poor RQD; core typically recovered at 25 mm pieces. Scratched easily with a knife. *(continued)*					162
23	161.3 / 23.0			15	R15	TCR = 100%	161
	23.3			16	R16	TCR = 100%	
24	159.5			17	R17	TCR = 100%	160
25	24.8			18	R18	TCR = 100%	159
26	157.9						158
27	26.4 / 156.7			19	R19	TCR = 100%	157
28	27.6			20	R20	TCR = 100%	156
29	155.1						155
30	29.2 / 153.5			21	R21	TCR = 100%	154
31	30.8						153
32	151.9			22	R22	TCR = 100%	152
33	32.4 / 150.4			23	R23	TCR = 100%	151
34	33.9						150
35	148.8			24	R24	TCR = 100%	149
36	35.5						148
37	147.3 / 37.0 / 146.9	...Sharp lower contact on change in colour and texture		25	R25	TCR = 100%	147
	37.4	Light grey, medium to coarse grained, thickly bedded fossiliferous Irondequoit Formation **LIMESTONE**, reacts to H-Cl. Hard, strong core. Good to excellent RQD.		26	R26	TCR = 100%	
38	146.0 / 38.3						146
39	145.1			27	R27	TCR = 100%	
	39.2 / 144.7	...Sharp lower contact on change in texture					145
40	39.6	Light grey to light greenish grey, fine grained, thinly bedded Reynales Formation **DOLOSTONE**, poor RQD.		28	R28	TCR = 100%	144
	143.5 / 40.8	**END OF BOREHOLE**					

Penetration Test Values (Blows / 0.3m) — Dynamic Cone: 10 20 30 40
Undrained Shear Strength (kPa) — Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40 80 120 160
Water Content (%) & Plasticity — PL MC LL: 10 20 30
PID Readings
Well Details
Lab Data and Comments — GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL



WATER LEVEL MONITORING

Date	Depth (m)	Elevation (m)
Dec 6, 2016	9.0	175.4

50 mm monitoring well installed.
No. 10 screen installed.

LOG OF BOREHOLE 40-2r

project | South Landfill
client | Walker Aggregates Inc.
location | Thorold, ON
position |

rig type | CME 75
method | Rock coring
coring | HQ core, OD=96mm, ID=64mm

project no. | 131-22826-01
date started | 2016/12/06
supervisor | SK
reviewer | KJF

Depth Scale (m)	Elev / Depth (m)	STRATIGRAPHY	Graphic Plot	SAMPLE: Number	SAMPLE: Type	SPT N-Value / Core Recovery
0	184.3	**GROUND SURFACE**				
		Augered straight to bedrock				
7	177.3 / 7.0	*at 7.0m below grade*				
14	14.1	**END OF BOREHOLE**				

Elevation Scale (mASL): 184, 183, 182, 181, 180, 179, 178, 177, 176, 175, 174, 173, 172, 171

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40

Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

Fracture Frequency

PID Readings

Well Details

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

For geologic details, see log for 40-1r

No. 10 sand
50mm MW

50 mm monitoring well installed.
No. 10 screen installed.

WATER LEVEL MONITORING

Date	Depth (m)	Elevation (m)
Dec 7, 2016	13.0	171.3

BOREHOLE NO. 41

PROJECT NAME Ground Water Monitor Installation BH 41 & 42 PROJECT NO. 82-81

CLIENT Walker Brothers Quarries Limited DATE Sept. 23/82

BOREHOLE TYPE 3" Airtrack Hole GEOLOGIST A.B.

GROUND ELEVATION WEATHER

DEPTH (ft)	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS	STRATIGRAPHY	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE %WATER	WATER CONTENT W_P W_L	COMMENTS
10	DOLOMITE-SHALE: Decew dolomite changing to Rochester shale								no samples. geological contacts are assumed
20									
30									
	34	▲							
40									
50									
54.0		●							

BOREHOLE NO. 42

PROJECT NAME Ground Water Monitor Installation BH 41 & 42 PROJECT NO. 82-81

CLIENT Walker Brothers Quarries Limited DATE Sept. 23/82

BOREHOLE TYPE 3" Airtrack Hole GEOLOGIST A.B.

GROUND ELEVATION 174.35 mASL (1998) WEATHER

DEPTH (ft)	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS	STRATIGRAPHY	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE %WATER	WATER CONTENT W_P	WATER CONTENT W_L	COMMENTS
4.0	FILL Medium brown clayey silt fill, moist.									geological contacts are assumed. no samples
	DOLOMITE Medium grey lockport dolomite									
20.0	DOLOMITE - SHALE Decew dolomite changing to Rochester shale									
	34	▲								
55.0		●								

BOREHOLE NO. 46-I

PROJECT NAME GROUND WATER MONITOR INSTALLATION

CLIENT WALKER BROTHERS QUARRIES LIMITED — DATE July 16,17, 1987

BOREHOLE TYPE 83 mm I.D. HOLLOW STEM AUGERS/98 mm HQ CORE — GEOLOGIST GAM

GROUND ELEVATION 179.12 — PROJECT NO. 87-237

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE Run No.	SAMPLE TYPE	SAMPLE RQD	SAMPLE % Recovery	PENETRATION RESISTANCE BLOWS /0.3m	WATER CONTENT % / COMMENT
0.1	TOPSOIL								
	CLAYEY SILT Medium brown, mottled becomes grey brown at 0.6 m clayey silt, Drier Than Plastic Limit, becomes Wetter Than Plastic Limit below ± 1.5 m.		Decommissioned and replaced with 46-1R (October 2003)	No Samples					Wp — Wl
6.8	DOLOSTONE (Lockport Fm) Medium grey, fine grained, medium to massive bedded, fractured dolostone ocassional shale bed, minor vugs, with calcite and gypsum.			1	HQ	88	100		
				2	HQ	97	100		
10.0									

BOREHOLE NO. 46-I (cont'd)

PROJECT NAME GROUND WATER MONITOR INSTALLATION

CLIENT WALKER BROTHERS QUARRIES LIMITED

DATE July 16, 17, 1987

BOREHOLE TYPE 83 mm I.D. HOLLOW STEM AUGERS/98 mm HQ CORE

GEOLOGIST GAM

GROUND ELEVATION

PROJECT NO. 87-237

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE Run No.	SAMPLE TYPE	SAMPLE RQD	SAMPLE % Recovery	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
10.0	DOLOSTONE (cont'd)			3	HQ	100	100		Wp — Wl
				4	HQ	94	100		
15.9	DOLOSTONE (Lockport Fm) Medium grey, coarse grained thick to massive bedded dolostone, occasional shale bed, with dolomite.			5	HQ	100	100		
				6	HQ	100	100		
	DOLOSTONE (Decew Fm) Dark grey, fine crystalline, massive bedded dolostone concoidal fracture.								
19.2	SHALE (Rochester Fm) Dark grey, with siltstone, with thin limestone beds, fine grained to aphanitics, massive bedded shale.								
19.9									

BOREHOLE NO. 46-I (cont'd)

PROJECT NAME GROUND WATER MONITOR INSTALLATION

CLIENT WALKER BROTHERS QUARRIES LIMITED DATE July 16, 17, 1987

BOREHOLE TYPE 83 mm I.D. HOLLOW STEM AUGUERS/98 mm HQ CORE GEOLOGIST GAM

GROUND ELEVATION PROJECT NO. 87-237

DEPTH 20(70)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE Run No.	SAMPLE TYPE	SAMPLE RQD	SAMPLE %Recovery	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT Wp — Wl
	SHALE (cont'd)			7	HQ	100	100		
				8	HQ	100	00		- gas encountere at ± 23.9 m and 27.8 m - flammable, strong H_2S odour
				9	HQ	91	99		
27.8	Diamond Drill Hole terminated in shale at ± 27.8 metres.								

BOREHOLE LOG	PROJECT: 23-694	BOREHOLE: 46-1R 1 of 3
Decommissioning/Reinstallation of Well Nest 32, 23 and 46-I Niagara Falls Landfill **FOR:** Walker Industries Holdings Ltd.		**DATE:** 8 October 2003 **GEOLOGIST** TMS **ELEVATION** 179.1 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0		**CLAYEY SILT (FILL)** Light brown clayey silt, trace gravel, some rootlets, soft, DTPL.		1		SS	27		60		
				2		SS	16		50		
1		- Becoming firm below 0.9 m depth.									
1.4		**CLAYEY SILT (NATIVE)** Brown clayey silt, occasional red mottling, firm, DTPL.		3		SS	36		80		
2				4		SS	29		90		
				5		SS	20		90		
3				6		SS	19		100		
		- Becoming greyish brown below 3.7 m depth.		7		SS	12		90		
4				8		SS	8		100		
5		- Becoming WTPL below 5.2 m depth.		9		SS	7		100		
		- Coarse sand from 5.6 m to 5.9 m depth.		10		SS	8		100		
6				11		SS	22/		100		
6.4		**DOLOSTONE (LOCKPORT FORMATION)** Greyish white dolostone, phaneritic to aphanitic with occasional fossiliferous zones throughout, thinly bedded, hard, occasional vug, occasional shale parting, broken to blocky, excellent quality.		12		HQ			100	63	
7				13		HQ			100	90	
8											
9				14		HQ			100	100	
10				15		HQ			100	100	
11											
				16		HQ			100	78	

BOREHOLE LOG	PROJECT: 23-694	BOREHOLE: 46-1R 2 of 3
Decommissioning/Reinstallation of Well Nest 32, 23 and 46-I Niagara Falls Landfill **FOR:** Walker Industries Holdings Ltd.		**DATE:** 8 October 2003 **GEOLOGIST** TMS **ELEVATION** 179.1 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
13				17		HQ			100	100	
14				18		HQ			100	100	
15		- Increasing shale content below 14.8 m depth.		19		HQ			100	100	
16											
17		- Becoming blocky and thinly to medium bedded below 16.6 m depth.		20		HQ			100	100	
18				21		HQ			100	100	
19											
19.6		**SHALEY DOLOSTONE (DECEW FORMATION)**		22		HQ			100	86	
20		Grey to dark grey shaley dolostone, phaneritic to aphanitic, thick bedded, hard, broken to blocky, excellent quality.									
21		- Becoming medium hard below 19.6 m depth.									
22				23		HQ			100	100	
23											
				24		HQ			100	94	

BOREHOLE LOG	PROJECT: 23-694	BOREHOLE: 46-1R 3 of 3
Decommissioning/Reinstallation of Well Nest 32, 23 and 46-I Niagara Falls Landfill **FOR:** Walker Industries Holdings Ltd.		**DATE:** 8 October 2003 **GEOLOGIST** TMS **ELEVATION** 179.1 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
24.4											
25		**SHALE (ROCHESTER FORMATION)** Dark grey shale, aphanitic, very thinly bedded, medium soft, blocky, good quality.		25		HQ			100	100	
26				26		HQ			100	100	
27											
27.3		Borehole terminated at 27.3 m depth in shale.									

LOG OF BOREHOLE 46-3R

project |	Walker Landfills - Well Decommissioning and Replacement			**project no. |**	131-22826-07
client |	Walker Industries	**rig type |**	CME 75, track-mounted	**date started |**	2018/05/30
location |	Thorold, Ontario	**method |**	Hollow stem augers, 215 mm dia.	**supervisor |**	BC
position |	E: 649390 N: 4776051 (17T, Geodetic)	**coring |**	HQ core, OD=96mm, ID=64mm	**reviewer |**	KJF

Depth (m)	Elev (m)	STRATIGRAPHY	Number	Type	SPT N-Value / Core Recovery
0	178.7	**GROUND SURFACE**			
		TOPSOIL = 76 mm, brown, grass and rootlets, humic odour, dry, loose ...at 0.1 m, occasional rootlets to 0.3 m	1	SS	14
		SILTY CLAY, brown with grey partings, occasional red silt partings, occasional fine gravel, laminated, DTPL, stiff ...at 0.8 m, becoming very stiff	2	SS	30
2		...at 1.5 m, grey partings becoming less frequent and red silt partings becoming more frequent (1-10 mm thickness)	3	SS	27
	176.4				
	2.3	**SILTY CLAY**, brown, homogeneous, DTPL, very stiff ...at 2.4 m, black staining to 2.5 m ...at 2.6 m, black staining (occurring vertically through middle of soil core) to 2.7 m ...at 3.0 m, becoming APL	4	SS	24
		...at 3.4 m, 7 cm layer of red-brown silt, weakly dilatant, wet, compact to 3.5 m ...at 3.5 m, becoming grey-brown	5	SS	16
4		...at 3.8 m, occasional thin grey partings and thin red silt partings, stiff to 5.2 m	6	SS	13
			7	SS	10
	173.4				
	5.3 173.2	**SILT AND CLAY**, alternating layers (2-15 mm thick) of grey-brown clay and red silt, clay layers are APL and firm, silt layers are wet, loose, and weakly dilatant	8	SS	8
	5.5 172.8				
6	5.9	**CLAYEY SILT**, red-brown, weakly dilatant, APL to WTPL and firm to saturated and loose ...at 5.8 m, occasional fine gravel to 5.9 m	9	SS	25
	172.1				
	6.6	**SILT**, red-brown, gravelly to trace gravel (fine to coarse, subrounded), trace sand, some to trace clay, APL to WTPL, firm ...at 6.5 m, clay no longer evident, wet, dense, weakly dilatant to 6.6 m	R1		TCR = **100**% RQD = **67**%
	171.1	Goat Island Formation, medium to dark brownish grey **DOLOSTONE**, fine to medium grained, medium bedded, slightly weathered with enhanced fractures at 7.9 m. Hard, strong core with few vugs. Fair to excellent RQD. Calcite filled cavities, 25 to 50 mm, at 1 to 2 per 0.3 m from 7.6 to 8.2 m. Gypsum nodule, 75 mm, at 8.5 m. Sharp lower contact at change in texture.	R2		TCR = **100**% RQD = **99**%
9	169.6		R3		TCR = **100**% RQD = **85**%
	168.8				

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane; 40 80 120 160

Water Content (%) & Plasticity: PL MC LL; 10 20 30

Elevation Scale (mASL): 178 177 176 175 174 173 172 171 170 169

PID Readings

Well Details: 3/8" granular bentonite; bentonite grout; slotted pipe w/ sand pack

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

(continued next page)

LOG OF BOREHOLE 46-3R

project |	Walker Landfills - Well Decommissioning and Replacement			**project no. |**	131-22826-07
client |	Walker Industries	**rig type |**	CME 75, track-mounted	**date started |**	2018/05/30
location |	Thorold, Ontario	**method |**	Hollow stem augers, 215 mm dia.	**supervisor |**	BC
position |	E: 649390 N: 4776051 (17T, Geodetic)	**coring |**	HQ core, OD=96mm, ID=64mm	**reviewer |**	KJF

Depth Scale (m)	Elev / Depth (m)	STRATIGRAPHY	Graphic Plot	SAMPLE Number	SAMPLE Type	SPT N-Value / Core Recovery	Elevation Scale (mASL)
10		*(continued)*					
	9.9	Gasport Formation, medium to dark grey **DOLOSTONE**, fine to medium grained, fossiliferous, hard, strong, smooth core. Excellent RQD. Stylolytes, 1 to 2 mm thick, at 1 to 2 per 50 mm from 10.2 m to end of hole. *(continued)*			R3	TCR = **100**% RQD = **85**%	
	168.0 10.7						

Penetration Test Values (Blows / 0.3m) — Dynamic Cone: 10 20 30 40

Undrained Shear Strength (kPa) — ○ Unconfined ● Pocket Penetrometer + Field Vane ■ Lab Vane: 40 80 120 160

Water Content (%) & Plasticity — PL MC LL: 10 20 30

PID Readings

Well Details

Lab Data and Comments — GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

END OF BOREHOLE

Water level not measured in borehole prior to well installation.

50 mm monitoring well installed.
No. 10 screen installed.

WATER LEVEL MONITORING

Date	Depth (m)	Elevation (m)
May 30, 2018	1.2	177.6
Jun 4, 2018	7.4	171.4

BOREHOLE NO. 47-I

PROJECT NAME GROUND WATER MONITOR INSTALLATION

CLIENT WALKER BROTHERS QUARRIES LIMITED

DATE July 9-13, 1987

BOREHOLE TYPE 83 mm I.D. HOLLOW STEM AUGERS/98 mm HQ CORE

GEOLOGIST GAM

GROUND ELEVATION 180.7

PROJECT NO. 87-237

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE Run No.	SAMPLE TYPE	SAMPLE RQD	SAMPLE % Recovery	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
0.1	TOPSOIL								
	CLAYEY SILT Medium brown, mottled, clayey silt, Drier Than Plastic Limit.			No Samples					
	Becomes Wetter Than Plastic Limit.								
	Colour changes to grey at ± 4.0 m.								

WP WL

BOREHOLE NO. 47-I (cont'd)

PROJECT NAME: GROUND WATER MONITOR INSTALLATION

CLIENT: WALKER BROTHERS QUARRIES LIMITED

DATE: July 9-13, 1987

BOREHOLE TYPE: 83 mm I.D. HOLLOW STEM AUGERS/98 mm HQ CORE

GEOLOGIST: GAM

GROUND ELEVATION:

PROJECT NO.: 87-237

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE Run No.	SAMPLE TYPE	SAMPLE RQD	SAMPLE % Recovery	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
10.1	CLAYEY SILT (cont'd)			1	HQ	52	100		Wp — Wl
	DOLOSTONE (Lockport Fm) Medium to dark grey, fine grained, medium to massive bedding, dolostone fractured from ± 11.1 to 20.3 m, occasional thin shale bed, occasional vug with gypsum inclusions.			2	HQ	93	100		-lost drilling fluid return from ± 10.5 m
				3	HQ	99	100		
				4	HQ	99	100		
20.0									

BOREHOLE NO. 47-I (cont'd)

PROJECT NAME: GROUND WATER MONITOR INSTALLATION

CLIENT: WALKER BROTHERS QUARRIES LIMITED

DATE: July 9-13, 1987

BOREHOLE TYPE: 83 mm I.D. HOLLOW STEM AUGERS/98 mm HQ CORE

GEOLOGIST: GAM

GROUND ELEVATION:

PROJECT NO.: 87-237

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE Run No.	SAMPLE TYPE	SAMPLE RQD	SAMPLE % Recovery	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
20.0	DOLOSTONE (cont'd)			5	HQ	97	100		Wp — Wl
				6	HQ	100	100		
23.8				7	HQ	98	100		
	SHALE (Rochester Fm) Dark grey, with siltstone and thin limestone beds, fine grained to aphanitic massive bedded shale, with fossils, calcite and gypsum.			8	HQ	92	100		
				9	HQ	100	100		-gas encountered at ± 28 m, strong H_2S odour and flammable
				10	HQ	88	97		
30.0				11	HQ	79	100		

BOREHOLE NO. 47-I

PROJECT NAME GROUND WATER MONITOR INSTALLATION

CLIENT WALKER BROTHERS QUARRIES LIMITED

DATE July 9-13, 1987

BOREHOLE TYPE 83 mm I.D. HOLLOW STEM AUGERS/98 mm HQ CORE

GEOLOGIST GAM

GROUND ELEVATION

PROJECT NO. 87-237

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS AND NUMBER	SAMPLE Run No.	SAMPLE TYPE	SAMPLE RQD	SAMPLE % Recovery	PENETRATION RESISTANCE BLOWS/0.3m	WATER CONTENT % / COMMENT
30.0	SHALE (cont'd) Fractured from about 30.4 to 30.7 metres.								Wp — Wl
31.0	Diamond Drill Hole terminated in shale at ± 31.0 metres.								

BOREHOLE LOG	PROJECT: 50-500	BOREHOLE: 47-1R 1 of 2
Decommissioning and Installation of Well Nest 47 Thorold, ON **FOR:** Niagara Waste Systems Limited and Walker Brothers Quarries		**DATE:** 25 May 2005 **GEOLOGIST** AD/PJAM **ELEVATION** 177.1 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	N VALUE	% WATER	% REC	% RQD	COMMENTS
0.2		**TOPSOIL** Medium brown sandy silt topsoil, some clay, rootlets, orange and grey mottling, dry to moist, compact.		1		CS					
0.3		**CLAYEY SILT (FILL)** Reddish-brown clayey silt fill, light brown mottling, some rootlets, blocky, APL, firm.									
1.2	1	**CLAYEY SILT (NATIVE)** Brown clayey silt till, heavily weathered, grey weathering of fractured faces, laminated, firm		2		CS					
	2	**CLAYEY-SILT (NATIVE)** Brownish grey clayey silt to silty clay, weathered to 2.0 m depth, firm to soft, APL. - Increase in silt content below ~2.0 m depth.									
	3			3		CS					
	4										
	5			4		CS					
	6			5		CS					
	7										
7.3		**DOLOSTONE (LOCKPORT FORMATION)** Light Grey dolostone, aphanitic, occasional shale partings, occasional fossiliferous zone, thick bedded, hard, very broken to broken, fresh weathering of fracture faces. - Vug infilled with calcite deposite at ~8.56 m depth.		1		HQ					
	8			2		HQ					
	9										
	10			3		HQ					
	11			4		HQ					
	12										
	13			5		HQ					
	14			6		HQ					
	15										
				7		HQ					

BOREHOLE LOG	PROJECT: 50-500	BOREHOLE: 47-1R 2 of 2
Decommissioning and Installation of Well Nest 47 Thorold, ON **FOR:** Niagara Waste Systems Limited and Walker Brothers Quarries		**DATE:** 25 May 2005 **GEOLOGIST** AD/PJAM **ELEVATION** 177.1 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
17.0		**SHALEY DOLOSTONE (DECEW FORMATION)** Grey to medium grey, shaley dolostone, aphanitic, fossiliferous, occasional shale partings, thin bedded, hard, broken to blocky, some calcite formations on fracture faces, fresh to moderately weathered.		8		HQ					
				9		HQ					
20.4		**SHALE (ROCHESTER FORMATION)** Dark grey shale, aphanitic, thin bedded, medium soft, broken to very broken, some shale partings, hard, broken, fresh weathering on fracture faces.		10		HQ					
				11		HQ					
				12		HQ					
				13		HQ					
				14		HQ					
				15		HQ					
29.3		Borehole terminated at ~29.3 m depth in shale (Rochester Formation).									

BOREHOLE LOG	PROJECT: 50-500	BOREHOLE: 47-2R 1 of 1
Decommissioning and Installation of Well Nest 47 Thorold, ON **FOR:** Niagara Waste Systems Limited and Walker Brothers Quarries		**DATE:** 25 May 2005 **GEOLOGIST** AD/PJAM **ELEVATION** 177.0 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.2 0.3 1.2		**TOPSOIL** Medium brown sandy silt topsoil, some clay, rootlets, orange and grey mottling, dry to moist, compact.									Drilled to ~17.02 m depth without sampling. Stratigraphy inferred from adjacent borehole 47-1R.
		CLAYEY SILT (FILL) Reddish-brown clayey silt fill, light brown mottling, some rootlets, blocky, APL, firm.									
		CLAYEY-SILT (NATIVE) Brown clayey-silt till, heavily weathered, grey weathering of fracture faces, laminated, firm.									
		CLAYEY SILT (FILL) Reddish-brown clayey silt fill, light brown mottling, some rootlets, blocky, APL, firm. - Increase in silt content below ~2.0 m depth.									
7.3		**DOLOSTONE (LOCKPORT FORMATION)** Light grey dolostone, aphanitic, occasional shale partings, occasional fossiliferous zone, thick bedded, hard, very broken to broken, fresh weathering of fracture faces.		1		HQ					
				2		HQ					
17.0		Borehole terminated at ~17.02 m in dolostone (Lockport Formation).									

BOREHOLE LOG	PROJECT: 50-500	BOREHOLE: 47-3R 1 of 1
Decommissioning and Installation of Well Nest 47 Thorold, ON **FOR:** Niagara Waste Systems Limited and Walker Brothers Quarries		**DATE:** 26 May 2005 **GEOLOGIST** AD/PJAM **ELEVATION** 176.9 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.2 0.3		**TOPSOIL** Medium brown sandy silt topsoil, some clay, rootlets, orange and grey mottling, dry to moist, compact.									Drilled to ~11.2 m depth without sampling. Stratigraphy inferred from adjacent borehole 47-1R.
1.2		**CLAYEY-SILT (FILL)** Reddish-brown clayey-silt fill, light brown mottling, some rootlets, blocky, APL, firm.									
		CLAYEY-SILT (NATIVE) Brown clayey-silt till, heavily weathered, grey staining of fracture faces, laminated, firm.									
		CLAYEY-SILT (NATIVE) Brownish grey clayey silt to silty clay, weathered to ~2.0 m depth, firm to soft, APL. - Increase in silt content below ~2.0 m depth.									
7.3		**DOLOSTONE (LOCKPORT FORMATION)** Light grey dolostone, aphanitic, occasional shale partings, occasional fossiliferous zone, thick bedded, hard, very broken to broken, fresh weathering of fracture faces.		1		HQ					
				2		HQ					
11.2		Borehole terminated at ~11.2 m depth in dolostone (Lockport Formation).									

BOREHOLE LOG	PROJECT: 50-500	BOREHOLE: 47-4R 1 of 1
Decommissioning and Installation of Well Nest 47 Thorold, ON **FOR:** Niagara Waste Systems Limited and Walker Brothers Quarries		**DATE:** 26 May 2005 **GEOLOGIST** AD/PJAM **ELEVATION** 176.9 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.2 0.3 1.2 1 2 3 4 5 6 7 7.3		**TOPSOIL** Medium brown sandy silt topsoil, some clay, rootlets, orange and grey mottling, dry to moist, compact. **CLAYEY SILT (FILL)** Reddish-brown clayey silt fill, light brown mottling, some rootlets, blocky, APL, firm. **CLAYEY SILT (NATIVE)** Brown clayey silt till, heavily weathered, grey staining of fracture faces, laminated, firm. **CLAYEY-SILT (NATIVE)** Brownish grey silty-clay to clayey-silt, weathered to ~2.0 m depth, firm to soft, APL. - Increase in silt content below ~2.0 m depth. Borehole terminated at ~7.3 m depth in clayey-silt.									Drilled to ~7.3 m depth without sampling. Stratigraphy inferred from adjacent borehole 47-1R.

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 48-I

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

CLIENT WALKER BROTHERS

DATE Jan.25, 1988
GEOLOGIST DCF
ELEVATION 184.6 m.a.s.l.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p — W_l
	CLAYEY SILT Not sampled, make reference to Borehole Log 48-II		S							

BOREHOLE LOG

PROJECT NO. 87-347 | **BOREHOLE NO.** 48-I

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE Jan.25, 1988
GEOLOGIST DCF
ELEVATION 184.6 m.a.s.l.

CLIENT WALKER BROTHERS

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE REC.	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p ——— W_l
10										
	DOLOSTONE (Lockport Formation) Fine to medium grained dolostone. Grey, fossiliferous, medium to massive bedded, occasional fractures, minor clay seams (1-2 mm), minor vugs (1-5 mm) with calcite, and rarely, gypsum infilling				1	HQ	100	91		
					2	HQ	100	97		
	DOLOSTONE (Decew Formation) Fine crystalline argillaceous dolostone. Dark grey, massive bedded, conchoidal fracture.									
13.6										
14.0					3	HQ	100	85		
	SHALE (Rochester Formation) Aphanitic shale with interbeds of siltstone and limestone (5-30 cm), dark grey, thinly bedded (1-10 mm), platy, calcareous.				4	HQ	100	73		
					5	HQ	100	97		
					6	HQ	100	92		
					7	HQ	100	100		

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 48-I

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE Jan.25, 1988

GEOLOGIST DCF

CLIENT WALKER BROTHERS

ELEVATION 184.6 m.a.s.l.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE REC	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3 m)	WATER CONTENT (%) W_p ____ W_l
20	SHALE (Rochester Formation) - continued				8	HQ	100	100		
22.3	Hq Core Hole terminated at 22.3 m in shale.		P							

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 48-II

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE Jan.22, 1988

GEOLOGIST DCF

CLIENT WALKER BROTHERS

ELEVATION 184.6 m.a.s.l.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	'N' VALUE	% WATER
	CLAYEY SILT Mottled reddish brown and grey clayey silt with trace fine sand, grey laminations at 1 to 5 mm intervals. D.T.P.L. becoming W.T.P.L. below 3 m. Very stiff.	1	SS	19	21
		2	SS	22	20
		3	SS	26	19
		4	SS	17	26
		5	SS	22	20
		6	SS	21	14
		7	SS	14	14
		8	SS	12	27
8.6	SILT TILL Mottled dark reddish brown silt till with occasional faint banding, W.T.P.L. becoming D.T.P.L. below 9.3 m, hard.	9	SS	58	9
9.9					

PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m) 10 20 30 40

WATER CONTENT (%) W_p W_l 10 20 30 40

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 48-II

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

CLIENT WALKER BROTHERS

DATE Jan.21, 1988

GEOLOGIST DCF

ELEVATION 184.6 m.a.s.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE REC	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p ——— W_l
10										
	DOLOSTONE (Lockport Formation) Fine to medium grained dolostone. Medium grey, fossiliferous, medium to massive bedded, occasional fractures, minor clay seams (1-2 mm), minor vugs (1-5 mm), with calcite, and rarely, gypsum infilling.				1	HQ	100	72		
					2	HQ	100	97		
13.9	DOLOSTONE (Decew Formation) Fine crystalline argillaceous dolostone. Dark grey, massive bedded, conchoidal fracture				3	HQ	100	88		
14.7	Hq Core Hole terminated in dolostone at 14.7 m.									

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 49-I

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE Jan.18, 1988

CLIENT WALKER BROTHERS

GEOLOGIST DCF

ELEVATION 183.6 m.a.s.l.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m) 10 20 30 40	WATER CONTENT (%) W_p W_l 10 20 30 40
	CLAYEY SILT Mottled, grey and reddish brown clayey silt with trace fine sand. Grey laminations at 1 to 5 mm intervals. DTPL becoming WTPL below 6 m. Very stiff becoming stiff below 6 m.				1	SS	30	19		
					2	SS	32	16		
					3	SS	31			
					4	SS	21	14		
					5	SS	36	14		
					6	SS	32	15		
					7	SS	18	16		
					8	SS	12	18		
8.6	SILT TILL Dark reddish brown silt till with sand and trace clay. WTPL. Very stiff.		S		9	SS	22	13		
9.8										

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 49-I

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE JAN.18, 1988

GEOLOGIST DCF

CLIENT WALKER BROTHERS

ELEVATION 183.6 m.a.s.l.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE REC.	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p ——— W_l
10.0	DOLOSTONE (Lockport Formation) Medium grained dolostone, grey, fossiliferous, thick to massive bedded, minor mud seams (1.2 mm), heavily fractured, abundant shale clasts below 10.5 m		I		1	HQ	97	58		
12.3	DOLOSTONE (Decew Formation) Fine crystalline argillaceous dolostone, dark grey, massive bedded, conchoidal fracture.				2	HQ	100	90		
13.0	SHALE (Rochester Formation) Aphanitic shale with interbeds of siltstone and limestone, dark grey, thinly bedded (1-10 mm), platy, calcareous.				3	HQ	100	98		
					4	HQ	98	85		
					5	HQ	100	100		
					6	HQ	100	95		
					7	HQ	100	98		

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 49-I

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE JAN.18, 1988

GEOLOGIST DCF

CLIENT WALKER BROTHERS

ELEVATION 183.6 m.a.s.l.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE REC.	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p — W_l
20.0	SHALE (Rochester Formation) - continued				8	HQ	100	98		
					9	HQ	100	100		
23.7	Hq Core hole terminated at 23.7 m in shale.		P							

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 49-II

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE 88/01/20

CLIENT WALKER BROTHERS QUARRIES

GEOLOGIST DCF

ELEVATION 183.6 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p — W_l
	CLAYEY SILT: Not sampled, please make reference to Borehole Log 49-I									
			caved							

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 49-II

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE 88/01/20

GEOLOGIST D.C.F.

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 183.6 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p — W_l
10.1	DOLOSTONE: (Lockport Formation) Medium grained dolostone. Grey, fossiliferous, medium to massive bedded, heavily fractured, minor clay seams (1-2 mm) minor vugs (1-5 mm) with calcite infilling, abundant shale clasts below 10.5.				1	HQ	97	79		
12.4	DOLOSTONE: (Decew Formation) Fine crystalline argillaceous dolostone. Dark grey, massive bedded conchoidal fracture.				2	HQ	100	100		
13.4	SHALE: (Rochester Formation) Aphanitic shale. Dark grey, thinly bedded, (1-10 mm) platy, calcareous, with interbeds of siltstone and limestone.		S		3	HQ	100	85		
13.9	HQ core hole terminated in Shale at 13.9 m.									

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 50-I

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE 88/01/15

GEOLOGIST D.C.F.

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 182.1 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	'N' VALUE	% WATER
	CLAYEY SILT: Mottled grey and dark reddish brown clayey silt with trace fine sand. D.T.P.L. becoming W.T.P.L. below 5 m. Very stiff below 2 m, firm below 6 m.				1	SS	20	21
					2	SS	22	20
					3	SS	9	27
					4	SS	9	26
5					5	SS	7	24
					6	SS	8	33
			caved		7	SS	5	31
7.6	DOLOSTONE: (Lockport Formation) Fine to medium grained dolostone. Grey, fossiliferous, thick bedded, occasional fractures, minor clay seams (1.2 mm), minor vugs with calcite and, rarely, gypsum infilling.					REC	RQD	
					1	HQ	80	44
					2	HQ	100	82

PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3 m)
10 20 30 40

WATER CONTENT (%)
W_p W_l
10 20 30 40

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 50-I

PROJECT NAME WALKER BROTHERS QUARRIES EXPANSION HYDROGEOLOGICAL STUDY

DATE 88/01/15

GEOLOGIST DCF

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 182.1 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3 m)	WATER CONTENT (%) W_p — W_l
10	DOLOSTONE:(Lockport Formation) - continued				3	HQ	100	100		
					4	HQ	100	87		
					5	HQ	100	93		
14.7	DOLOSTONE:(Decew Formation) Fine crystalline argillaceous dolostone, dark grey, massive bedded, conchoidal fracture.				6	HQ	100	93		
					7	HQ	100	92		
17.4	SHALE: (Rochester Formation) Aphanitic shale with interbeds of siltstone and limestone (5-30 cm), dark grey, thinly bedded (1-10 mm), platy, calcareous.				8	HQ	100	92		
					9	HQ	100	98		

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 50-I

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE 88/01/15

GEOLOGIST DCF

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 182.1 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p — W_l
20	SHALE: (Rochester Formation) - continued		I		10	HQ	100	98		
					11	HQ	100	100		
23.7	HQ Core hole terminated at 23.7 m in shale		P							

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 50-II

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION HYDROGEOLOGICAL STUDY

DATE 88/01/28

GEOLOGIST D.C.F.

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 182.1 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE REC	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p ——— W_l
	CLAYEY SILT: Not sampled, please make reference to Borehole Log 50-I.									
			caved							
7.6	DOLOSTONE: (Lockport Formation) Fine to medium grained dolostone, grey, fossiliferous, thick bedded, occasional clay seams (1-2 mm), minor vugs (1-5 mm), minor fractures.				1	HQ	91	40		
					2	HQ	100	70		

BOREHOLE LOG

PROJECT NO. 87-347 | **BOREHOLE NO.** 50-II

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE 88/01/28
GEOLOGIST D.C.F.
ELEVATION 182.1 m A.S.L.

CLIENT WALKER BROTHERS QUARRIES

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3 m)	WATER CONTENT (%) W_p — W_l
10.0	DOLOSTONE: (Lockport Formation) - continued				3	HQ	100	94		
					4	HQ	100	97		
					5	HQ	100	96		
14.6	DOLOSTONE: (Decew Formation) Fine crystalline, argillaceous dolostone, dark grey, massive bedded, conchoidal fracture.				6	HQ	100	89		
15.5	HQ core hole terminated at 15.5 m in dolostone.		P							

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 50-III

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE 88/02/03

GEOLOGIST D.C.F.

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 182.2 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) Wp — Wl
	CLAYEY SILT: Not sampled, please make reference to Borehole 50-I									
			caved							
7.6	DOLOSTONE: (Lockport Formation) Fine to medium grained dolostone, grey, fossiliferous, thick bedded, occasional shale seams (1-2 mm), minor vugs (1-5 mm), minor fractures.						REC	RQD		
					1	HQ	94	79		
					2	HQ	100	98		

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 50-III

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE 88/02/03

GEOLOGIST D.C.F.

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 182.2 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3 m)	WATER CONTENT (%) W_p ——— W_l
10.0	DOLOSTONE: (Lockport Formation) - continued				3	HQ	100	100		
11.7	HQ Core hole terminated at 11.7 m in dolostone.		S							

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 50-IV

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION HYDROGEOLOGICAL STUDY

DATE 88/02/02

GEOLOGIST D.C.F.

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 182.1 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE: INTERVAL	SAMPLE: NO.	SAMPLE: TYPE	SAMPLE: 'N' VALUE	SAMPLE: % WATER	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3 m)	WATER CONTENT (%) W_p — W_l
	CLAYEY SILT: Not sampled, please make reference to Borehole 50-I.		IV							
7.7	Borehole terminated at 7.7 m on assumed bedrock.		S							

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 51-I

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE 88/02/05

GEOLOGIST D.C.F.

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 184.7 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE REC.	SAMPLE RQD
	CLAYEY SILT: Mottled, grey and reddish brown clayey silt with trace fine sand. Grey laminations at 1 to 5 mm intervals. D.P.T.L. becoming W.T.P.L. below 5 m. Very stiff to firm at depth.		I		1	SS	13	23		
					2	SS	28	23		
					3	SS	25	25		
					4	SS	12	26		
					5	SS	6	36		
					6	SS	13	23		
5.8	DOLOSTONE: (Lockport Formation) Fine to medium grained dolostone. Grey, fossiliferous, medium to massive bedded, occasional fractures, minor clay seams (1-2 mm), minor vugs (1-5 mm) with calcite and gypsum infilling, vuggy (25 %) 8.8-9.1 m.				1	HQ	87	73		
					2	HQ	100	83		
					3	HQ	100	93		

PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3 m) 10 20 30 40

WATER CONTENT (%) W_p W_l 10 20 30 40

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 51-I

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE 88/02/05

GEOLOGIST D.C.F.

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 184.7 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p ____ W_l
10	DOLOSTONE:(Lockport Formation) -continued		I		4	HQ	100	100		
					5	HQ	100	100		
					6	HQ	100	95		
					7	HQ	100	88		
					8	HQ	100	100		
					9	HQ	100	98		
19.4	DOLOSTONE: (Decew Formation) - description over				10	HQ	100	97		

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 51-I

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

CLIENT WALKER BROTHERS QUARRIES

DATE 88/02/05
GEOLOGIST D.C.F.
ELEVATION 184.7 mASL

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p — W_l
20			I							
	Fine crystalline argillaceous dolostone. Dark grey, massive bedded, conchoidal fracture.									
20.8	SHALE: (Rochester Formation) Aphanitic Shale, dark grey, thinly bedded (1-10 mm) platy, calcareous interbeds of siltstone and shale (5-30 cm)				11	HQ	100	92		
					12	HQ	100	100		
					13	HQ	100	100		
	MONITOR 51-I IS CONSTRUCTED OF TEFLON				14	HQ	100	100		
26.8	HQ core hole terminated 26.8 m in to shale.		P							

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 51-II

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION HYDROGEOLOGICAL STUDY

DATE 88/02/09

GEOLOGIST D.C.F.

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 184.7 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)	WATER CONTENT (%) W_p ——— W_l
	CLAYEY SILT: Not sampled, please make reference to Borehole Log 51-I.									
6.2							REC.	RQD		
	DOLOSTONE: (Lockport Formation) Fine to medium grained dolostone. Grey, fossiliferous, medium to massive bedded, occasional fractures, minor clay seams (1-2 mm), minor vugs (1-5 mm) with calcite and gypsum infilling. Vuggy (25%) 8.2-9.3 m.				1	HQ	93	81		
					2	HQ	100	93		
					3	HQ	100	85		

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 51-II

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION HYDROGEOLOGICAL STUDY

DATE 88/02/09

GEOLOGIST D.C.F.

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 184.7 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE RQD	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3 m)	WATER CONTENT (%) W_p — W_l
10	DOLOSTONE: (Lockport Formation) -continued				4	HQ	100	100		
					5	HQ	100	100		
					6	HQ	100	93		
					7	HQ	100	89		
	MONITOR 51-II IS CONSTRUCTED OF TEFLON				8	HQ	100	98		
					9	HQ	100	100		
19.2	HQ core hole terminated at 19.2 m in dolostone.		P							

BOREHOLE LOG

PROJECT NO. 87-347 | **BOREHOLE NO.** 51-III

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION HYDROGEOLOGICAL STUDY

CLIENT WALKER BROTHERS QUARRIES

DATE 88/02/10
GEOLOGIST D.C.F.
ELEVATION 184.7 m A.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	'N' VALUE	% WATER
	CLAYEY SILT: Not sampled, please make reference to Borehole Log 51-I.				
				REC.	RQD
6.6	DOLOSTONE: (Lockport Formation) Fine to medium grained dolostone. Grey, fossiliferous, medium to massive bedded, occasional fractures, minor clay seams (1-2 mm), minor vugs (1-5 mm) with calcite and rarely, gypsum infillings. Vuggy (25%) 7.8-9.3 m	1	HQ	78	85
		2	HQ	100	80
		3	HQ	100	100

PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3m)

WATER CONTENT (%) W_p W_l

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 51-III

PROJECT NAME WALKER BROTHERS QUARRY EXPANSION
HYDROGEOLOGICAL STUDY

DATE 88/02/10

GEOLOGIST D.C.F.

CLIENT WALKER BROTHERS QUARRIES

ELEVATION 184.7 mA.S.L.

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE RDQ	PENETRATION RESISTANCE 'N' VALUE (BLOWS/0.3 m)	WATER CONTENT (%) W_p — W_l
10.2	HQ core hole terminated at 10.2 m in dolostone.		S							

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 52-1

PROJECT NAME Walker Brothers Quarry Expansion Study
Thorold, Ontario

CLIENT Walker Brothers Quarries Limited

DATE 3 August 1988
GEOLOGIST D.C.F.
ELEVATION 179.2 m A.S.L.

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER I III	SAMPLE INTERVAL	NO.	TYPE	%RECOVERY	%RQD	RECOVERY (%) 20 40 60 80	RQD (%) 20 40 60 80
1		**CLAYEY SILT** Reddish brown clayey silt to silty clay, mottled, laminated, D.T.P.L. becoming W.T.P.L. below 6 m, not sampled, logged from cuttings.								
2										
3										
4										
5										
5.8		– dolostone boulders above bedrock								
6					1	HQ	100	0		
					2	HQ	100	83		
		DOLOSTONE (Lockport Formation) Grey, medium grained, fossiliferous dolostone. Medium to thick bedded with minor, thin (1-2 mm) shale seams, heavily fractured to 14m, vuggy (5%) to 11 m with calcite and some gypsum infilling.								
7										
8					3	HQ	100	81		
9										

P-Piezometer S-Standpipe G-Gas Monitor

Gartner Lee Limited

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 52-1

PROJECT NAME Walker Brothers Quarry Expansion Study
Thorold, Ontario

DATE 3 August 1988

CLIENT Walker Brothers Quarries Limited

GEOLOGIST D.C.F.

ELEVATION 179.2 m A.S.L.

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE %RECOVERY	SAMPLE %RQD	RECOVERY (%)	RQD (%)
11		- change to dark grey dolostone with high shale content	I III		4	HQ	100	70	20 40 60 80	20 40 60 80
12										
13										
14		- change to grey, fosssiliferous dolostone			5	HQ	100	87		
15.1		**DOLOSTONE** (Decew Formation) Dark grey, fine crystalline, argillaceous dolostone. Massive to thickly bedded, conchoidal fracture.								
16										
17					6	HQ	100	99		
18										
18.2		**SHALE** (Rochester Formation) Black, aphanitic shale with interbeds of limestone and siltstone. Thinly bedded, fissile, occasional gypsum seams (1-5 mm), and nodules.								
19										
19.9		HQ Corehole terminated at 19.85 m.								

P-Piezometer S-Standpipe G-Gas Monitor

Gartner Lee Limited

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 52-2

PROJECT NAME Walker Brothers Quarry Expansion Study
Thorold, Ontario

DATE 4 August 1988

GEOLOGIST D.C.F.

CLIENT Walker Brothers Quarries Limited

ELEVATION 179.5 m A.S.L.

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NO.	SAMPLE TYPE	SAMPLE %RECOVERY	SAMPLE %RQD	RECOVERY (%) 20 40 60 80	RQD (%) 20 40 60 80
0		**CLAYEY SILT** Reddish brown clayey silt to silty clay, mottled, laminated, D.T.P.L. becoming W.T.P.L. below 3 m, logged from cuttings.	II	1	GS				
1									
2				2	GS				
3				3	GS				
4									
5				4	GS				
5.6		**DOLOSTONE** (Lockport Formation) Grey, medium grained, fossiliferous dolostone. Medium to thick bedded with minor, thin (1-2 mm) shale seams, heavily fractured, vuggy (5%) with calcite and some gypsum infilling.		1	HQ	100	89		
6									
7									
8				2	HQ	100	100		
9									
9.3		HQ Corehole terminated at 9.28 m in dolostone.							

P-Piezometer S-Standpipe G-Gas Monitor

Gartner Lee Limited

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 53-1

PROJECT NAME Walker Brothers Quarry Expansion Study
Thorold, Ontario

DATE 27 July 1988

GEOLOGIST D.C.F.

CLIENT Walker Brothers Quarries Limited

ELEVATION 179.7 m A.S.L.

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER I III	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE %RECOVERY	SAMPLE %RQD	RECOVERY (%) 20 40 60 80	RQD (%) 20 40 60 80
0		**CLAYEY SILT**			1	GS				
1		Reddish brown clayey silt to silty clay, mottled, laminated, D.T.P.L. becoming W.T.P.L. below 6 m, logged from cuttings.								
2					2	GS				
3					3	GS				
4					4	GS				
5					5	GS				
6					6	GS				
7					7	GS				
8										
9										
9.8					1	HQ	92	51	□	×

P-Piezometer S-Standpipe G-Gas Monitor

Gartner Lee Limited

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 53-1

PROJECT NAME Walker Brothers Quarry Expansion Study
Thorold, Ontario

DATE 27 July 1988

GEOLOGIST D.C.F.

CLIENT Walker Brothers Quarries Limited

ELEVATION 179.7 m A.S.L.

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE %RECOVERY	SAMPLE %RQD	RECOVERY (%) 20 40 60 80	RQD (%) 20 40 60 80
11		DOLOSTONE (Lockport Formation) Grey, medium grained, fossiliferous dolostone. Medium to thick bedded with minor, thin (1-2 mm) shale seams, heavily fractured to 11 m, vuggy (5%) to 14 m with calcite and some gypsum infilling.			2	HQ	100	87		
12										
13										
14					3	HQ	100	99		
15										
16										
17					4	HQ	100	94		
18										
19					5	HQ	100	99		

P-Piezometer S-Standpipe G-Gas Monitor

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 53-1

PROJECT NAME Walker Brothers Quarry Expansion Study
Thorold, Ontario

DATE 27 July 1988

GEOLOGIST D.C.F.

CLIENT Walker Brothers Quarries Limited

ELEVATION 179.7 m A.S.L.

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER I III	SAMPLE INTERVAL	NO.	TYPE	%RECOVERY	%RQD	RECOVERY (%) 20 40 60 80	RQD (%) 20 40 60 80
21		DOLOSTONE (Lockport Formation) - continued								
21.8										
22		DOLOSTONE (Decew Formation) Dark grey, fine crystalline, argillaceous dolostone. Massive to thickly bedded, conchoidal fracture.			6	HQ	100	99		
23										
					7	HQ	100	93		
24										
24.8										
25		SHALE (Rochester Formation) Black, aphanitic shale with interbeds of limestone and siltstone. Thinly bedded, fissile, occasional gypsum seams (1-5 mm), and nodules.			8	HQ	100	96		
26										
26.4		HQ Corehole terminated at 26.37 m in shale.								

P-Piezometer S-Standpipe G-Gas Monitor

Gartner Lee Limited

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 53-2

PROJECT NAME Walker Brothers Quarry Expansion Study
Thorold, Ontario

DATE 3 August 1988

GEOLOGIST D.C.F.

CLIENT Walker Brothers Quarries Limited

ELEVATION 179.8 m A.S.L.

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE %RECOVERY	SAMPLE %RQD	RECOVERY (%) 20 40 60 80	RQD (%) 20 40 60 80
1		**CLAYEY SILT** Reddish brown clayey silt to silty clay, mottled, laminated, D.T.P.L. becoming W.T.P.L. below 6 m, not sampled, logged from cuttings.	II							
2										
3										
4										
5										
6										
7										
8										
9										

P-Piezometer S-Standpipe G-Gas Monitor

Gartner Lee Limited

BOREHOLE LOG

PROJECT NO. 87-347

BOREHOLE NO. 53-2

PROJECT NAME Walker Brothers Quarry Expansion Study
Thorold, Ontario

DATE 3 August 1988

GEOLOGIST D.C.F.

CLIENT Walker Brothers Quarries Limited

ELEVATION 179.8 m A.S.L.

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE INTERVAL	SAMPLE NO.	SAMPLE TYPE	SAMPLE %RECOVERY	SAMPLE %RQD	RECOVERY (%) 20 40 60 80	RQD (%) 20 40 60 80
10.1										
		DOLOSTONE (Lockport Formation)			1	HQ	100	71		
11		Grey, medium grained, fossiliferous dolostone. Medium to thick bedded with minor, thin (1-2 mm) shale seams, heavily fractured to 11 m, vuggy (5%) with calcite and some gypsum infilling.								
12					2	HQ	100	88		
13										
13.9		HQ Corehole terminated at 13.93 m in dolostone.								

P-Piezometer S-Standpipe G-Gas Monitor

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 53-IV 1 of 3

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 19 July 1990
GEOLOGIST KTH
ELEVATION 179.70 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	N VALUE	% WATER	% REC	% RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
		CLAYEY SILT	IV	1		SS	16	27	80			
		Medium brown clayey silt, some very fine sand, reddish-brown mottling, laminated, occasional blue clay-infilled horizontal and vertical partings, DTPL, firm to stiff, rootlets to about 1.0 m.		2		SS	22	24	100			
1				3		SS	19		100			
2				4		SS	19		70			
3				5		SS	16	24	90			
		WTPL, soft from about 3.7 m.		6		SS	11	24	100			
4				7		SS	8	23	70			
5												
		Dark reddish-brown silty clay, very soft, from about 5.6 m.		8		SS	7	23	100			
6												
7				9		SS	5	39	100			
8												
9		Trace coarse sand, very fine gravel from about 9.0 m.		10		SS	5	27	90			
10.1 10		**DOLOSTONE** (Lockport Formation - Goat Island Member)		11		HQ			95	72		
11		Dark grey, very finely crystalline, thin to thick bedded argillaceous dolostone. Dense with occasional clay seams. Occasional calcite and gypsum-infilled vugs, chert nodules.		12		HQ			98	54		
12				13		HQ			100	78		
13												
13.5		Contact gradational.										
14		**DOLOSTONE** (Lockport Formation - Gasport Member)		14		HQ			99	88		
		Medium to dark grey, very finely to finely crystalline, medium to thick bedded fossiliferous dolostone. Locally argillaceous - dense to weakly porous, shaly stringers and styolites numerous.										
15												

Printed: 11 SEP 98

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 53-IV 2 of 3

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 19 July 1990
GEOLOGIST KTH
ELEVATION 179.70 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
17			IV	15		HQ			100	92		
18												
19												
20		(Gasport Member - continued)										
20.6		Conglomeratic section from about 20.3 to 20.4 m.										
		Contact gradational.		16		HQ			100	80		
21		DOLOSTONE (Decew Formation)										
		Dark brownish-grey, very finely crystalline medium to thick bedded argillaceous dolostone. Occasional shaly stringer, conchoidal fracture.										
22												
23												
23.9		Contact gradational.		17		HQ			100	19		
24		SHALE (Rochester Formation)										
		Dark grey to black, thin to medium bedded calcareous shale to siltstone with interbeds of fossiliferous limestone to dolostone. Numerous fracture zones, clay seams.										
25		Fossiliferous zone from about 23.9 m to 24.0 m.		18		HQ			99	60		
26												
27												
		Strong sulfurous gas encountered at about 27.5 m.		19		HQ			100	42		
28												
29												
30		Fossiliferous zone, gypsum nodules from about 29.8 m to 29.2 m		20		HQ			100	34		
31		Fossiliferous zone, gypsum nodules from about 30.8 m to 31.7 m										
31.7												

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BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 53-IV 3 of 3

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 19 July 1990
GEOLOGIST KTH
ELEVATION 179.70 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
		Borehole terminated at 31.69 m in shale.	IV									

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BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 54-I 1 of 3

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 24 July 1990
GEOLOGIST KTH
ELEVATION 177.57 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%)	RQD (%)
		CLAYEY SILT	I IV	1		SS	9	25	60		25 50 75 100	25 50 75 100
		Yellowish-brown clayey silt, some very fine sand, reddish-brown mottling, blue clay-infilled horizontal and vertical partings, DTPL, firm to stiff, rootlets to about 1.4 m.		2		SS	21	15	55			
				3		SS	18	25	90			
				4		SS	15		90			
		Becomes APL at about 2.9 m.		5		SS	13		80			
		Medium brown from about 3.7 m.		6		SS	13	21	80			
4.7				7		SS	10	23	75			
		SANDY SILT TILL										
		Medium brown sandy silt, some clay, trace very fine gravel, reddish mottling, with very thin ochre sand laminae. APL, firm.		8		SS	9	22	100			
		Bluish-grey clayey silt, trace sand, very fine gravel, WTPL, soft from about 6.4 m to 6.6 m.		9		SS	30	7	100			
7.5		Grey fine to medium gravel, some silt, sand, trace clay, gravel subangular, flat, from about 7.4 m to 7.5 m.				HQ			97	57		
		DOLOSTONE (Lockport Formation - Goat Island Member)										
		Medium to dark grey, very finely crystalline, thin to medium bedded argillaceous dolostone. Dense, occasional shaly stringers and clay seams, chert nodules and gypsum-infilled vugs.										
10.0		Contact gradational.		12		HQ			100	79		
		DOLOSTONE (Lockport Formation - Gasport Member)										
		Medium to dark grey, finely crystalline, thin to thick bedded argillaceous dolostone, locally highly fossiliferous. Dense to weakly porous, thin shale interbeds and stringers common. Occasional clay seams, gypsum-infilled vugs.										
		Highly fossiliferous, shaly from about 14.2 m to 16.4 m.		13		HQ			100	84		

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Gartner Lee Limited

BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 54-I 2 of 3

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 24 July 1990
GEOLOGIST KTH
ELEVATION 177.57 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER I IV	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
17				14		HQ			100	90	■	▲
18												
19		Brownish-grey with laminations to thin beds of siltstone, locally conglomeratic from about 18.5 m to 20.7 m.		15		HQ			97	87	■	▲
20		(Gasport Member - continued)										
20.7		Contact gradational.		16		HQ			100	95	■	▲
21		**DOLOSTONE** (Decew Formation) Dark brownish-grey, very finely to finely crystalline, thick bedded argillaceous dolostone. Occasional shaly stringers to styolites, gypsum and calcite-infilled vugs. Weathered from about 20.7 m to 20.8 m.										
22												
23												
24.0		Contact gradational.		17		HQ			99	91	■	▲
24		**SHALE** (Rochester Formation) Dark grey to black, laminated to thinly bedded calcareous shale to siltstone. Laminae to thin beds of limestone occur throughout, locally fossiliferous. Occasional clay seams, pyrite nodules.										
25												
26												
27				18		HQ			98	92	■	▲
		Strong sulfurous gas encountered at about 27.5 m.										
28												
29												
		Weathered fossiliferous limestone from about 29.5 m to 29.9 m.		19		HQ			100	39	■	▲
30												
31												
31.6												

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BOREHOLE LOG	PROJECT: 90-115	BOREHOLE: 54-I 3 of 3
Walker Brothers Quarry Expansion Study Thorold, Ontario FOR: Walker Brothers Quarries Limited		DATE: 24 July 1990 GEOLOGIST KTH ELEVATION 177.57 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER (I IV)	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
		Borehole terminated at 31.55 m in shale.										

BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 54-II 1 of 2

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 25 July 1990
GEOLOGIST KTH
ELEVATION 177.40 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
		CLAYEY SILT Yellowish-brown clayey silt, some very fine sand, reddish-brown mottling, blue clay-infilled horizontal and vertical partings, DTPL, firm to stiff, rootlets to about 1.4 m.	II									
1												
2												
3		Becomes APL at about 2.9 m.										
4		Medium brown from about 3.7 m.										
4.7		**SANDY SILT TILL** Medium brown sandy silt, some clay, trace very fine gravel, reddish mottling, with very thin ochre sand laminae. APL, firm.										
5												
6		Bluish-grey clayey silt, trace sand, very fine gravel, WTPL, soft from about 6.4 m to 6.6 m.										
7												
7.5		Grey fine to medium gravel, some silt, sand, trace clay, gravel subangular, flat, from about 7.4 m to 7.5 m.		1		HQ			100	74		
8		**DOLOSTONE** (Lockport Formation - Goat Island Member) Medium to dark grey, very finely crystalline, thin to medium bedded argillaceous dolostone. Dense, occasional shaly stringers and clay seams, chert nodules and gypsum-infilled vugs.										
9												
10.0		Contact gradational.										
10		**DOLOSTONE** (Lockport Formation - Gasport Member) Medium to dark grey, finely crystalline, thin to thick bedded argillaceous dolostone, locally highly fossiliferous. Dense to weakly porous, thin shale interbeds and stringers common. Occasional clay seams, gypsum-infilled vugs.		2		HQ			99	73		
11												
12												
13				3		HQ			100	89		
14		Highly fossiliferous, shaly from about 14.2 m to 16.4 m.										
15												

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BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 54-II 2 of 2

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 25 July 1990
GEOLOGIST KTH
ELEVATION 177.40 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
			II	4		HQ			100	93		
17												
18												
		Brownish-grey with laminations to thin beds of siltstone, locally conglomeratic from about 18.5 m to 20.7 m.		5		HQ			100	93	■	▲
19												
20		(Gasport Member - continued)										
20.7		Contact gradational.										
21		DOLOSTONE (Decew Formation) Dark brownish-grey, very finely to finely crystalline, thick bedded argillaceous dolostone. Occasional shaly stringers to styolites, gypsum and calcite-infilled vugs. Weathered from about 20.7 m to 20.8 m.		6		HQ			100	83	■	▲
22												
23												
23.7		Contact gradational.										
24.2 24		SHALE (Rochester Formation) Dark grey to black laminated to thinly bedded calcareous shale to siltstone, locally fossiliferous. Borehole terminated at 24.20 m in shale. **Stratigraphy inferred from BH 54-I.**										

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BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 54-III 1 of 1

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 26 July 1990
GEOLOGIST KTH
ELEVATION 177.35 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
			III									
1		**CLAYEY SILT** Yellowish-brown clayey silt, some very fine sand, reddish-brown mottling, blue clay-infilled horizontal and vertical partings, DTPL, firm to stiff, rootlets to about 1.4 m.										
2												
3		Becomes APL at about 2.9 m.										
4		Medium brown from about 3.7 m.										
4.7												
5		**SANDY SILT TILL** Medium brown sandy silt, some clay, trace very fine gravel, reddish mottling, with very thin ochre sand laminae. APL, firm.										
6		Bluish-grey clayey silt, trace sand, very fine gravel, WTPL, soft from about 6.4 m to 6.6 m.										
7												
7.5		Grey fine to medium gravel, some silt, sand, trace clay, gravel subangular, flat, from about 7.4 m to 7.5 m.		1		HQ			97	58		
8		**DOLOSTONE** (Lockport Formation - Goat Island Member) Medium to dark grey, very finely crystalline, thin to medium bedded argillaceous dolostone. Dense, occasional shaly stringers and clay seams, chert nodules and gypsum-infilled vugs.										
9												
10.0		Contact gradational.										
10		**DOLOSTONE** (Lockport Formation - Gasport Member) Medium to dark grey, finely crystalline, thin to thick bedded argillaceous dolostone, locally highly fossiliferous. Dense to weakly porous, thin shale interbeds and stringers common. Occasional clay seams, gypsum-infilled vugs.		2		HQ			99	77		
11												
11.8		Borehole terminated at 11.81 m in dolostone. **Stratigraphy inferred from BH 54-I.**										

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BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 55-I 1 of 2

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 31 July 1990
GEOLOGIST KTH
ELEVATION 177.87 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER I IV	SAMPLE NUMBER	INTERVAL	TYPE	N VALUE	% WATER	% REC	% RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
		CLAYEY SILT Medium brown clayey silt, some very fine to fine sand, weakly laminated, reddish-brown mottling, blue clay-infilled horizontal and vertical partings, DTPL, stiff to very stiff, rootlets to about 1.4 m.		1		SS	16	16	75			
1				2		SS	42	17	55			
2				3		SS	33	21	90			
				4		SS	24		10			
3		WTPL from about 3.5 m.		5		SS	19	21	70			
4				6		SS	12	20	90			
5		Soft to firm from about 4.9 m		7		SS	7	32	75			
		Reddish-brown sandy silt with greyish clayey silt from about 5.5 m.										
6.2 6		**SILTY SAND TILL** Reddish-brown silty sand, some fine to coarse gravel, trace clay, massive, moist to wet, loose to compact.		8		SS	9	12	80			
7.2 7		**DOLOSTONE** (Lockport Formation - Goat Island Member) Medium grey, very finely crystalline, thin to thick bedded argillaceous dolostone. Dense, occasional shaly stringer, locally vuggy with gypsum and sphalerite infilling. Occasional chert nodule.		9		HQ			94	85		
8												
9				10		HQ			99	62		
10												
11												
12				11		HQ			99	88		
13												
14												
15.1 15		Contact gradational. **DOLOSTONE** (Lockport Formation - Gasport Member)		12		HQ			99	91		

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BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 55-I 2 of 2

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 31 July 1990
GEOLOGIST KTH
ELEVATION 177.87 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER I IV	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
17		Medium to dark grey, very finely to finely crystalline, medium to massive bedded dolostone. Locally highly fossiliferous, dense to weakly porous, occasional shaly stringers, styolites. Highly fossiliferous, shaly from about 15.1 m to 16.5 m.										
18		Laminated calcareous siltsone, possibly conglomeratic from about 18.2 m to 21.6 m.										
19				13		HQ			97	93	■	▲
20		(Gasport Member - continued)										
21												
21.6		Contact gradational.										
22		DOLOSTONE (Decew Formation) Dark brownish-grey, very finely crystalline, medium to massive bedded argillaceous dolostone. Dense, occasional shaly stringers, gypsum seams.		14		HQ			98	83	■	▲
23												
23.6		Contact gradational.										
24		SHALE (Rochester Formation) Dark grey to black, thin to medium bedded calcareous shale to siltstone with interbeds of fossiliferous limestone. Occasional clay seam. Clean, highly fossiliferous limestone from about 24.5 m to 24.7 m.										
25				15		HQ			100	57	■	▲
26		Sulfurous gas encountered at about 26.5 m.										
27												
28				16		HQ			100	53	■	▲
29		Weathered zone from about 29.6 m to 30.3 m.										
30		Fossiliferous limestone, locally porous from about										

BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 55-II 1 of 2

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 1 August 1990
GEOLOGIST KTH
ELEVATION 177.89 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
		CLAYEY SILT Medium brown clayey silt, some very fine to fine sand, weakly laminated, reddish-brown mottling, blue clay-infilled horizontal and vertical partings, DTPL, stiff to very stiff, rootlets to about 1.4 m.	II									
1												
2												
3		WTPL from about 3.5 m.										
4												
5		Soft to firm from about 4.9 m										
6.2 6		Reddish-brown sandy silt with greyish clayey silt from about 5.5 m.										
		SILTY SAND TILL										
7.2 7		Reddish-brown silty sand, some fine to coarse gravel, trace clay, massive, moist to wet, loose to compact.										
		DOLOSTONE (Lockport Formation - Goat Island Member) Medium grey, very finely crystalline, thin to thick bedded argillaceous dolostone. Dense, occasional shaly stringer, locally vuggy with gypsum and sphalerite infilling. Occasional chert nodule.		1		HQ			97	68		
8												
9												
				2		HQ			100	63		
10												
11												
12												
				3		HQ			98	83		
13												
14												
15.1 15		Contact gradational.										
		DOLOSTONE (Lockport Formation - Gasport Member)		4		HQ			100	83		

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BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 55-II 2 of 2

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 1 August 1990
GEOLOGIST KTH
ELEVATION 177.89 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
17		Medium to dark grey, very finely to finely crystalline, medium to massive bedded dolostone. Locally highly fossiliferous, dense to weakly porous, occasional shaly stringers, styolites. Highly fossiliferous, shaly from about 15.1 m to 16.5 m.	II									
18		Laminated calcareous siltsone, possibly conglomeratic from about 18.2 m to 21.6 m.		5		HQ			99	64	■	▲
19												
20		(Gasport Member - continued)										
21												
21.6		Contact gradational.		6		HQ			100	92	■	▲
22		**DOLOSTONE** (Decew Formation) Dark brownish-grey, very finely crystalline, medium to massive bedded argillaceous dolostone. Dense, occasional shaly stringers, gypsum seams.										
23												
23.5		Borehole terminated at 23.54 m in dolostone. **Stratigraphy inferred from BH 55-I.**										

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 55-III 1 of 1

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 2 August 1990
GEOLOGIST KTH
ELEVATION 177.90 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
		CLAYEY SILT	III									
		Medium brown clayey silt, some very fine to fine sand, weakly laminated, reddish-brown mottling, blue clay-infilled horizontal and vertical partings, DTPL, stiff to very stiff, rootlets to about 1.4 m.										
1												
2												
3		WTPL from about 3.5 m.										
4												
5		Soft to firm from about 4.9 m										
		Reddish-brown sandy silt with greyish clayey silt from about 5.5 m.										
6.2 6		**SILTY SAND TILL**										
7.2 7		Reddish-brown silty sand, some fine to coarse gravel, trace clay, massive, moist to wet, loose to compact.										
		DOLOSTONE (Lockport Formation - Goat Island Member)		1		HQ			98	86	■	▲
8		Medium grey, very finely crystalline, thin to thick bedded argillaceous dolostone. Dense, occasional shaly stringer, locally vuggy with gypsum and sphalerite infilling. Occasional chert nodule.										
9				2		HQ			99	74	■	▲
10												
11												
11.8		Borehole terminated at 11.81 m in dolostone. **Stratigraphy inferred from BH 55-I.**										

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BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 56-I 1 of 2

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 8 August 1990
GEOLOGIST KTH
ELEVATION 182.26 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER I IV	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	N VALUE	% WATER	% REC	% RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
0.6		**SANDY SILT TOPSOIL** Brown sandy silt, some clay, rootlets, DTPL, very stiff.		1		SS	17		15			
1		**CLAYEY SILT** Medium to reddish-brown clayey silt, some very fine sand, laminated, nodules of yellowish-brown sandy silt, blue clay-infilled partings, DTPL, stiff to very stiff.		2		SS	33		60			
2				3		SS	28		55			
3				4		SS	20	23	65			
		Greyish to bluish-brown, WTPL, soft to firm from about 3.4 m.		5		SS	21	22	65			
4				6		SS	8	22	90			
5				7		SS	8		95			
5.5				8		SS	12	25	100			
6		**SILTY SAND TILL** Reddish-brown silty sand, some subangular to subrounded gravel, some clay, weakly laminated, wet, loose to compact, increasing gravel content with depth.		9		SS	26	9	60			
7.1				10		HQ			100	72		
8		**DOLOSTONE** (Lockport Formation - Goat Island Member) Medium to dark brownish-grey, very finely crystalline, thin to thick bedded argillaceous dolostone. Dense, locally vuggy with dolomite, calcite, sphalerite and fluorite infilling. Occasional chert nodule.										
9				11		HQ			99	95		
10		Moderately porous, vuggy from about 9.8 m to 10.7 m.										
11.3	11	Contact gradational.										
12		**DOLOSTONE** (Lockport Formation - Gasport Member) White to light grey, finely to coarsely crystalline, thick to massive bedded clean fossiliferous dolostone. Weakly to locally highly porous, occasional styolite. Moderately to highly porous from about 12.3 m to 14.1 m.		12		HQ			100	98		
13												
14												
15				13		HQ			100	95		

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Gartner Lee Limited

BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 56-I 2 of 2

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 8 August 1990
GEOLOGIST KTH
ELEVATION 182.26 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER (I IV)	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
17												
18												
19				14		HQ			100	96	■	▲
20		(Gasport Member - continued) Conglomeratic section from about 20.5 m to 20.6 m.										
20.6		Contact sharp.										
21		**DOLOSTONE** (Decew Formation) Dark brownish-grey, very finely crystalline, medium to thick bedded argillaceous dolostone. Dense with occasional shale stringers, gypsum seams.		15		HQ			100	93	■	▲
22												
23												
23.4		Contact gradational.										
24		**SHALE** (Rochester Formation) Dark grey to black, laminated to thickly bedded, calcareous to dolomitic shale to siltstone with occasional interbeds of fossiliferous limestone to dolostone. Increasing shale content downsection.		16		HQ			100	95	■	▲
25												
26												
27				17		HQ			100	88	■	▲
28				18		HQ			100	91	■	▲
29		Highly fossiliferous limestone from about 29.0 m to 29.2 m. Moderately fossiliferous, bioturbated, gypsum seams from about 29.2 m to 29.6 m.										
30												
30.7		Borehole terminated at 30.69 m in shale.										

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BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 56-II 1 of 2

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 9 August 1990
GEOLOGIST KTH
ELEVATION 182.23 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
0.6		**SANDY SILT TOPSOIL** Brown sandy silt, some clay, rootlets, DTPL, very stiff.	II									
1		**CLAYEY SILT** Medium to reddish-brown clayey silt, some very fine sand, laminated, nodules of yellowish-brown sandy silt, blue clay-infilled partings, DTPL, stiff to very stiff.										
2												
3		Greyish to bluish-brown, WTPL, soft to firm from about 3.4 m.										
4												
5												
5.5		**SILTY SAND TILL** Reddish-brown silty sand, some subangular to subrounded gravel, some clay, weakly laminated, wet, loose to compact, increasing gravel content with depth.										
6												
7.1		**DOLOSTONE** (Lockport Formation - Goat Island Member) Medium to dark brownish-grey, very finely crystalline, thin to thick bedded argillaceous dolostone. Dense, locally vuggy with dolomite, calcite, sphalerite and fluorite infilling. Occasional chert nodule.		1		HQ			95	60		
7												
8				2		HQ			100	93		
9		Moderately porous, vuggy from about 9.8 m to 10.7 m.										
10												
11.3		Contact gradational.										
11		**DOLOSTONE** (Lockport Formation - Gasport Member) White to light grey, finely to coarsely crystalline, thick to massive bedded clean fossiliferous dolostone. Weakly to locally highly porous, occasional styolite. Moderately to highly porous from about 12.3 m to 14.1 m.		3		HQ			99	94		
12												
13												
14				4		HQ			100	91		
15												

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BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 56-II 2 of 2

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 9 August 1990
GEOLOGIST KTH
ELEVATION 182.23 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
17			II	5		HQ			100	97		
18												
19												
20												
20.6		(Gasport Member - continued) Conglomeratic section from about 20.5 m to 20.6 m. Contact sharp.		6		HQ			99	98		
21		DOLOSTONE (Decew Formation) Dark brownish-grey, very finely crystalline, medium to thick bedded argillaceous dolostone. Dense with occasional shale stringers, gypsum seams.										
22												
23												
23.3		Borehole terminated at 23.34 m in dolostone. **Stratigraphy inferred from BH 56-I.**										

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BOREHOLE LOG

PROJECT: 90-115

BOREHOLE: 56-III 1 of 1

Walker Brothers Quarry Expansion Study
Thorold, Ontario
FOR: Walker Brothers Quarries Limited

DATE: 9 August 1990
GEOLOGIST KTH
ELEVATION 182.19 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
0.6		**SANDY SILT TOPSOIL** Brown sandy silt, some clay, rootlets, DTPL, very stiff.	III									
1		**CLAYEY SILT** Medium to reddish-brown clayey silt, some very fine sand, laminated, nodules of yellowish-brown sandy silt, blue clay-infilled partings, DTPL, stiff to very stiff.										
2												
3		Greyish to bluish-brown, WTPL, soft to firm from about 3.4 m.										
4												
5												
5.5		**SILTY SAND TILL** Reddish-brown silty sand, some subangular to subrounded gravel, some clay, weakly laminated, wet, loose to compact, increasing gravel content with depth.										
6												
7.1	7	**DOLOSTONE** (Lockport Formation - Goat Island Member) Medium to dark brownish-grey, very finely crystalline, thin to thick bedded argillaceous dolostone. Dense, locally vuggy with dolomite, calcite, sphalerite and fluorite infilling. Occasional chert nodule.		1		HQ			91	55	■	▲
8												
9												
10		Moderately porous, vuggy from about 9.8 m to 10.7 m.		2		HQ			97	81	■	▲
11.1	11											
		Borehole terminated at 11.10 m in dolostone. **Stratigraphy inferred from BH 56-I.**										

Gartner Lee Limited

BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 61-1 1 of 4
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 24 September 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 185.91 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	N VALUE	% WATER	% REC	% RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
0		**CLAYEY SILT** Brown clayey silt, trace fine sand, DTPL, firm to stiff.		1		SS						
1												
2												
3												
4												
5												
6												
7												
8				2		SS	9		35			
8.5		**SANDY SILT TILL** Brown (slightly mottled) sandy silt till, trace gravel, moist, compact.										
9												
10												
11				3		SS	14		85			
12												
				4		SS	15		90			

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BOREHOLE LOG	**PROJECT:** 98-403	**BOREHOLE:** 61-1 2 of 4
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 24 September 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 185.91 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
12.7												
13		**GASPORT DOLOSTONE** (Lockport Formation) Steely Blue grey (weathered brownish grey), medium to coarse crystalline, thin bedded dolostone, locally very weathered.		1		HQ			100	79		
14		-Vertical fracture infilled with clayey silt from about 13.9 to 14.5 m.		2		HQ			100	18		
				3		HQ			100	56	2.0E-05 m/s Test Interval 14.48 to 16.92 m	
15												
		-Vertical fracture infilled with clayey silt from about 15.3 to 15.8 m.		4		HQ			100	64		
16												
16.4		**DECEW DOLOSTONE** (Clinton Group) Dark grey to grey, aphanitic to fine crystalline, massive argillaceous dolostone, occasional shale stringers.		5		HQ			100	94	2.9E-07 m/s Test Interval 16.92 to 19.96 m	
17												
		Increasing shale content and appearance below about 17.6 m.										
18				6		HQ			100	92		
		-Trace occurrance of sphalerite mineralization observed at about 18.8 m.										
19												
19.5		**ROCHESTER FORMATION** (Clinton Group) Dark grey, aphanitic, thin to medium bedded shale, moderate dolomitic content.		7		HQ			100	87	1.9E-07 m/s Test Interval 19.96 to 23.01 m	
20		-Locally laminated to thinly interbedded with dolostone and moderate to high dolomitic content from about 19.5 to 22.2 m.										
21		-Dolomitic bed, upper contact denoted by 2 cm clay seam, from about 20.9 to 21.0 m.		8		HQ			100	75		
		-6 cm dolostone bed observed at about 21.8 m.										
22		-4 cm dolomitic bed observed at about 22.1 m.										
23				9		HQ			100	95	3.8E-08 m/s Test Interval 23.01 to 26.06 m	
24												
24.9				10		HQ			100	93		

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BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 61-1 3 of 4
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 24 September 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 185.91 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
26		-Numerous fossils and fossiliferous zones with occasional gypsum seams (~1mm), some subparallel, from about 24.9 to 27.0 m. Zone is competent with no indication of water bearing bedding fractures.		11		HQ			100	100	8.5E-07 m/s Test Interval 26.06 to 29.11 m	
27.0 27		-Minor occurrances of fossils and fossiliferous zones from about 27.3 to 27.7 m.										
28		-Locally laminated to thinly interbedded with dolostone from about 27.7 to 32.0 m.		12		HQ			100	92		
29				13		HQ			100	78	5.0E-07 m/s Test Interval 29.11 to 32.16 m	
30												
31				14		HQ			100	100		
32.0 32		-High dolomitic content and tight vertical fracture observed from about 31.6 to 31.8 m.		15		HQ			100	97	1.6E-06 m/s Test Interval 32.16 to 35.20 m	
33		-Local fossiliferous zones (competent) with increasing dolostone content below about 32.0 m.										
34		-High dolostone content below about 33.5 m.		16		HQ			100	85		
34.3		**IRONDEQUOIT DOLOSTONE**										
35		Buff grey to pinkish grey, medium to coarse crystalline, thick bedded calcareous dolostone, occassional shale stringers, locally porous.										
		-Sphalerite mineralization at upper contact.		17		HQ			100	80	8.4E-07 m/s Test Interval 35.20 to 38.25 m	
36		-Weathered and porous from about 35.4 to 35.5 m.										
36.7		-Weathered zones and porous from about 36.2 and 36.7 m.										
37		**REYNALES DOLOSTONE**		18		HQ			100	90		
		Grey, aphanitic to fine crystalline. medium to thick bedded dolostone, minor occurrance of thin shale beds.										

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BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 61-1 4 of 4
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 24 September 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 185.91 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
38		-Slightly weathered bedding fractures observed from about 37.0 to 37.2 m.										
				19		HQ			100	97	1.4E-06 m/s Test Interval 38.25 to 41.30 m	▲
39												
40				20		HQ			100	88		▲
40.3		-Increase in shale content from about 40.3 to 41.0 m.										
41.0	41											
41.4		-Sharp contact change - Buff to greenish grey, fine crystalline, massive calcareous dolostone with occasional green shale stringers and minor occurances of glauconite mineralization on bedding fracture planes. Borehole terminated at 41.39 m in the Reynales Formation (dolostone).										

BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 62-1 1 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 29 September 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 180.99 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
6.0		**GASPORT DOLOSTONE** (Lockport Formation) Dark grey (weathered greyish brown), medium to coarse crystalline, thin to medium bedded dolostone. -Locally weathered in upper 4 m.		4	SS	52/			100	86		
				1	HQ	0.08m			100			
				2	HQ				100	76	1.2E-06 m/s Test Interval 7.47 to 10.52 m	
		-Large vertical fracture, tight along most of length, from about 9.0 to 10.1 m.		3	HQ				100	86		
10.3		-Becoming calcareous (fossiliferous) below about 10.3 m.		4	HQ				100	94	2.5E-07 m/s Test Interval 10.67 to 13.72 m	
				5	HQ				100	100		

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BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 62-1 2 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 29 September 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 180.99 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
13												
14.0		**DECEW DOLOSTONE** (Clinton Group) Dark grey, occasional buff coloured beds, aphanitic to fine crystalline, thin to thick bedded argillaceous dolostone.		6		HQ			100	94	3.1E-06 m/s Test Interval 13.72 to 16.76 m	▲
14												
15												
15.4		-Increasing shale content below about 15.4 m.		7		HQ			100	93		▲
16												
17.2		**ROCHESTER FORMATION** (Clinton Group) Dark grey, aphanitic, thin to thick bedded shale, locally moderate dolomitic content. -Locally laminated to thinly interbedded dolostone with moderate dolomitic content from about 17.2 to 22.4 m. -9 cm dolomitic bed observed at about 18.3 m.		8		HQ			100	97	2.8E-06 m/s Test Interval 16.76 to 19.81 m	▲
17												
18												
19				9		HQ			100	93		▲
20		-7 cm dolomitic bed observed at about 18.8 m.		10		HQ			100	97	4.6E-07 m/s Test Interval 19.81 to 22.86 m	▲
21												
22		-10 cm dolostone bed observed at about 21.7 m.		11		HQ			100	98		▲
22.4		-Numerous fossils and fossiliferous zones from about 22.4 to 23.2 m. Moderate dolostone content associated with some fossiliferous zones. -Bedding fractures with indication of weathering at about 22.6 and 22.7 m. -Moderate dolomitic content and several weathered bedding fractures from about 23.2 to 23.9 m. -Distinct weathered zones at 23.5 and 23.9 m. -Numerous fossils and fossiliferous zones, occassional gypsum seams (~1mm), below about 23.9 m. Zone		12		HQ			100	59	4.5E-07 m/s Test Interval 22.86 to 26.82 m	▲
23												
23.2												
23.9												
24				13		HQ			100	84		▲

BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 62-1 3 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 29 September 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 180.99 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
		appears to be competent with no indication of water bearing bedding fractures.										
26				14		HQ			100	75		▲
26.9		Borehole terminated at 26.85 m in the Rochester Formation (shale).										

BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 63-1 1 of 2
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 02 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 175.75 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
		FILL Brown silt, moist, very dense.										
1				1		SS	62/ 0.15m		20			
2.0 2		**SANDY SILT TILL** Brown sandy silt till, some clay, trace fine gravel, moist, very dense.		2		SS	79		75			
3												
4				3		SS	58		95			
5.1 5		**GASPORT DOLOSTONE** (Lockport Formation) Medium to steely blue grey, medium to coarse crystalline, thin bedded dolostone, numerous shale stringers and styolites, locally weathered.		1		HQ			100	69		▲
6		-Locally fossiliferous below about 6.3 m. -Weathered from about 6.3 to 6.8 m.		2		HQ			100	67		▲
7											8.0E-06 m/s Test Interval 6.55 to 8.99 m	
				3		HQ			100	85		▲
8		-Weathered bedding fracture at about 8.3 m. -Vertically fractured from about 8.6 to 9.1 m.										
9				4		HQ			100	83	2.5E-06 m/s Test Interval 8.99 to 12.04 m	▲
9.6		**DECEW DOLOSTONE** (Clinton Group) Dark grey to grey, aphanitic to fine crystalline, thin to medium bedded argillaceous dolostone.										
10 10.4		-Increasing shale content and appearance below about 10.4 m.		5		HQ			100	73		▲
11		-Bedding fracture with gypsum infilled vug at about 10.7 m, possible water bearing.										
12		-Subangular bedding fracture, small calcite infilled vug, at		6		HQ			100	61	3.8E-06 m/s Test Interval	▲

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BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 63-1 2 of 2
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 02 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 175.75 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
12.8		about 12.2 m, possible water bearing.									11.89 to 14.94 m	
13		**ROCHESTER FORMATION** (Clinton Group) Dark grey, aphanitic, thin to medium bedded shale, locally moderate dolomitic content. -Locally laminated to thinly interbedded with dolostone and moderate dolomitic content from about 12.8 to 19.5 m.		7		HQ			100	93		▲
14												
15		-3 cm Clay seam associated with a 2 cm dolomitic bed at about 14.9 m.		8		HQ			100	84	2.9E-07 m/s Test Interval 14.94 to 18.14 m	▲
16		-8 cm Dolomitic bed with clay, broken up, at about 16.1 m.										
17		-1 cm clay seam at about 16.9 m.		9		HQ			100	76		▲
18				10		HQ			100	79	4.5E-07 m/s Test Interval 18.14 to 21.18 m	▲
19												
19.3		-Numerous fossils and fossiliferous zones from about 19.3 to 21.1 m. Moderate dolostone content associated with some fossiliferous zones. -Weathered bedding fracture at about 19.8 m. -Weathered bedding fracture at about 19.9 m. -Weathered bedding fracture at about 20.0 m.		11		HQ			100	44		▲
20												
21.1	21	-1 cm clay seam at about 20.9 m. -3 cm very weathered shale bed, almost clay in texture, at about 21.0 m. -Local fossils and minor occurrances of thin fossiliferous zones below about 21.1 m.		12		HQ			100	70	3.6E-07 m/s Test Interval 21.18 to 24.23 m	▲
22												
23		-Competent shale, trace occurrances of fossils below about 23.0 m.		13		HQ			100	88		▲
24.0	24											
24.2		-Changing back into fossiliferous zones below about 24.0 m Borehole terminated at 24.22 m in the Rochester Formation (shale)										

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BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 64-1 1 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 05 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 173.05 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
0		**SANDY SILT** Brown (slightly mottled) sandy silt till, trace gravel, moist, compact.		1		SS						
1												
				2		SS						
2												
3				3		SS						
4												
4.7				4		SS						
5		**GASPORT DOLOSTONE** (Lockport Formation) Dark grey to grey, medium to coarse crystalline, thin to medium bedded dolostone, occassional shale stringers and styolites, locally porous (more coarse crystalline). -Local fossils with sphalerite mineralization throughout. -Darker in colour and more porous (coarse crystalline) to about 6.0 m.		1		HQ			100	80		
				2		HQ			100	100		
6				3		HQ			100	90	2.9E-07 m/s Test Interval 5.94 to 9.30 m	
7												
8				4		HQ			100	97		
8.3		**DECEW DOLOSTONE** (Clinton Group) Dark grey, aphanitic to fine crystalline, thin to medium bedded argillaceous dolostone, locally cleaner beds of dolostone, minor occurrance of shale stringers.										
9				5		HQ			100	96	2.7E-07 m/s Test Interval 9.30 to 12.34 m	
10		-Increasing shale content and appearance below about 10.0 m.										
11				6		HQ			100	77		
11.6		**ROCHESTER FORMATION** (Clinton Group) Dark grey, aphanitic, thin to medium bedded shale, moderate dolomitic content.										
12												

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BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 64-1 2 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 05 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 173.05 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
13		-Locally laminated to thinly interbedded with dolostone and moderate dolomitic content from about 11.2 to 16.8 m. -7 cm clay seam associated with 2 cm dolostone bed at about 12.5 m. -4 cm dolostone bed observed at about 12.9 m. -6 cm dolostone bed observed at about 13.6 m.		7		HQ			100	63	4.4E-07 m/s Test Interval 12.34 to 15.39 m	
14		-Dolomitic to dolostone zone between 12.8 to 14.0 m. -3 cm dolomitic bed observed at about 14.4 m.		8		HQ			100	79		
15				9		HQ			100	83	8.8E-08 m/s Test Interval 15.39 to 18.44 m	
16												
16.8												
17		-Numerous calcareous fossiliferous zones from about 16.8 to 18.5 m.		10		HQ			100	81		
18												
18.5												
19		-Locally laminated to thinly interbedded with dolostone from about 18.5 m to 23.6 m.		11		HQ			100	81	8.3E-08 m/s Test Interval 18.44 to 21.49 m	
20				12		HQ			100	70		
21		-16 cm dolostone bed observed between at about 21.2 m										
22				13		HQ			100	63	9.6E-08 m/s Test Interval 21.49 to 24.54 m	
23												
23.6				14		HQ			100	91		
24		-Local fossiliferous zones (competent) with increasing dolostone content and occassional gypsum seams (~1mm) below about 23.6 m.										
		-9 cm weathered zone encountered at about 24.8 m.		15		HQ			100	75	1.0E-07 m/s Test Interval	

BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 64-1 3 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 05 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 173.05 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
											24.54 to 27.58 m	
26				16		HQ			100	87		▲
26.8		-10 cm weathered and dolomitic zone at about 26.6 m.										
27		**IRONDEQUOIT DOLOSTONE** Buff grey to steel grey, medium to coarse crystalline, thick bedded calcareous dolostone, occassional shale stringers, locally porous. -Possible water bearing bedding fracture at about 27.1 m. -Possible water bearing bedding fracture at about 27.7 m. -Possible water bearing bedding fracture at about 27.8 m. -Possible water bearing bedding fracture at about 27.9 m. -Possible water bearing bedding fracture at about 28.2 m.		17		HQ			100	92	9.0E-07 m/s Test Interval 27.58 to 30.63 m	▲
28												
29												
29.2		-Possible water bearing bedding fracture at about 28.7 m.		18		HQ			100	80		▲
30		**REYNALES DOLOSTONE** Grey, aphanitic to fine crystalline. medium to thick bedded dolostone, minor occurrance of thin shale beds. -Shaly zone with slumping structure observed between about 29.4 and 29.5 m.										
31				19		HQ			100	100	<1.0E-8 m/s Test Interval 30.63 to 33.68 m	▲
32												
32.8				20		HQ			100	100		▲
33		-Increase in shale content with minor occurrance of sphalerite mineralization from about 32.8 to 33.3 m.										
33.3												
33.8		-Sharp contact change - Buff to greenish grey, fine crystalline, massive calcareous dolostone with occasional green shale stringers and minor occurrance of glauconite mineralization on bedding fracture planes. Borehole terminated at 33.77 m in the Reynales Formation (dolostone).										

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BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 65-1 1 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 07 October 1998 **LOGGED BY** TLC/DIG **GROUND ELEV** 181.37 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
1				1		SS	32		30			
2												
3												
4												
5				2		SS	50		40			
6												
7												
8				3		SS	23		50			
9												
10												
11				4		SS	32		40			
11.6				1		HQ			100	43		▲
12		**GASPORT DOLOSTONE** (Lockport Formation) Dark grey to grey, medium to coarse crystalline, thin to medium bedded calcareous dolostone, occassional shale		2		HQ			100	49		▲

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BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 65-1 2 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 07 October 1998 **LOGGED BY** TLC/DIG **GROUND ELEV** 181.37 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
		stringers and styolites, locally porous (more coarse crystalline).									4.3E-06 m/s Test Interval 12.56 to 15.30 m	
13		-Numerous bedding fractures from about 11.6 to 13.1 m.										
14		-10 cm vertical fracture encountered at 13.9 m.		3		HQ			100	85		▲
15				4		HQ			100	94	4.4E-08 m/s Test Interval 15.24 to 18.29 m	▲
16.2 16		**DECEW DOLOSTONE** (Clinton Group) Dark grey to grey, aphanitic to fine crystalline, thick bedded argillaceous dolostone, minor occurrance of shale stringers.		5		HQ			100	100		▲
17		-Increasing shale content and appearance below about 17.5 m.										
18				6		HQ			100	82	2.1E-07 m/s Test Interval 18.29 to 21.34 m	▲
19												
19.3		**ROCHESTER FORMATION** (Clinton Group) Dark grey, aphanitic, thin to medium bedded shale, moderate dolomitic content.		7		HQ			100	100		▲
20		-Locally laminated to thinly interbedded with dolostone and moderate dolomitic content from about 19.3 to 24.3 m.										
21		-5 cm dolostone bed observed at about 20.3 m. -5 cm dolostone bed observed at about 20.6 m. -6 cm dolomitic bed observed at about 21.0 m.		8		HQ			100	100	4.4E-08 m/s Test Interval 21.34 to 24.38 m	▲
22												
		-5 cm dolostone bed observed at about 22.5 m.										
23		-4 cm clay seam observed at about 23.0 m.		9		HQ			100	99		▲
24												
24.7		-Dolostone bed zone, some associated with fossils, observed from about 24.3 to 24.8 m. -Numerous calcareous fossiliferous zones from about 24.8		10		HQ			100	88	3.7E-07 m/s Test Interval	▲

BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 65-1 3 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 07 October 1998 **LOGGED BY** TLC/DIG **GROUND ELEV** 181.37 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
		to 25.6 m. -Weathered bedding fracture at about 25.1 m. -Weathered bedding fracture at about 25.4 m.									24.38 to 27.43 m	
25.7												
26		-Locally laminated to thinly interbedded with dolostone from about 18.5 m to 23.6 m.		11		HQ			100	95		▲
27												
27.5												
28		-Increasing frequency of thin fossil zones observed below about 27.5 m.		12		HQ			100	100		▲
29.0		Borehole terminated at 28.96 m in the Rochester Formation (shale).										

BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 66-1 1 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 16 October 1998 **LOGGED BY** TLC/DIG **GROUND ELEV** 182.00 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
1												
2												
3												
4												
5												
6												
7												
8												
9												
9.4		**GASPORT DOLOSTONE** (Lockport Formation) Dark grey to grey, fine to medium crystalline, thin bedded dolostone, occassional shale stringers and styolites, trace to some fossils.		1		HQ			100	56		▲
10				2		HQ			100	11		
11				3		HQ			100	67	7.7E-08 m/s Test Interval 10.97 to 14.33 m	▲
				4		HQ			100	90		▲
12.1 12		Buff to steely blue grey, medium to coarse crystalline, thin										

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Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 16 October 1998 **LOGGED BY** TLC/DIG **GROUND ELEV** 182.00 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
		bedded dolostone, minor occurrance of fossils throughout with local fossil zones.		5		HQ			100	94		
13												
14		-Becoming locally thinly interbedded with fine crystalline argillaceous to arenaceous dolostone below about 14.2 m.		6		HQ			100	97	4.1E-08 m/s Test Interval 14.33 to 17.37 m	
15												
16				7		HQ			100	76		
16.7		**DECEW DOLOSTONE** (Clinton Group) Dark grey to grey (brownish), aphanitic to fine crystalline, thin to medium bedded argillaceous dolostone, minor occurrance of shale stringers.										
17				8		HQ			100	100	2.0E-08 m/s Test Interval 17.37 to 20.39 m	
18		-Possible water bearing bedding fracture observed at about 17.8 m. -Increasing shale content and appearance below about 17.8 m.										
19				9		HQ			100	93		
19.9		-Possible water bearing bedding fracture from about 19.8 m to lower contact.										
20		**ROCHESTER FORMATION** (Clinton Group) Dark grey, aphanitic, medium bedded shale, moderate dolomitic content.		10		HQ			100	99	2.1E-08 m/s Test Interval 20.39 to 23.44 m	
21		-Locally laminated to thinly interbedded with dolostone and moderate dolomitic content from about 19.9 to 24.9 m. -12 cm dolostone bed observed at about 20.5 m.										
22		-11 cm dolostone bed observed at about 21.7 m, slightly weathered with thin clay seam.		11		HQ			100	100		
23												
		-9 cm dolomitic bed observed at about 23.3 m. -7 cm dolostone bed observed at about 23.4 m.		12		HQ			100	73	2.3E-08 m/s Test Interval 23.44 to 26.49 m	
24												
24.8												

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Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 16 October 1998 **LOGGED BY** TLC/DIG **GROUND ELEV** 182.00 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
26		-Numerous calcareous fossiliferous zones from about 24.8 to 26.3 m. -Possible water bearing bedding fracture observed at about 25.2 m. -Possible water bearing bedding fracture observed at about 25.4 m.		13		HQ			100	86		
26.3		-Water bearing bedding fracture zone from about 25.6 to 25.7 m. -Possible water bearing bedding fracture observed at about 26.8 m. -Numerous dolostone and dolomitic beds, some associated with clay seams from about 26.8 to 28.0 m. -Locally laminated to thinly interbedded with dolostone and becoming in colour below about 28.0 m.		14		HQ			100	52	1.4E-08 m/s Test Interval 26.49 to 29.50 m	
27												
28				15		HQ			100	76		
29												
29.5		Borehole terminated at 29.50 m in the Rochester Formation (shale).										

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BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 67-1 1 of 4
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 09 October 1998 **LOGGED BY** TLC/PW/YS **GROUND ELEV** 182.72 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
1												
2				1		SS	27		8			
3												
4												
5				2		SS	15		100			
6												
7												
8				3		SS	6		100			
9.1 9		**GASPORT DOLOSTONE** (Lockport Formation) Buff grey to steely blue grey, fine to medium crystalline, thin to medium bedded dolostone, occassional shale stringers and styolites, minor occurrance of fossils.		1		HQ			100	92		▲
10												
11				2		HQ			100	85	1.6E-06 m/s Test Interval 10.67 to 13.72 m	▲
11.8		-Slumping depositional feature observed at contact.										
12		Light to dark grey (mottled), medium to coarse crystalline, thin to medium bedded calcareous dolostone, locally porous		3		HQ			100	67		▲

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BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 67-1 2 of 4
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 09 October 1998 **LOGGED BY** TLC/PW/YS **GROUND ELEV** 182.72 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
		(more coarse crystalline). -Weathered bedding fractures from about 12.3 to 12.6 m. -Subparallel bedding fracture observed at about 12.3 m. -Weathered bedding fracture at about 13.2 m.										
13												
14		-Water bearing fractured zone from about 14.0 to 14.2 m.		4		HQ			100	73	6.8E-08 m/s Test Interval 13.72 to 16.76 m	
15				5		HQ			100	83		
16												
16.8												
17		Buff to grey, medium to coarse crystalline dolostone, slightly porous.		6		HQ			100	98	2.9E-07 m/s Test Interval 16.76 to 19.81 m	
17.6		-Vertical fracture encountered from about 17.1 to 17.3 m, weathered at about 17.2 m.										
18		**DECEW DOLOSTONE** (Clinton Group) Dark grey to grey, aphanitic to fine crystalline, medium to thick bedded argillaceous dolostone, minor occurrance of shale stringers.		7		HQ			100	92		
19		-Less argillaceous to about 18.7 m.										
20		-Increasing shale content and appearance below about 19.8 m.		8		HQ			100	91	6.5E-08 m/s Test Interval 19.81 to 22.86 m	
21.0												
21		**ROCHESTER FORMATION** (Clinton Group) Dark grey, aphanitic, thin to medium bedded shale, moderate dolomitic content.		9		HQ			100	90		
22		-Locally laminated to thinly interbedded with dolostone and moderate dolomitic content from about 21.0 to 26.0 m. -3 cm dolostone bed observed at about 22.2 m. -3 cm dolostone bed observed at about 22.3 m.										
23		-Very high dolomitic content from about 23.0 to 23.7 m.		10		HQ			100	98	1.1E-07 m/s Test Interval 22.86 to 25.91 m	
24		-Dolomitic to dolostone zone between 12.8 to 14.0 m.										
		-4 cm dolostone bed observed at about 24.4 m. -4 cm dolostone bed observed at about 24.6 m.		11		HQ			100	100		

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Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 09 October 1998 **LOGGED BY** TLC/PW/YS **GROUND ELEV** 182.72 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
26.0		-Numerous calcareous fossiliferous zones from about 26.0 to 29.0 m. -16 cm fossiliferous and dolomitic bed at about 26.0 m. -20 cm dolostone and fossiliferous bed at about 26.2 m.		12		HQ			100	85	1.5E-07 m/s Test Interval 25.91 to 28.96 m	
27												
				13		HQ			100	88		
28												
29.0		-Locally laminated to thinly interbedded with dolostone and moderate dolomitic content from about 29.0 m to 33.5 m.		14		HQ			100	92	4.1E-08 m/s Test Interval 28.96 to 32.00 m	
30												
				15		HQ			100	99		
31												
32				16		HQ			100	100	7.5E-08 m/s Test Interval 32.00 to 35.05 m	
33												
33.5		-Local fossiliferous zones (competent) with increasing dolostone content and occassional gypsum seams (~1mm) below about 23.6 m. -Weathered at contact.		17		HQ			100	85		
34												
35				18		HQ			100	97	8.6E-08 m/s Test Interval 35.05 to 38.10 m	
		-Becoming calcareous below about 35.5 m.										
36.0		**IRONDEQUOIT DOLOSTONE** Buff to grey, medium to coarse crystalline, thin to medium bedded calcareous dolostone, occassional styolites and shale stringers, minor occurrance of sphalerite mineralization, locally slightly porous. -Possible water bearing bedding fracture at about 36.5 m		19		HQ			100	100		
37												

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Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 09 October 1998 **LOGGED BY** TLC/PW/YS **GROUND ELEV** 182.72 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
		-Possible water bearing bedding fracture at about 37.2 m. -Possible water bearing bedding fracture at about 27.7 m. -Possible water bearing bedding fracture at about 27.8 m.										
38												
38.5		**REYNALES DOLOSTONE** Grey to dark grey, fine crystalline, medium to thick bedded dolostone, minor occurrance of thin shale beds.		20		HQ			100	91	<1.0E-8 m/s Test Interval 38.10 to 41.15 m	
39												
				21		HQ			100	94		
40												
41												
				22		HQ			100	97		
41.6		-Increase in shale content and becoming dark greenish grey to grey from about 41.6 to 42.5 m.										
42												
42.5												
42.9		-Sharp contact change - Buff to greenish grey, fine to medium crystalline, massive calcareous dolostone with occasional green shale stringers and minor occurrance of glauconite mineralization on bedding fracture planes.		23		HQ			100	79		
43		**NEAHGA SHALE** Dark green, aphanitic shale (fissile in nature). -Very weathered at contact (10 cm), at about 43.3 m, and at 43.7 m.										
44.0												
44												
44.3		Buff to grey, medium to coarse crystalline, calcareous dolostone, slightly clastic, numerous slumping depositional feature. Borehole terminated at 44.25 m in the Neahga Formation (shale).										

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Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 14 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 183.19 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
1				1		SS	20/ 0.13m					
2												
3												
4												
5				2		SS	35					
6												
7												
8				3		SS	10					
8.3		**GASPORT DOLOSTONE** (Lockport Formation) Grey to dark grey, medium to coarse crystalline, thin to medium bedded dolostone, occassional shale stringers and styolites, locally porous.		1		HQ			100	95		
9												
10				2		HQ			100	94	<1.0E-8 m/s Test Interval 9.60 to 12.59 m	
11.0		-Locally calcareous from about 11.0 to 15.6 m.		3		HQ			100	95		
11												
12												

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Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 14 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 183.19 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
13				4		HQ			100	100	<1.0E-8 m/s Test Interval 12.59 to 15.67 m	
14		-Mineralization (pyrite in colour) of styolites and fossils from about 14.2 to 14.5 m.		5		HQ			100	98		
15												
15.6		Buff to grey, medium to coarse crystalline dolostone, slightly porous.		6		HQ			100	100	7.1E-08 m/s Test Interval 15.67 to 18.71 m	
16												
17												
17.4		**DECEW DOLOSTONE** (Clinton Group) Dark grey to grey, aphanitic to fine crystalline, medium to thick bedded argillaceous dolostone, minor occurrance of shale stringers.		7		HQ			100	100		
18												
19		-Increasing shale content and appearance below about 19.8 m. -Water bearing bedding fracture observed at about 19.7 m.		8		HQ			100	61	3.8E-08 m/s Test Interval 18.71 to 21.70 m	
20												
20.6		**ROCHESTER FORMATION** (Clinton Group) Dark grey, aphanitic, thin to medium bedded shale, moderate dolomitic content. -Locally laminated to thinly interbedded with dolostone and moderate dolomitic content from about 20.6 to 25.4 m.		9		HQ			100	100		
21												
22		-25 cm dolostone bed observed at about 22.5 m.		10		HQ			100	100	3.2E-08 m/s Test Interval 21.70 to 24.75 m	
23												
24		-4 cm dolostone bed observed at about 24.6 m. -2 cm dolostone bed observed at about 24.3 m.		11		HQ			100	100		
				12		HQ			100	100	2.2E-07 m/s	

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DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
25.4		-Slightly fossiliferous with moderate to high dolostone content from about 25.4 to 28.8 m.									Test Interval 24.75 to 27.80 m	
26		-4 cm dolostone/fossil bed observed at about 26.4 m.		13		HQ			100	100		
27		-Possible water bearing bedding fracture at about 26.9 m.										
28		-Dolostone/fossil zone observed from about 28.0 to 28.5 m.		14		HQ			100	100	6.6E-08 m/s Test Interval 27.80 to 30.85 m	
28.8		-Possible water bearing bedding fracture observed at about 28.4 m and 28.5 m.										
29		-Locally laminated to thinly interbedded with dolostone and high dolomitic content below about 28.8 m.										
				15		HQ			100	100		
30												
30.9		-Large dolostone bed observed from about 30.4 m to end of borehole.										
		Borehole terminated at 30.85 m in the Rochester Formation (shale).										

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Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 07 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 182.81 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
				1		SS	12		66			
1												
				2		SS	13		89			
2												
3				3		SS			100			
4												
				4		SS	15/		100			
5				1		HQ	0.15m					
6.0		**GASPORT DOLOSTONE** (Lockport Formation) Grey to dark grey, medium to coarse crystalline, thin to medium bedded dolostone, occassional shale stringers and styolites, locally porous. -Steely blue grey in colour to about 6.9 m.		2		HQ			100	100		
6.9				3		HQ			100	91		
7												
8				4		HQ			100	100		
9											<1.0E-8 m/s Test Interval 9.14 to 12.95 m	
10				5		HQ			100	100		
				6		HQ			100	100		
11												
				7		HQ			100	100		
12												

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Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 07 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 182.81 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
13				8		HQ			100	85	7.4E-08 m/s Test Interval 12.95 to 16.00 m	▲
14				9		HQ			100			
15												
15.3		**DECEW DOLOSTONE** (Clinton Group) Dark grey to grey, aphanitic to fine crystalline, thin to thick bedded dolostone, minor occurrance of shale stringers. -1 cm subparallel argillaceous bed at about 16.4 m. -2 cm subparallel length of small vugs at about 16.5 m.		10		HQ			100	100	9.4E-08 m/s Test Interval 15.97 to 18.96 m	▲
16												
17				11		HQ			100	84		▲
18		-Water bearing bedding fracture observed at about 18.0 m.										
18.6		**ROCHESTER FORMATION** (Clinton Group) Dark grey, aphanitic, thin to thick bedded shale, moderate dolomitic content. -Locally laminated to thinly interbedded with dolostone and moderate dolomitic content from about 18.6 to 24.2 m. -8 cm dolomitic bed observed at about 19.4 m.		12		HQ			100	97	5.3E-08 m/s Test Interval 18.96 to 22.01 m	▲
19												
20				13		HQ			100	91		▲
21		-10 cm dolostone bed observed at about 20.9 m.										
22				14		HQ			100	86	3.1E-08 m/s Test Interval 22.01 to 25.05 m	▲
23		-3 cm dolostone bed observed at about 22.8 m.										
24				15		HQ			100	94		▲
24.2		-Fossiliferous and fossil zones with moderate to high dolostone content and occasional gypsum seams (~1mm) from about 24.2 to 26.9 m.										

Printed: 02 May 05
File Location:

Gartner Lee Limited

BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 69-1 3 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 07 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 182.81 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
		-Fossil/Dolostone beds from about 24.2 to about 24.6 m.		16		HQ			100	91	<1.0E-8 m/s Test Interval 25.05 to 28.10 m	▲
26		-Thin dolostone/fossil bed observed from about 25.7 to 26.4 m.										
26.9				17		HQ			100	97		▲
27		-Locally laminated to thinly interbedded with dolostone and high dolomitic content below about 26.9 m.										
28.2 28		Borehole terminated at 28.10 m in the Rochester Formation (shale).										
29												
30												
31												
32												
33												

Printed: 02 May 05
File Location:

Gartner Lee Limited

LOG OF BOREHOLE 69-2R

project | Walker Landfills - Well Decommissioning and Replacement
project no. | 131-22826-07
client | Walker Industries
rig type | CME 75, track-mounted
date started | 2018/05/25
location | Thorold, Ontario
method | Hollow stem augers, 215 mm dia.
supervisor | BC
position | E: 648320 N: 4776836 (17T, Geodetic)
coring | HQ core, OD=96mm, ID=64mm
reviewer | KJF

Depth Scale (m)	Elev / Depth (m)	STRATIGRAPHY	Graphic Plot	Sample Number	Sample Type	SPT N-Value / Core Recovery
0	182.6	**GROUND SURFACE**				
	182.5 / 0.1	**TOPSOIL = 102 mm**, dark brown, grass and rootlets, damp, loose		1	SS	10
	181.8 / 0.8	**SILTY CLAY FILL**, brown, occasional fine gravel, occasional organics and rootlets, occasional grey-brown and red-brown partings, DTPL, stiff		2	SS	50 / 75mm
1	181.6 / 1.0	**SAND FILL**, black, red-brown, orange-yellow, brown and grey, coarse-grained, fragments of pulverized rock, moist, very dense				
		SILTY CLAY, brown with frequent grey to grey-brown partings, occasional coarse sand grains and fine to medium gravel, DTPL, very stiff ...at 1.5 m, 2 inches of light grey-brown to black dry clumps of clayey silt and sand in the top of the sample spoon with a slight petroliferous odour ...at 1.6 m, 2 inch zone of frequent rusty partings ...at 2.3 m, becoming hard, and appearance of frequent pinkish-grey and red-brown partings to 3.0 m		3	SS	22
2				4	SS	34
3	179.1 / 3.5			5	SS	30
	178.8 / 3.8	**CLAYEY SILT**, greenish-brown with red-brown silty partings, trace fine gravel, DTPL, very stiff				
4		**CLAYEY SILT TILL**, reddish-brown, fine to coarse gravel (angular to subrounded), DTPL, hard		6	SS	34
	178.0 / 4.6					
		SILTY CLAY, brown with occasional grey-brown clay partings, trace fine to coarse gravel (subangular to subrounded), DTPL, hard		7	SS	33
5				8	SS	53
	176.8 / 5.8					
	176.7 / 5.9	**CLAYEY SILT TILL**, reddish-brown, fine to medium gravel (subangular to subrounded), APL, hard			R1	TCR = **50%** RQD = **49%**
6		Gasport Formation, medium to dark grey **DOLOSTONE**, fine to medium grained, medium bedded, fossiliferous, hard, strong, smooth core with a fresh appearance, slightly saccharoidal texture, excellent RQD. Thin shaley partings typically 2 to 5 mm at 1 per 100 mm below 13.4 m. Lower contact below conglomeratic bed at 15.6 m.			R2	TCR = **100%** RQD = **78%**
7	175.0					
					R3	TCR = **100%** RQD = **96%**
8	173.5					
					R4	TCR = **99%** RQD = **99%**
9	172.0					

Elevation Scale (mASL): 182, 181, 180, 179, 178, 177, 176, 175, 174, 173

Penetration Test Values (Blows / 0.3m)
Dynamic Cone: 10 20 30 40
Undrained Shear Strength (kPa)
Unconfined, Pocket Penetrometer, Field Vane, Lab Vane
40 80 120 160

Water Content (%) & Plasticity
PL MC LL
10 20 30

PID Readings

Well Details
3/8" granular bentonite
bentonite grout

Lab Data and Comments
GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL

(continued next page)

LOG OF BOREHOLE 69-2R

project | Walker Landfills - Well Decommissioning and Replacement
project no. | 131-22826-07
client | Walker Industries
rig type | CME 75, track-mounted
date started | 2018/05/25
location | Thorold, Ontario
method | Hollow stem augers, 215 mm dia.
supervisor | BC
position | E: 648320 N: 4776836 (17T, Geodetic)
coring | HQ core, OD=96mm, ID=64mm
reviewer | KJF

Depth Scale (m)	Elev / Depth (m)	STRATIGRAPHY (continued)	Graphic Plot	Sample Number	Sample Type	SPT N-Value / Core Recovery	Elevation Scale (mASL)
10	172.0	Gasport Formation, medium to dark grey **DOLOSTONE**, fine to medium grained, medium bedded, fossiliferous, hard, strong, smooth core with a fresh appearance, slightly saccharoidal texture, excellent RQD. Thin shaley partings typically 2 to 5 mm at 1 per 100 mm below 13.4 m. Lower contact below conglomeratic bed at 15.6 m. *(continued)*			R4	TCR = **99**% RQD = **99**%	172
11					R5	TCR = **100**% RQD = **100**%	171
12	170.5				R6	TCR = **99**% RQD = **93**%	170
13	169.0				R7	TCR = **102**% RQD = **96**%	169
14							168
15	167.4						
	167.0				R8	TCR = **100**% RQD = **100**%	167
16	15.6 / 166.0	Decew Formation, dark grey **SHALEY DOLOSTONE**, fine grained, medium bedded, barren, wavy internal bedding structures with a dull texture, scratched with a knife, excellent RQD. Sharp lower contact on change in texture.					166
17	165.2				R9	TCR = **98**% RQD = **89**%	165
18	17.4 / 164.4	Rochester Formation, dark grey to black **SHALE**, fine grained, calcareous, thinly bedded, scratched easily with a knife. Some 25 mm lighter grey fossiliferous and calcareous beds. Moderately fractured with core recovered typically as 10 cm long pieces but with excellent RQD.					164
19					R10	TCR = **95**% RQD = **89**%	163
	162.9						
	161.4				R11	TCR = **107**% RQD =	

Penetration Test Values (Blows / 0.3m) — Dynamic Cone: 10 20 30 40
Undrained Shear Strength (kPa) — Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40 80 120 160
Water Content (%) & Plasticity — PL MC LL: 10 20 30
PID Readings
Well Details
Lab Data and Comments — GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Well Details: bentonite grout; 1/4" granular bentonite; slotted pipe w/ sand pack

(continued next page)

LOG OF BOREHOLE 69-2R

project |	Walker Landfills - Well Decommissioning and Replacement			**project no. |**	131-22826-07
client |	Walker Industries	**rig type |**	CME 75, track-mounted	**date started |**	2018/05/25
location |	Thorold, Ontario	**method |**	Hollow stem augers, 215 mm dia.	**supervisor |**	BC
position |	E: 648320 N: 4776836 (17T, Geodetic)	**coring |**	HQ core, OD=96mm, ID=64mm	**reviewer |**	KJF

Depth Scale (m)	Elev / Depth (m)	STRATIGRAPHY (continued)	Graphic Plot	Sample Number	Sample Type	SPT N-Value / Core Recovery	Elevation Scale (mASL)
20		Rochester Formation, dark grey to black **SHALE**, fine grained, calcareous, thinly bedded, scratched easily with a knife. Some 25 mm lighter grey fossiliferous and calcareous beds. Moderately fractured with core recovered typically as 10 cm long pieces but with excellent RQD. *(continued)*				99%	
					R11	TCR = **107**% RQD = **99**%	162
21	161.4						
	161.3				R12	TCR = **100**% RQD = **0**%	
	21.4	**END OF BOREHOLE**					

Penetration Test Values (Blows / 0.3m) — Dynamic Cone: 10, 20, 30, 40

Undrained Shear Strength (kPa) — Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40, 80, 120, 160

Water Content (%) & Plasticity — PL, MC, LL: 10, 20, 30

PID Readings

Well Details: slotted pipe w/ sand pack

Lab Data and Comments — GRAIN SIZE DISTRIBUTION (%) (MIT): GR SA SI CL

Water not measured in borehole prior to well installation.

50 mm monitoring well installed.
No. 10 screen installed.

WATER LEVEL MONITORING

Date	Depth (m)	Elevation (m)
May 28, 2018	5.9	176.7
Jun 4, 2018	12.4	170.2

BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 70-1 1 of 2
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 13 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 168.54 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
3.0		**DECEW DOLOSTONE** (Clinton Group) Dark grey, aphanitic to fine crystalline, massive argillaceous dolostone (shale appearance), occasional shale stringers. -Water bearing bedding fracture observed at about 3.5 m. -Numerous subparallel bedding breaks from 3.5 to 3.8 m.		1		HQ			100	52		
				2		HQ			100	86	2.9E-06 m/s Test Interval 3.81 to 7.16 m	
4.7		**ROCHESTER FORMATION** (Clinton Group) Dark grey, aphanitic, thin to medium bedded shale, moderate dolomitic content. -Locally laminated to thinly interbedded with dolostone and moderate to high dolomitic content from about 4.7 to 10.0 m. -3 cm dolostone bed with associated base fracture (possible water bearing) observed at about 6.5 m. -6 cm dolostone bed with associated base fracture (possible water bearing) observed at about 6.9 m. -5 cm dolostone bed observed at about 7.5 m.		3		HQ			100	95		
				4		HQ			100	95	8.6E-08 m/s Test Interval 7.16 to 10.21 m	
				5		HQ			100	94		
10.0		-Numerous fossils and fossiliferous zones with occasional gypsum seams (~1mm), from about 10.0 to 13.6 m. Zone is competent with no indication of water bearing bedding fractures. -Fossil/Dolostone zone from about 10.0 to 10.7 m. -Weathered zones associated with dolostone at about 10.4 and 10.5 m. -Water bearing bedding fracture observed at about 11.4 m.		6		HQ			100	91	1.6E-06 m/s Test Interval 10.21 to 13.26 m	
				7		HQ			100	90		

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BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 70-1 2 of 2
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 13 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 168.54 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
13												
13.6				8		HQ			100	100	1.7E-08 m/s Test Interval 13.26 to 16.31 m	
14		-5 cm dolostone bed observed at about 14.3 m										
15		-8 cm dolostone bed observed at about 14.8 m		9		HQ			100	95		
15.5		-Minor occurrance of fossil zones from about 15.5 to 17.5 m.										
16		-Weathered bedding fracture at about 16.2 m.		10		HQ			100	97		
17												
17.5		-1 cm clay seam at about 17.3 m.										
17.9		Borehole terminated at 17.85 m in the Rochester Formation (shale).										

BOREHOLE LOG

PROJECT: 98-403

BOREHOLE: 71-1 1 of 3

Hydrogeological Investigation
West Quarry Landfill - Thorold, Ontario
FOR: Walker Industries

DATE: 14 October 1998
LOGGED BY TLC/YS
GROUND ELEV 184.81 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
0		**WASTE**										
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

Printed: 02 May 05
File Location:

Gartner Lee Limited

BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 71-1 2 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 14 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 184.81 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
13												
14												
15												
16												
17												
18												
19												
20												
20.6		**DECEW DOLOSTONE** (Clinton Group) Dark grey, aphanitic to fine crystalline, massive argillaceous dolostone (shale appearance), occasional shale stringers. -Minor occurrance of sphalerite mineralization observed at about 21.4 m. -Possible water bearing bedding fracture observed at about 21.7 m. -Possible water bearing bedding fracture observed at about 22.0 m.		1		HQ			100	41		▲
21				2		HQ			100	92		▲
22											2.8E-07 m/s Test Interval 22.01 to 24.32 m	
23				3		HQ			100	100		▲
23.5		**ROCHESTER FORMATION** (Clinton Group) Dark grey, aphanitic, thin to medium bedded shale, moderate dolomitic content. -Locally laminated to thinly interbedded with dolostone and moderate dolomitic content from about 23.5 to 27.4 m. -7 cm dolostone bed observed at about 24.2 m.										
24				4		HQ			100	95	4.2E-08 m/s Test Interval	▲

Printed: 02 May 05
File Location:

Gartner Lee Limited

BOREHOLE LOG	PROJECT: 98-403	BOREHOLE: 71-1 3 of 3
Hydrogeological Investigation West Quarry Landfill - Thorold, Ontario **FOR:** Walker Industries		**DATE:** 14 October 1998 **LOGGED BY** TLC/YS **GROUND ELEV** 184.81 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	Packer Test Results m/s	RQD (%) 25 50 75 100
											24.32 to 27.37 m	
26		-5 cm dolomitic bed observed at about 25.8 m.		5		HQ			100	91		▲
27												
27.4		-Numerous fossils and fossiliferous zones associated with dolostone to high dolomitic content with occasional gypsum seams (~1mm), from about 27.4 to 30.4 m. Zone is competent with no indication of water bearing bedding fractures.		6		HQ			100	90	2.4E-07 m/s Test Interval 27.37 to 30.42 m	▲
28												
29		-Decreasing occurrance of fossil zone below about 29.1 m.		7		HQ			100	96		▲
30												
30.4		-Becoming locally laminated to thinly interbedded with dolostone and moderate to high dolomitic content from about 31.7 to 33.5 m. Zone is competent.		8		HQ			100	100	2.0E-08 m/s Test Interval 30.42 to 32.89 m	▲
31												
32				9		HQ			100	91		▲
33											1.4E-07 m/s Test Interval 32.89 to 35.02 m	
33.5		-Local fossil to fossiliferous zones and occasional gypsum seams, some subparallel, below about 33.5 m.		10		HQ			100	100		▲
34												
35.0		Borehole terminated at 35.00 m in the Rochester Formation (shale).										

Printed: 02 May 05
File Location:

Gartner Lee Limited

BOREHOLE LOG	**PROJECT:** 70196	**BOREHOLE:** 72 1 of 1
Closed West Landfill Drilling Program Thorold, ON **FOR:** Niagara Waste Systems Limited		**DATE:** May 9, 2007 **LOGGED BY** AME **GROUND ELEV** 182.00 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	COMMENTS
0.3		**SANDY SILT FILL** Brown sandy silt fill, with large angular gravel, dry.		1		CS			90		
		SILTY CLAY FILL Medium brown silty clay fill with trace gravel, dry to moist.									
1		- Becoming moist and with some gravel below ~1.3 m depth.		2		CS			77		
2											
3		- Wood chips, twigs and other organic debris from ~2.8 to 3.3 m depth, saturated.		3		CS			80		
4				4		CS			52		
5											
6		- Wood chips, twigs and other organic debris noted below ~5.6 m depth. - Moist to saturated below ~5.9 m depth.		5		CS			35		
7											
7.6		- Colour change to dark brown to black below ~7.4 m depth.		6		CS					
		Borehole terminated at ~7.6 m depth at assumed bedrock contact.									

LOG OF BOREHOLE 72R

PROJECT: Walker Drilling January 2021
CLIENT: Walker Environmental Group
PROJECT LOCATION: Thorold, Ontario
DATUM:
BH LOCATION: N 9889.558 E 9785.57

Method: Hollow Stem Augers
Diameter: 200 mm
Date: Jan/15/2021 to Jan/18/2021

REF. NO.: 131-22826-16
ENCL NO.:
ORIGINATED BY SK
COMPILED BY SCL
CHECKED BY GRS

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
181.87	Ground Surface						
0.00	Brown silt fill, trace clay, trace gravel, trace sand, stiff to firm, APL.						181
			1	SS	16		180
			2	SS	10		179
			3	SS	8		178
			4	SS	8		
177.22							
4.65	Grey silt fill, some clay, trace sand, firm to soft, WTPL.		5	SS	6		177
			6	SS	3		176
175.77							
6.10	Greyish brown silt fill, trace clay, trace gravel, trace sand, stiff, APL.		7	SS	11		
175.16							
6.71	Brown silt fill, some clay, trace sand, trace gravel, stiff, APL.		8	SS	14		175
174.25							
7.62							

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
$+^3$, $\times^3$: Numbers refer to Sensitivity
○ $^{\varepsilon}$=3% Strain at Failure

BOREHOLE LOG

PROJECT: 91-108

BOREHOLE: MM2-I 1 of 1

Niagara Waste Systems Hydrogeologic Investigation
Thorold, Ontario
FOR: Niagara Waste Systems Limited

DATE: 13 June 1991
GEOLOGIST KTH
ELEVATION 160.44 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
1		**CONCRETE PAD**	I									
1.8												
2		**SHALE** (Rochester Formation) Dark grey thin bedded calcareous shale occasionally interlaminated to interbedded with light grey argillaceous dolostone, locally fossiliferous. -Lost circulation at about 2.8 m.		1		HQ			95	92		
3				2		HQ						
4				3		HQ			100	85		
5				4		HQ			100	79		
6				5		HQ			100	80		
7												
8		-Numerous gypsum nodules and seams observed below 7.7 m. -Fossiliferous dolostone with gypsum nodules between about 8.2 m and 8.5 m.		6		HQ			100	85		
9												
9.4		Borehole terminated at 9.36 m in shale.										

Printed: 14 SEP 98

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BOREHOLE LOG

PROJECT: 91-108

BOREHOLE: MM2-II 1 of 1

Niagara Waste Systems Hydrogeologic Investigation
Thorold, Ontario
FOR: Niagara Waste Systems Limited

DATE: 13 June 1991
GEOLOGIST KTH
ELEVATION 160.44 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
		CONCRETE PAD	II									
1												
1.8												
2		**SHALE** (Rochester Formation) Dark grey thin bedded calcareous shale interlaminated with fossiliferous dolostone.		1		HQ			97	95		
3												
				2		HQ			100	100		
4												
4.9												
		Borehole terminated at 4.88 m in shale.										

Printed: 14 SEP 98

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 91-108

BOREHOLE: MM3-I 1 of 1

Niagara Waste Systems Hydrogeologic Investigation
Thorold, Ontario
FOR: Niagara Waste Systems Limited

DATE: 14 June 1991
GEOLOGIST KTH
ELEVATION 160.28 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	N VALUE (15 30 45 60)	WATER CONTENT (%) (10 20 30 40)
1		CONCRETE PAD										
1.7												
2		SHALE (Rochester Formation) Dark grey thin bedded calcareous shale occasionally interlaminated to interbedded with argillaceous dolostone, locally fossiliferous.		1		HQ			100	94		
3												
				2		HQ			99	98		
4												
5				3		HQ			100	90		
6												
				4		HQ			95	38		
7												
8		-Numerous gypsum seams and nodules observed below about 7.7 m.		5		HQ			100	40		
9												
		-Fossiliferous zone from about 9.3 m to 9.5 m.		6		HQ			100	81		
10												
10.5		Borehole terminated at 10.51 m in shale.										

Printed: 14 SEP 98

Gartner Lee Limited

BOREHOLE LOG

PROJECT: 91-108

BOREHOLE: MM3-II 1 of 1

Niagara Waste Systems Hydrogeologic Investigation
Thorold, Ontario
FOR: Niagara Waste Systems Limited

DATE: 14 June 1991
GEOLOGIST KTH
ELEVATION 160.28 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	N VALUE 15 30 45 60	WATER CONTENT (%) 10 20 30 40
		CONCRETE PAD	II									
1												
1.7												
2		**SHALE**		1		HQ			98	67		
		Dark grey thin bedded calcareous shale occasionally interlaminated to interbedded with argillaceous dolostone, locally fossiliferous.										
3												
				2		HQ			99	97		
4												
5.1												
5				3		HQ			100	71		
		Borehole terminated at 5.08 m in shale.										

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BOREHOLE LOG	PROJECT: 95-105	BOREHOLE: MM4-1 1 of 1
Installation of Manhole Monitoring Well East Quarry Landfill, Thorold, Ontario **FOR:** Niagara Waste Systems Limited		**DATE:** 01 May 1995 **GEOLOGIST** YS **ELEVATION** 162.5 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	% WATER	% REC	% RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
		CONCRETE				HQ						
1.4												
1		**SHALE** (Rochester Formation) Dark grey to black, aphanitic to very fine crystalline, thin bedded calcarious shale, locally interbedded to interlaminated with argillaceous dolostone. Very weathered to about 1.9 m.				HQ			100	35		
2						HQ			100	90		
3						HQ			100	88		
4												
5						HQ			100	94		
6		-Numerous gypsum seams and nodules observed below about 6.2 m.				HQ			100	86		
7												
8						HQ			100	69		
9.2		Borehole terminated at 9.22 m in shale.										

BOREHOLE LOG	PROJECT: 95-105	BOREHOLE: MM4-2 1 of 1
Installation of Manhole Monitoring Well East Quarry Landfill, Thorold, Ontario **FOR:** Niagara Waste Systems Limited		**DATE:** 01 May 1995 **GEOLOGIST** YS **ELEVATION** 162.5 m ASL

DEPTH (m)	STRATIGRAPHY	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS & NUMBER	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE TYPE	SAMPLE N VALUE	SAMPLE % WATER	SAMPLE % REC	SAMPLE % RQD	RECOVERY (%) 25 50 75 100	RQD (%) 25 50 75 100
1.4		**CONCRETE**		1								
		SHALE (Rochester Formation) Dark grey to black, aphanitic to very fine crystalline, thin bedded calcarious shale, locally interbedded to interlaminated with argillaceous dolostone. Very weathered to about 1.9 m.		2 3 4								
4.4		Borehole terminated at 4.38 m in shale. **Stratigraphy inferred from the adjacent borehole MM4-1**										

PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 75-I

SHEET 1 OF 2

LOCATION: N 4775538.1 ;E 649530.8

DRILLING DATE: 2024-11-29

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR / % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		179.98															
0		Soil stratigraphy not logged.		0.00															
2																			
4																			
6																			
8				171.09															
		GOAT ISLAND Dolostone, dark grey, medium to fine grained, with a dull appearance, thin to medium bedded with thin wispy argillaceous contacts, thin stylolites (1mm) becoming thicker (2 mm) and more frequent below 17.07 m strong smooth core scratched with difficulty with a knife, good RQD to 13.54 m then excellent RQD, unweather appearance, occasional chert As 4 mm thick lenses subtle lower contact on fossil rich bed.		8.89	1														
10					2														
12					3														
14					4														
				164.18	5														
16	Rotary Drill HQ Core	**GASPORT** Dolostone, Medium grey to blueish grey, medium bedded fine to medium grained packstone with a weakly crystalline appearance, some thin gypsum infilling, fossils as small light-coloured fragments with some stylolite 1mm to 4mm thick, strong smooth core, excellent RQD, fresh appearance. Sharp lower contact at change in texture.		15.80	6														
18					7														
20					8														
22					9														
				157.07															
		DECEW Argillaceous dolostone, dark grey, barren, fine to very fine grained with thin wavy bedding, smooth core can be scratched with knife. Good RQD, fresh appearance. Lower contact on change in texture.		22.91	10														
24				155.93															
				24.05	11														
		CONTINUED NEXT PAGE																	

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 75-I

SHEET 2 OF 2

LOCATION: N 4775538.1 ;E 649530.8

DRILLING DATE: 2024-11-29

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR / % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		--- CONTINUED FROM PREVIOUS PAGE ---																	
26	Rotary Drill HQ Core	**ROCHESTER** Shale, dark grey to black with infrequent white calcareous and fossiliferous beds typically 1 cm to 4 cm thick, very fined grained, smooth core scratched easily with a knife. Calcareous beds become more frequent and thicker below 31.67 m and locally may comprise 20% of the recovered core particularly in the last 2 m of the Formation. Very sharp lower contact below a calcareous bed on change in texture.			11														
					12														
28					13														
					14														
30					15														
					16														
32					17														
					18														
34					19														
					20														
36					21														
					22														
38				138.37	23														
		IRONDEQUOIT Limestone, Light grey medium grained crystalline packstone with occasional stylolites and thin shaley partings especially near the upper contact, scratched with difficulty with a knife , excellent RQD sharp lower contact on colour change.		41.61														
40					24														
				136.08															
42		**REYNALES** Dolostone, medium grey wackestone, smooth core scratched by a knife, good RQD.		43.90	25														
				134.95															
44				45.03															
46																			
48																			
50																			

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 75-II

SHEET 1 OF 2

LOCATION: N 4775538.3 ;E 649536.0

DRILLING DATE: 2024-12-11

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		179.67																
		Refer to log of 75-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24		*CONTINUED NEXT PAGE*																		

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 75-II

SHEET 2 OF 2

LOCATION: N 4775538.3 ;E 649536.0

DRILLING DATE: 2024-12-11

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY TOTAL CORE % (80 60 40 20)	RECOVERY SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER 0.3 m (5 10 15 20)	DISCONTINUITY DATA: B Angle (0 30 60 90)	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3})	Diametral Point Load Index (MPa) (2 4 6)	RMC -Q' AVG.
26		*--- CONTINUED FROM PREVIOUS PAGE ---*																		
28																				
30																				
32																				
34																				
36																				
38																				
40																				
42																				
44																				
46																				
48																				
50																				

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 75-III

SHEET 1 OF 2

LOCATION: N 4775538.2 ;E 649537.7

DRILLING DATE: 2025-01-06

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		179.59																
0		Refer to log of 75-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24		*CONTINUED NEXT PAGE*																		

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 75-III

SHEET 2 OF 2

LOCATION: N 4775538.2 ;E 649537.7

DRILLING DATE: 2025-01-06

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE % (80 60 40 20)	RECOVERY: SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER 0.3 m (5 10 15 20)	DISCONTINUITY DATA: B Angle (0 90 180 270)	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3})	Diametral Point Load Index (MPa) (2 4 6)	RMC -Q' AVG.
		--- CONTINUED FROM PREVIOUS PAGE ---																		
26																				
28																				
30																				
32																				
34																				
36																				
38																				
40																				
42																				
44																				
46																				
48																				
50																				

DEPTH SCALE
1 : 125

LOGGED: JD / KJF
CHECKED: KJF

PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 75-IV

SHEET 1 OF 1

LOCATION: N 4775538.2 ;E 649532.5

DRILLING DATE: 2024-12-16

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE % (80 60 40 20)	RECOVERY: SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER 0.3 m (5 10 15 20)	DISCONTINUITY DATA: B Angle (0 30 60 90)	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3})	Diametral Point Load Index (MPa) (2 4 6)	RMC -Q' AVG.
0		GROUND SURFACE		179.90																
		Refer to log of 75-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 75-V

SHEET 1 OF 1

LOCATION: N 4775538.3 ;E 649534.2

DRILLING DATE: 2024-12-16

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		179.78																
0		Refer to log of 75-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 76-I

SHEET 1 OF 2

LOCATION: N 4777484.3 ;E 649636.9

DRILLING DATE: 2025-01-14

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.
0		GROUND SURFACE		180.05	
		Soil stratigraphy not logged.		0.00	
2					
4					
6		**GASPORT** Dolostone, blueish grey to pinkish grey, medium bedded fine to medium grained crinoidal grainstone to packstone with a weakly crystalline appearance, trace stylolite typically < 1mm thick, strong smooth core, good RQD, fresh appearance except core is light coloured with a weathered and chalky appearance to 5.38 m, sharp lower contact at change in texture.			1
				172.81	2
8		**DECEW** Argillaceous dolostone, dark grey, with a dull appearance, barren, fine to very fine grained, smooth core can be scratched with knife. Good RQD, fresh appearance. Lower contact at first appearance of calcareous bed.		7.24	3
10				169.69	4
		ROCHESTER Shale, dark grey to black with white calcareous and fossiliferous beds typically 1 cm to 4 cm thick, very fined grained, smooth core scratched easily with a knife, Calcareous beds become more frequent and thicker below 23.27 m. Fair to excellent RQD. Very sharp lower contact below a calcareous bed on change in colour and texture.		10.36	5
12					6
14	Rotary Drill HQ Core				7
16					8
					9
18					10
					11
20					12
					13
22					14
					15
24					16
		CONTINUED NEXT PAGE			

COLOUR % RETURN / FLUSH

RECOVERY: TOTAL CORE % (80 60 40 20); SOLID CORE % (80 60 40 20)

R.Q.D. % (80 60 40 20)

FRACT. INDEX PER 0.3 m (5 10 15 20)

DISCONTINUITY DATA: B Angle (0 30 60 90); DIP w.r.t. CORE AXIS (0 30 60 90); TYPE AND SURFACE DESCRIPTION; Jr; Ja; Jn

HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3})

Diametral Point Load Index (MPa) (2 4 6)

RMC -Q' AVG.

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 76-I

SHEET 2 OF 2

LOCATION: N 4777484.3 ;E 649636.9

DRILLING DATE: 2025-01-14

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		--- CONTINUED FROM PREVIOUS PAGE ---																	
26	Rotary Drill / HQ Core				16														
				153.25	17														
28		**IRONDEQUOIT** Limestone, Light grey medium grained crystalline packstone with trace thin 1mm stylolites, scratched with difficulty with a knife, excellent RQD, sharp lower contact on change in texture at base of fossiliferous bed.		26.80	18														
				150.79															
30		**REYNALES** Dolostone, medium greenish grey wackestone, smooth core scratched by a knife, good RQD.		29.26	19														
				149.55															
				30.50															
32																			
34																			
36																			
38																			
40																			
42																			
44																			
46																			
48																			
50																			

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

GTA-RCK 040 C:\USERS\CRAIG.LEGER\ONEDRIVE - WSP O365\DOCUMENTS\2026 PROJECT\SLF2 BH LOGS\SLF2 BOREHOLE LOGS_NEW FORMAT.GPJ GAL-MISS.GDT 26-4-30

PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 76-II

SHEET 1 OF 1

LOCATION: N 4777485.8 ;E 649636.6

DRILLING DATE: 2025-01-14

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		180.12																
		Refer to log of 76-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 76-III

SHEET 1 OF 1

LOCATION: N 4777487.3 ;E 649636.2

DRILLING DATE: 2025-01-14

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		180.20																
		Refer to log of 76-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 76-IV

SHEET 1 OF 1

LOCATION: N 4777489.1 ;E 649635.9

DRILLING DATE: 2025-01-14

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		180.18																
0		Refer to log of 76-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 77-I

SHEET 1 OF 2

LOCATION: N 4776927.6 ;E 650219.3

DRILLING DATE: 2025-01-30

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR / % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		181.71															
0		Soil stratigraphy not logged.		0.00															
2																			
4																			
6																			
8				172.87															
10	Rotary Drill HQ Core	**GASPORT** Dolostone, light blueish grey, medium bedded, fine to medium grained crinoidal grainstone to packstone, trace stylolite typically < 1mm thick , strong smooth core, fair to good RQD, fresh appearance. Sharp lower contact at change in colour and texture.		8.84	1														
12					2														
				168.76	3														
14		**DECEW** Argillaceous dolostone, medium to dark grey, barren, fine to very fine grained, smooth core can be scratched with knife. Good RQD, fresh appearance. Lower contact is gradational at appearance of 3 mm gypsum nodules.		12.95	4														
				165.86	5														
16		**ROCHESTER** Shale, dark grey to black, very fined grained, smooth core scratched easily with a knife, white calcareous and fossiliferous beds are rare until 23.62 m, calcareous beds typically 1 cm thick and generally constitute <10% of the recovered core, fair to poor RQD improving with depth, very sharp lower contact below a 30 cm friable calcareous bed containing rip up clasts of white dolostone on change in colour and texture.		15.85	6														
18					7														
20					8														
22					9														
24					10														
					11														
		CONTINUED NEXT PAGE																	

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 77-I

SHEET 2 OF 2

LOCATION: N 4776927.6 ;E 650219.3

DRILLING DATE: 2025-01-30

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		--- CONTINUED FROM PREVIOUS PAGE ---																	
26	Rotary Drill / HQ Core	**ROCHESTER** Shale, dark grey to black, very fined grained, smooth core scratched easily with a knife, white calcareous and fossiliferous beds are rare until 23.62 m, calcareous beds typically 1 cm thick and generally constitute <10% of the recovered core, fair to poor RQD improving with depth, very sharp lower contact below a 30 cm friable calcareous bed containing rip up clasts of white dolostone on change in colour and texture.			11														
					12														
28					13														
					14														
30					15														
					16														
32				149.15															
		IRONDEQUOIT Limestone, light grey to pinkish white - grey medium grained crystalline packstone with trace thin 1mm stylolites, scratched with difficulty with a knife, recovered core has a pitted to sandy texture, excellent RQD, sharp lower contact on change in texture and colour.		32.56	17														
34				146.68															
		REYNALES Dolostone, medium greenish grey wackestone with some shaley to stylolite partings, smooth core scratched by a knife, fair to good RQD.		35.03	18														
36				144.65															
				37.06															
38																			
40																			
42																			
44																			
46																			
48																			
50																			

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 77-II

SHEET 1 OF 2

LOCATION: N 4776927.8 ;E 650217.6

DRILLING DATE: 2025-01-30

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		181.65																
0		Refer to log of 77-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24		*CONTINUED NEXT PAGE*																		

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 77-II

SHEET 2 OF 2

LOCATION: N 4776927.8 ;E 650217.6

DRILLING DATE: 2025-01-30

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		--- CONTINUED FROM PREVIOUS PAGE ---																		
26																				
28																				
30																				
32																				
34																				
36																				
38																				
40																				
42																				
44																				
46																				
48																				
50																				

DEPTH SCALE
1 : 125

LOGGED: JD / KJF
CHECKED: KJF

PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 77-III

SHEET 1 OF 1

LOCATION: N 4776928.0 ;E 650215.9

DRILLING DATE: 2025-01-30

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		181.62																
0		Refer to log of 77-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 77-IV

SHEET 1 OF 1

LOCATION: N 4776928.6 ;E 650212.6

DRILLING DATE: 2025-01-30

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		181.56																
		Refer to log of 77-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 77-V

SHEET 1 OF 1

LOCATION: N 4776928.4 ;E 650214.2

DRILLING DATE: 2025-01-30

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		181.59																
		Refer to log of 77-I for stratigraphic descriptions.		0.00																

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 78-I

SHEET 1 OF 2

LOCATION: N 4776303.4 ;E 649935.1

DRILLING DATE: 2025-02-11

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR / % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		182.14															
0		Soil stratigraphy not logged.		0.00															
2																			
4																			
6																			
8	Rotary Drill HQ Core	**GASPORT** Dolostone, light blueish grey, medium bedded, fine to medium grained crinoidal grainstone to packstone, vuggy to 10.49 m typically 1 to 2 vugs per 1.5 m, 4 mm to 10 mm in size then becoming noticeably less vuggy and with trace stylolites typically < 1mm thick, strong core, good to excellent RQD, fresh overall appearance except rust-stained fracture at 11.30 m. Sharp lower contact on a brecciated bed at change in colour and texture.		174.22 7.92	1														
10					2														
12					3														
14					4														
16					5														
18					6														
					7														
					8														
				163.23	9														
20		**DECEW** Argillaceous dolostone, medium to dark grey with wavy internal bedding, barren, fine to very fine grained, smooth core can be scratched with knife. Good RQD, fresh appearance. Lower contact is gradational at appearance of a gypsum seam.		18.91	10														
				160.50															
22		**ROCHESTER** Shale, dark grey to black, very fined grained, smooth core scratched easily with a knife white calcareous and fossiliferous beds are rare until 28.80 m. Calcareous beds typically 2 cm thick and generally constitute <5% of the recovered core. Fair to good RQD Sharp lower contact below a bed containing rip up clasts of white dolostone on change in colour and texture.		21.64	11														
24					12														
					13														
		CONTINUED NEXT PAGE																	

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 78-I

SHEET 2 OF 2

LOCATION: N 4776303.4 ;E 649935.1

DRILLING DATE: 2025-02-11

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		--- CONTINUED FROM PREVIOUS PAGE ---																	
26	Rotary Drill / HQ Core	**ROCHESTER** Shale, dark grey to black, very fined grained, smooth core scratched easily with a knife white calcareous and fossiliferous beds are rare until 28.80 m. Calcareous beds typically 2 cm thick and generally constitute <5% of the recovered core. Fair to good RQD Sharp lower contact below a bed containing rip up clasts of white dolostone on change in colour and texture.			13														
28					14														
30					15														
32					16														
34					17														
36					18														
38					19														
					20														
					21														
					22														
				143.63	23														
		IRONDEQUOIT Limestone, light grey to pinkish- grey medium grained crystalline packstone with trace thin 1mm stylolites, scratched with difficulty with a knife, recovered core has a pitted to sandy texture, excellent RQD.		38.51															
40					24														
				141.35															
		REYNALES		40.79	25														
				140.59															
42				41.55															
44																			
46																			
48																			
50																			

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

GTA-RCK 040 C:\USERS\CRAIG.LEGER\ONEDRIVE - WSP O365\DOCUMENTS\2026 PROJECT\SLF2 BH LOGS\SLF2 BOREHOLE LOGS_NEW FORMAT.GPJ GAL-MISS.GDT 26-4-30

PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 78-II

SHEET 1 OF 2

LOCATION: N 4776304.8 ;E 649935.7

DRILLING DATE: 2025-02-13

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		182.07																
0		Refer to log of 78-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
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16																				
18																				
20																				
22																				
24		*CONTINUED NEXT PAGE*																		

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 78-II

SHEET 2 OF 2

LOCATION: N 4776304.8 ;E 649935.7

DRILLING DATE: 2025-02-13

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN
		--- CONTINUED FROM PREVIOUS PAGE ---					

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

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PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

RECOVERY: TOTAL CORE % (80 60 40 20); SOLID CORE % (80 60 40 20)

R.Q.D. % (80 60 40 20)

FRACT. INDEX PER 0.3 m (5 10 15 20)

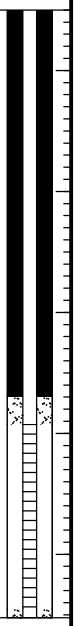
DISCONTINUITY DATA: B Angle (0 30 60 90); DIP w.r.t. CORE AXIS (0 30 60 90); TYPE AND SURFACE DESCRIPTION; Jr; Ja; Jn

HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3})

Diametral Point Load Index (MPa) (2 4 6)

RMC -Q' AVG.

26 28 30 32 34 36 38 40 42 44 46 48 50



DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 78-III

SHEET 1 OF 2

LOCATION: N 4776306.4 ;E 649936.3

DRILLING DATE: 2025-02-17

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		182.11																
		Refer to log of 78-I for stratigraphic descriptions.		0.00																
2																				
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20																				
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24		*CONTINUED NEXT PAGE*																		

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 78-III

SHEET 2 OF 2

LOCATION: N 4776306.4 ;E 649936.3

DRILLING DATE: 2025-02-17

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE % (80 60 40 20)	RECOVERY: SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER 0.3 m (5 10 15 20)	DISCONTINUITY DATA: B Angle (0 90 180 270)	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3})	Diametral Point Load Index (MPa) (2 4 6)	RMC -Q' AVG.
		--- CONTINUED FROM PREVIOUS PAGE ---																		
26																				
28																				
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46																				
48																				
50																				

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 78-IV

SHEET 1 OF 1

LOCATION: N 4776307.6 ;E 649936.9

DRILLING DATE: 2025-02-18

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		182.08																
		Refer to log of 78-I for stratigraphic descriptions.		0.00																

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

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DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 78-V

SHEET 1 OF 1

LOCATION: N 4776309.3 ;E 649937.4

DRILLING DATE: 2025-04-03

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		182.12																
		Refer to log of 78-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
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18																				
20																				
22																				
24																				

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 79-I

SHEET 1 OF 2

LOCATION: N 4775767.4 ;E 650457.4

DRILLING DATE: 2025-04-17

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		182.46															
0		Soil stratigraphy not logged.		0.00															
2																			
4																			
6				176.52															
		GOAT ISLAND Argillaceous dolostone, dark grey, medium to fine grained, with a dull appearance, thin to medium bedded with thin wispy argillaceous contacts, stylolites and shaley partings (1 to 4 mm) typically 3 to 4 per 0.3m, strong smooth core scratched with difficulty with a knife, poor RQD to 9.88 m then fair RQD, slightly weathered appearance to 6.60 m, sharp lower contact on fossil rich bed with change in colour and texture.		5.94	1														
8					2														
					3														
10				172.38	4														
		GASPORT Dolostone, dark grey becoming light blueish grey below 11.73 m becoming pinkish grey below 17.70 m, medium bedded, fine to medium grained crinoidal grainstone to packstone, with trace stylolites typically 1mm to 4mm thick, strong smooth core, good to excellent RQD. Fresh overall appearance. Sharp lower contact on a fossiliferous bed at change in colour and texture.		10.08	5														
12					6														
14					7														
16	Rotary Drill / HQ Core				8														
					9														
18				162.88	10														
		DECEW Argillaceous dolostone, medium to dark grey with wavy internal bedding, barren, fine to very fine grained, smooth core can be scratched with knife. Good RQD, fresh appearance. Lower contact is gradational at appearance of first carbonate bed.		19.58	11														
20					12														
22				159.90															
				22.56	13														
24					14														
					15														
		CONTINUED NEXT PAGE																	

DEPTH SCALE
1 : 125

LOGGED: JD / KJF
CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 79-I

SHEET 2 OF 2

LOCATION: N 4775767.4 ;E 650457.4

DRILLING DATE: 2025-04-17

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR / % RETURN	FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		--- CONTINUED FROM PREVIOUS PAGE ---																		
26	Rotary Drill HQ Core	**ROCHESTER** Shale, dark grey, very fined grained, smooth core scratched easily with a knife, white calcareous and fossiliferous beds are rare until 28.19 m. Calcareous beds typically 2 cm thick and generally constitute 5% to 10% of the recovered core. Gypsum coated fractures are common throughout. Good to excellent RQD. Sharp lower contact below a bed containing rip up clasts of white dolostone on change in colour and texture.			15															
					16															
28					17															
					18															
30					19															
					20															
32					21															
					22															
34					23															
					24															
36					25															
				143.57																
38		**IRONDEQUOIT** Limestone, light grey to pinkish-grey medium grained crystalline packstone to grainstone with trace thin 1mm stylolites, scratched with difficulty with a knife, recovered core has a slightly pitted texture, excellent RQD.		38.89	26															
40				141.62																
				40.84																
42																				
44																				
46																				
48																				
50																				

DEPTH SCALE
1 : 125

LOGGED: JD / KJF
CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 79-II

SHEET 1 OF 2

LOCATION: N 4775769.1 ;E 650457.3

DRILLING DATE: 2025-04-17

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		182.53																
		Refer to log of 79-I for stratigraphic descriptions.		0.00																
2																				
4																				
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22																				
24		*CONTINUED NEXT PAGE*																		

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 79-II

SHEET 2 OF 2

LOCATION: N 4775769.1 ;E 650457.3

DRILLING DATE: 2025-04-17

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		--- CONTINUED FROM PREVIOUS PAGE ---																		
26																				
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44																				
46																				
48																				
50																				

DEPTH SCALE
1 : 125

LOGGED: JD / KJF
CHECKED: KJF

PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 79-III

SHEET 1 OF 1

LOCATION: N 4775770.8 ;E 650457.4

DRILLING DATE: 2025-04-17

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		182.56																
0		Refer to log of 79-I for stratigraphic descriptions.		0.00																
2																				
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12																				
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18																				
20																				
22																				
24																				

JN - Joint
FLT - Fault
SHR- Shear
VN - Vein
CJ - Conjugate

BD- Bedding
FO- Foliation
CO- Contact
OR- Orthogonal
CL - Cleavage

PL - Planar
CU- Curved
UN- Undulating
ST - Stepped
IR - Irregular

PO- Polished
K - Slickensided
SM- Smooth
Ro - Rough
MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 79-IV

SHEET 1 OF 1

LOCATION: N 4775772.3 ;E 650457.3

DRILLING DATE: 2025-04-17

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		182.54																
		Refer to log of 79-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 80-I

SHEET 1 OF 2

LOCATION: N 4776939.6 ;E 650820.0

DRILLING DATE: 2025-04-29

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR / % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		182.26															
0		Soil stratigraphy not logged.		0.00															
2																			
4																			
6																			
8				174.18															
		GASPORT Dolostone, light grey to blueish grey, medium bedded fine to medium grained crinoidal grainstone with a weakly crystalline appearance, some stylolites typically 1 to 3 mm thick except 12 cm shaley zone at 12.80 m, smooth core with a notably pitted surface below 13.41 m where core becomes pinkish grey to blue-green, grey. Fair RQD, slightly weathered appearance to 10.97 m with a lower RQD. Sharp lower contact at change in texture and colour.		8.08	1														
10					2														
					3														
12					4														
14					5														
				167.40															
		DECEW Argillaceous dolostone, dark grey, with a dull appearance, barren, fine to very fine grained, wavy bedding is evident throughout, some gypsum infilled fractures, smooth core can be scratched with knife, good RQD, fresh appearance. Lower contact at first appearance of calcareous bed.		14.86	6														
16	Rotary Drill HQ Core				7														
					8														
18					9														
				162.45															
20		**ROCHESTER** Shale, dark grey to black with white calcareous and fossiliferous beds typically 1 cm to 4 cm thick most prominent in two zones 24.18 m to 25.76 m and 33.38 m to 34.14 m, very fined grained, smooth core scratched easily with a knife. Good to excellent RQD. Very sharp lower contact below a calcareous bed on change in colour and texture.		19.81	10														
22					11														
					12														
24					13														
		CONTINUED NEXT PAGE																	

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 80-I

SHEET 2 OF 2

LOCATION: N 4776939.6 ;E 650820.0

DRILLING DATE: 2025-04-29

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break; BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR / % RETURN	FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		--- CONTINUED FROM PREVIOUS PAGE ---																		
26	Rotary Drill / HQ Core	**ROCHESTER** Shale, dark grey to black with white calcareous and fossiliferous beds typically 1 cm to 4 cm thick most prominent in two zones 24.18 m to 25.76 m and 33.38 m to 34.14 m, very fined grained, smooth core scratched easily with a knife. Good to excellent RQD. Very sharp lower contact below a calcareous bed on change in colour and texture.			13															
					14															
28					15															
					16															
30					17															
32					18															
					19															
34				148.12																
		IRONDEQUOIT Limestone, light grey medium grained crystalline packstone with trace thin 1mm stylolites, trace vugs, scratched with difficulty with a knife, good to excellent RQD.		34.14	20															
36				145.96	21															
				36.30																
38																				
40																				
42																				
44																				
46																				
48																				
50																				

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 80-II

SHEET 1 OF 1

LOCATION: N 4776938.0 ;E 650820.4

DRILLING DATE: 2025-04-29

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		182.29																
		Refer to log of 80-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 80-III

SHEET 1 OF 1

LOCATION: N 4776936.1 ;E 650821.2

DRILLING DATE: 2025-04-29

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		182.26																
0		Refer to log of 80-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 81-I

SHEET 1 OF 2

LOCATION: N 4777440.3 ;E 650802.1

DRILLING DATE: 2025-05-12

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR % RETURN / FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		182.78															
0		Soil stratigraphy not logged.		0.00															
				175.52															
		GASPORT Dolostone, light grey to blueish grey. Medium bedded crinoidal grainstone, medium grained, trace vugs, with some stylolite 1mm to 4mm thick, strong smooth core, good RQD, fresh appearance Sharp and dished lower contact at change in texture at 11.51 m.		7.26	1														
8					2														
10					3														
				171.27	4														
		DECEW Argillaceous dolostone, dark grey, barren but with a 7 cm thick fossiliferous bed at 12.27 m, fine to very fine grained, smooth core can be scratched with knife. Good RQD, fresh appearance. Lower contact is subtle at appearance of first calcareous fossiliferous bed.		11.51	5														
12				169.60															
		ROCHESTER Shale, dark grey to black with infrequent white calcareous and fossiliferous beds typically 1 cm to 4 cm thick, very fined grained, smooth core scratched easily with a knife Calcareous beds become more frequent and thicker below 21.89 m and locally may comprise 20% of the recovered core. Very sharp lower contact below a calcareous bed on change in texture.		13.18	6														
14					7														
					8														
16	Rotary Drill HQ Core				9														
18					10														
20					11														
22					12														
					13														
24					14														
		CONTINUED NEXT PAGE																	

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 81-I

SHEET 2 OF 2

LOCATION: N 4777440.3 ;E 650802.1

DRILLING DATE: 2025-05-12

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	COLOUR / % RETURN	FLUSH	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		--- CONTINUED FROM PREVIOUS PAGE ---																		
26	Rotary Drill HQ Core	**ROCHESTER** Shale, dark grey to black with infrequent white calcareous and fossiliferous beds typically 1 cm to 4 cm thick, very fined grained, smooth core scratched easily with a knife Calcareous beds become more frequent and thicker below 21.89 m and locally may comprise 20% of the recovered core. Very sharp lower contact below a calcareous bed on change in texture.			14															
28					15															
30					16															
32					17															
				151.39	18															
		IRONDEQUOIT Limestone, light grey medium grained packstone with occasional stylolites and thin shaley partings especially near the upper contact, scratched with difficulty with a knife, vuggy appearance below 32.28 m.		31.39	19															
				149.66																
				33.12																

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE
1 : 125

LOGGED: JD / KJF
CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 81-II

SHEET 1 OF 1

LOCATION: N 4777440.5 ;E 650803.9

DRILLING DATE: 2025-05-12

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
0		GROUND SURFACE		182.86																
		Refer to log of 81-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate

BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage

PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular

PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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PROJECT: Walker South Landfill Phase 2

RECORD OF MONITORING WELL: 81-III

SHEET 1 OF 1

LOCATION: N 4777440.9 ;E 650805.8

DRILLING DATE: 2025-05-12

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Noll Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH	COLOUR / % RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jr	Ja	Jn	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.
		GROUND SURFACE		182.92																
0		Refer to log of 81-I for stratigraphic descriptions.		0.00																
2																				
4																				
6																				
8																				
10																				
12																				
14																				
16																				
18																				
20																				
22																				
24																				

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE

1 : 125

LOGGED: JD / KJF

CHECKED: KJF

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Table B-1 Monitor Construction Details - Existing Wells

Well ID	Monitor Installation Date	Well Pipe Diameter mm	Ground Elevation	Top of Pipe Elevation	Screened Interval	Filter Pack	Seal	Surface Seal	Hydrostratigraphic Unit
Monitoring Wells									
1-1	1976	32	182.210	183.080	156.2 - 156.0	156.2 - 158.5	158.5 - 181.5		Rochester shale (fossil zone)
1-2	1976	19	182.190	183.070	166.1 - 166.1	166.1 - 167.3	167.3 - 181.5		Decew dolostone
1-3 [d]	1976	10	181.900		173.1 -	173.1 - 177.1	177.1 -		Lockport dolostone
1-4	1976	19	182.250	183.120	176.2 - 176.2	176.2 - 180.3	180.3 - 181.4		Overburden
1-5		51	182.470	183.140	166.7 - 167.3				Lockport dolostone
2-1	1976	32	182.790	183.670	154.6 - 156.2	154.6 - 161.2	161.2 - 182.2		Rochester shale (fossil zone)
2-2	1976	32	182.730	183.650	167.0 - 168.5	167.0 -			Lockport dolostone
2-3 [d]	1976	10	182.640		168.9 -	168.9 - 172.5	172.5 -		Lockport dolostone
2-4	1976	19	182.780	183.640	174.6 - 170.0	174.6 - 181.0	181.0 - 182.2		Overburden
3-1	1976	32	180.180	181.160	155.3 - 156.8	155.3 - 163.4	163.4 - 179.5		Rochester shale (fossil zone)
3-2	1976	32	180.110	181.100	164.5 - 166.0	164.5 - 169.1	169.1 - 179.4		Lockport dolostone
3-3 [d]	1976	10	179.830		165.4 -	165.4 - 169.5	169.5 -		Lockport dolostone
3-4	1976	51	180.190	181.170	172.0 - 173.5	172.0 - 178.3	178.3 - 179.5		Overburden
3-5	1996	51	180.830	181.610	172.3 - 175.4	172.3 - 175.8	175.8 - 179.9	179.9 180.5	Overburden
4-1	1976	32	180.400	181.380	154.7 - 156.3	154.7 - 164.6	164.6 -		Rochester shale
4-2	1976	32	180.320	181.290	164.4 - 166.0	164.4 -	- 179.8		Lockport dolostone
4-3 [d]	1976	10	180.140		165.2 -	165.2 - 166.4	166.4 -		Lockport dolostone
4-4	1976	19	180.410	181.390	169.4 - 170.9	169.4 - 178.6	178.6 -		Overburden
5-1	1976	32	175.830	176.810	156.3 - 157.8	156.3 - 157.0	157.0 - 176.2		Rochester shale (fossil zone)
5-2	1976	32	175.880	176.850	167.1 - 168.6	167.1 - 168.0	168.0 - 176.2		Lockport dolostone
5-3	1976	19	175.870	176.850	170.7 - 172.2	170.7 - 174.9	174.9 - 176.1	178.6 179.4	Overburden
6-1	1976	32	181.080	181.930	158.9 - 160.5	158.9 - 160.9	160.9 - 181.0		Rochester shale (fossil zone)
6-2	1976	32	181.390	182.180	168.0 - 169.5	168.0 - 169.2	169.2 - 179.9		Decew dolostone
6-3	1976	19	181.390	182.180	175.1 - 176.6	175.1 - 177.7	177.7 - 179.9		Overburden
7-1 [d]	1976	32	184.980	184.910	157.9 - 159.4	157.9 - 158.8	158.8 - 185.0		Rochester shale (fossil zone)
7-1R		51		184.420					Rochester shale (fossil zone)
7-2	1976	32	183.910	184.960	170.4 - 172.0	170.4 - 171.1	171.1 - 183.9		Lockport dolostone
7-3 [d]	1976	19	184.980	184.830	171.9 - 173.4	171.9 - 182.9	182.9 - 185.0		Overburden
7-3R		51		184.540					Overburden
8-1 [d]	1977	32			157.1 - 158.6	157.1 - 158.2	158.2 -		Rochester shale
8-2 [d]	1977	19			165.0 - 166.5	165.0 - 166.7	166.7 -		Fill
9-1 [d]	1976	32			155.9 - 157.4	155.9 - 156.7	156.7 -		Rochester shale
9-2 [d]	1976	19			165.3 - 166.8	165.3 -			Rochester shale
10-1 [d]	1977	32			156.2 - 157.7	156.2 - 157.3	157.3 -		Rochester shale
10-2 [d]	1977	19			164.1 - 165.7	164.1 - 169.5	169.5 -		Fill
11-1 [d]	1977	32	170.110		156.0 - 157.5	156.0 - 157.6	157.6 -		Rochester shale
11-2 [d]	1977	19	170.110		163.1 - 164.6	163.1 - 166.1	166.1 -		Fill
11A-1 [d]	1978	19	170.260		154.8 - 156.4	154.8 - 157.0	157.0 - 167.3		Rochester shale
11A-2 [d]	1978	13	170.260		160.7 - 162.2	160.7 - 165.5	165.5 -		Fill
12-1 [d]	1976	32	170.380		156.2 - 157.7	156.2 - 157.0	157.0 -		Rochester shale
12-2 [d]	1976	19	170.380		164.3 - 165.8	164.3 - 168.6	168.6 -		Rochester shale
13-1 [d]	1977	19	184.130		166.1 - 167.6	166.1 - 170.7	170.7 - 175.8		Waste
14-1 [d 2012]	1977	32	181.080	182.000	155.1 - 156.6	155.1 - 157.9	157.9 - 172.2		Rochester shale (fossil zone)

Table B-1 Monitor Construction Details - Existing Wells

Well ID	Monitor Installation Date	Well Pipe Diameter mm	Ground Elevation	Top of Pipe Elevation	Screened Interval	Filter Pack	Seal	Surface Seal	Hydrostratigraphic Unit
14-1R	2012	51	181.480	182.240	155.6 - 157.1	155.6 - 158.5	158.5 - 171.1	180.9 181.5	Rochester shale (fossil zone)
14-2	1977	32	181.370	182.220	166.5 - 171.2	166.5 - 167.0	167.0 -		Lockport dolostone
14-3	1977	13	181.370	182.220	171.2 - 172.9	171.2 - 170.9	170.9 - 179.9		Lockport dolostone
14-4	1977	19	181.080	181.990	167.6 - 172.9	172.9 - 175.6	175.6 - 180.2		Overburden
14-5	1977	19	182.080	182.230	166.6 - 167.3	167.3 - 169.8	169.8 - 180.1		Lockport dolostone
15-1	1977	32	175.480	176.320	148.2 - 148.2	148.2 - 148.1	148.1 - 168.2		Rochester shale (fossil zone)
15-2	1977	32	175.470	176.220	160.6 - 160.6	160.6 - 161.1	161.1 - 162.4		Lockport dolostone
15-3	1977	19	175.460	176.210	162.5 - 165.1	162.5 - 166.2	166.2 - 173.6		Lockport dolostone
15-4	1977	19	175.470	176.330	168.7 - 168.7	168.7 - 171.2	171.2 - 173.7		Overburden
15-5	1991	51	175.740	176.520	156.0 - 158.8	156.0 - 159.0	159.0 - 175.3		Decew dolostone
16-1	1977	32	176.750	177.630	151.4 - 152.9	151.4 - 152.1	152.1 - 171.0		Rochester shale (fossil zone)
16-2	1977	32	176.970	177.690	163.5 - 165.1	163.5 - 165.5	165.5 - 177.6		Lockport dolostone
16-3	1977	13	176.890	177.660	165.5 - 167.1	165.5 - 170.2	170.2 - 176.5		Lockport dolostone
16-4	1977	19	176.590	177.480	171.6 - 173.1	171.6 - 174.5	174.5 - 176.6		Overburden
17-1 [d 2012]	1977	32	182.060	182.050	153.2 - 154.7	153.2 - 153.8	153.8 - 174.5		Rochester shale (fossil zone)
17-1R	2012	51	181.840	182.660	156.8 - 159.8	156.8 - 160.5	160.5 - 174.5	180.9 181.9	Rochester shale (fossil zone)
17-2	1977	32	181.490	182.020	166.0 - 167.5	166.0 - 166.6	166.6 - 180.3		Lockport dolostone
17-3	1977	19	181.480	182.020	166.9 - 168.4	166.9 - 175.1	175.1 - 182.3		Lockport dolostone
17-4	1977	19	182.060	182.050	178.1 - 179.6	178.1 - 181.2	181.2 - 182.1		Overburden
17-5	1977	13	181.460	182.020	175.3 - 176.8	175.3 - 181.5	181.5 - 182.3		Overburden
18-1	1977	32	181.770	181.770	156.5 - 158.0	156.5 - 157.3	157.3 - 178.0		Rochester shale (fossil zone)
18-2	1977	32	182.540	183.020	167.9 - 169.4	167.9 - 168.7	168.7 - 172.4		Lockport dolostone
18-3	1977	13	182.530	182.990	169.3 - 170.8	169.3 - 181.8	181.8 - 182.7		Lockport dolostone
18-4	1977	19	181.830	181.830	178.1 - 179.6	178.1 - 181.0	181.0 - 183.1		Overburden
19-1 [d 2008]		32	184.830	184.820	158.3 - 159.8	158.3 - 168.3	168.3 - 177.2		Rochester shale (fossil zone)
19-1R	2008	51	183.700	184.570	155.9 - 158.9	155.9 - 159.5	159.5 - 183.4		Rochester shale (fossil zone)
19-2 [d 2008]		32	184.710	184.700	169.7 - 170.4	169.7 - 170.4	170.4 - 175.0		Lockport dolostone
19-2R	2008	51	183.580	184.450	166.6 - 168.2	166.6 - 168.5	168.5 - 183.3		Decew dolostone
19-3 [d 2008]		13	184.710	184.700	171.7 - 173.2	171.7 - 175.0	175.0 - 183.5		Lockport dolostone
19-3R	2008	51	183.620	184.590	169.6 - 172.5	169.6 - 172.9	172.9 - 183.3		Lockport dolostone
19-4 [d 2008]		19	184.830	184.820	177.3 - 178.6	177.3 - 180.6	180.6 - 183.6		Overburden
19-4R	2008	51	183.620	184.530	176.5 - 179.5	176.5 - 181.2	181.2 - 183.3		Overburden
20-1	1977	32	167.500	167.720	158.8 - 160.4	158.8 - 159.3	159.3 - 167.2		Rochester shale (fossil zone)
20-2	1977	13	167.500		162.0 - 163.6	162.0 - 165.1	165.1 - 167.2		Rochester shale
21-1	1977	32	166.150		156.6 - 158.1	156.6 - 157.1	157.1 - 165.1		Rochester shale
21-2	1977	13	165.930		160.8 - 162.3	160.8 - 163.3	163.3 - 165.1		Decew dolostone
22-1	1977	32	179.930	180.680	160.5 - 162.0	160.5 - 161.2	161.2 - 180.4		Rochester shale (fossil zone)
22-2	1977	32	179.930	180.650	171.0 - 172.5	171.0 - 171.9	171.9 - 180.5		Lockport dolostone
22-3	1977	13	179.980	180.620	172.3 - 173.8	172.3 - 177.1	177.1 - 179.2		Lockport dolostone
22-4	1977	19	179.900	180.680	175.8 - 177.3	175.8 - 175.6	175.6 - 178.3		Overburden
23-1 [d 2003]		32	173.580		164.5 - 166.0	164.5 - 165.1	165.1 - 172.7		Rochester shale (fossil zone)
23-1R	2003	51	173.800	174.620	164.3 - 165.6	164.3 - 166.4	166.4 - 172.8		Rochester shale (fossil zone)
23-2		13	173.220		167.2 - 168.7	167.2 - 170.1	170.1 - 175.9		Rochester shale
24-1	1977	32	179.680	180.420	160.2 - 161.7	160.2 - 161.0	161.0 - 175.9		Rochester shale (fossil zone)

Table B-1 Monitor Construction Details - Existing Wells

Well ID	Monitor Installation Date	Well Pipe Diameter mm	Ground Elevation	Top of Pipe Elevation	Screened Interval	Filter Pack	Seal	Surface Seal	Hydrostratigraphic Unit
24-2	1977		180.500		172.8 - 174.3	172.8 - 177.3	177.3 - 179.6		Lockport dolostone
24-3	1977		180.500		173.6 - 175.2	173.6 - 174.2	174.2 - 180.5		Lockport dolostone
24-4	1977	19	179.720	180.480	175.7 - 177.2	175.7 - 178.9	178.9 - 178.9		Overburden
25-1	1978	19	171.450		158.8 - 160.3	158.8 - 159.6	159.6 - 170.3		Rochester shale
25-2	1978	13	171.450		160.6 - 162.2	160.6 - 163.9	163.9 - 171.5		Rochester shale
26-1 [d 2007]	1978	32	169.290	172.300	147.4 - 149.0	147.4 - 148.0	148.0 - 168.2		Irondequoit limestone
26-1R	2007	51		179.220	-30.4 - -29.0	-30.4 - -28.0	-28.0 - 0.0		Irondequoit limestone
26-2 [d 2007]	1978	32	169.710	172.340	159.9 - 161.4	159.9 - 160.5	160.5 - 169.7		Rochester shale
26-2R	2007	51		179.200	-20.8 - -19.4	-20.8 - -18.4	-18.4 - 0.0		Rochester shale
26-3 [d 2007]	1978	19	169.710	172.280	162.1 - 163.6	162.1 - 164.8	164.8 - 168.2		Rochester shale
26-4 [d 2007]	1991	51	172.580	172.590	158.0 - 162.3	157.8 - 162.7	162.7 - 168.6		Rochester shale (fossil zone)
26-4R	2007	51		179.210	-16.8 - -13.8	-16.8 - -12.8	-12.8 - 0.0		Rochester shale (fossil zone)
27-1	1978	13	183.860		164.4 - 165.9	164.4 - 167.6	167.6 - 183.1		Overburden
28-1	1978	19	168.770		159.1 - 160.7	159.1 - 159.9	159.9 - 168.8		Rochester shale
28-2	1978	13	168.770		160.7 - 162.2	160.7 - 163.9	163.9 - 167.6		Rochester shale
29-1	1978	19	168.070		158.1 - 159.7	158.1 - 159.0	159.0 - 168.1		Rochester shale
29-2	1978	13	168.070		159.7 - 161.2	159.7 - 162.7	162.7 - 166.9		Rochester shale
30-1	1978	32	166.570		148.6 - 150.1	148.6 - 149.2	149.2 - 165.4		Rochester shale
30-2	1978	19	166.420		157.1 - 158.6	157.1 - 157.7	157.7 - 166.4		Rochester shale
30-3	1978	13	166.420		158.3 - 159.8	158.3 - 161.4	161.4 - 165.4		Rochester shale
31-1	1978	32	184.040		154.3 - 155.8	154.3 - 155.7	155.7 - 184.0		Rochester shale
31-2	1978	19	184.040		168.2 - 169.7	168.2 - 173.7	173.7 - 182.8		Lockport dolostone
31-3	1978	13	184.040		170.8 - 172.4	170.8 - 173.7	173.7 - 182.8		Lockport dolostone
31-4	1978	19	184.040		177.8 - 179.3	177.8 - 180.7	180.7 - 182.8		Overburden
32-1 [d 2003]		19	177.390		164.7 - 166.3	164.7 - 165.4	165.4 - 177.4		Lockport dolostone
32-1R	2003	51	177.050	177.730	163.0 - 164.4	163.0 - 165.0	165.0 - 176.0		Lockport dolostone
32-2 [d 2003]		13	177.390		166.4 - 167.9	166.4 - 169.3	169.3 - 176.3		Lockport dolostone
32-2R	2003	51	177.030	177.760	166.7 - 168.3	166.7 - 168.7	168.7 - 176.0		Lockport dolostone
36-1	1980	51	184.070		162.9 - 164.4	162.9 - 182.4	182.4 - 182.4		Waste
36-2 [d]	1991	51	183.220	185.050	166.4 - 172.3	166.0 - 172.7	172.7 - 183.2		Waste
36-2R		51	185.540	186.380					Waste
37-1 [d]	1980	51	185.260	187.950	166.1 - 167.6	166.1 - 178.7	179.8 * - 180.1 *	185.0 * - 185.3 *	Rochester shale
37-2 [d]	1980	51	185.470	187.970	175.6 - 177.1	175.6 - 184.0		185.2 * - 185.5 *	Waste
38-1	1979	19	169.260		150.5 - 152.0	150.5 - 151.3			Reynales dolostone
38-2	1979	13	169.800		163.7 - 165.3	163.7 - 166.5	166.5 - 168.0		Rochester shale
39-1	1979	19	176.910	177.550	139.1 - 140.6	139.1 - 139.8	139.8 - 139.8		Irondequoit limestone
39-2	1979	13	176.910	177.560	163.1 - 164.7	163.1 - 165.4	165.4 - 165.4		Lockport dolostone
40-1	1979	19	184.480	185.480	142.9 - 144.4	142.9 - 143.5			Reynales dolostone
40-2	1979	13	184.480	185.460	170.3 - 171.9	170.3 - 172.8			Lockport dolostone
41-1	1982	38	168.860		148.7 -	148.7 - 153.3	153.3 - 168.6		Rochester shale
41-2	1982	38	168.860		154.5 -	154.5 - 168.6	168.6 - 168.9		Decew dolostone
42-1	1982	38	174.040	175.050	157.3 - 158.5	157.3 - 158.5	158.5 - 174.0		Rochester shale (fossil zone)
42-2	1982	38	174.320	175.280	164.4 - 172.6	164.4 - 172.6			Decew dolostone
43-1		51		164.400					Rochester shale

Table B-1 Monitor Construction Details - Existing Wells

Well ID	Monitor Installation Date	Well Pipe Diameter mm	Ground Elevation	Top of Pipe Elevation	Screened Interval	Filter Pack	Seal	Surface Seal	Hydrostratigraphic Unit
43-2		51		164.530					Rochester shale (fossil zone)
44-1		51							Rochester shale
44-2		51							Rochester shale
45-1		51	171.590	172.190	155.8 - 156.6				Rochester shale
45-2		51	171.540	172.390	160.0 - 169.1				Rochester shale (fossil zone)
46-1 [d 2003]		51	179.300	179.780	151.6 - 152.2	151.6 - 153.0	153.0 - 153.9	178.6 - 178.9	Rochester shale (fossil zone)
46-1R	2003	51	179.120	180.100	151.3 - 152.8	151.3 - 153.3	153.3 - 178.6		Rochester shale (fossil zone)
46-2		51	179.180	179.770	162.1 - 162.7	162.0 - 163.4	163.4 - 163.9		Lockport dolostone
46-3		51	179.220	179.600	169.7 - 172.3	169.0 - 177.7	177.7 - 177.3		Lockport dolostone
46-4		51	179.180	179.740	173.0 - 176.4	173.0 - 177.7	177.7 - 178.2		Overburden
47-1 [d 2005]		51	179.940	180.400	149.1 - 149.7	149.1 - 150.8	150.8 - 151.9		Rochester shale (fossil zone)
47-1R	2005	51	177.170	177.940	147.4 - 148.9	147.4 - 149.3	149.3 - 175.9		Rochester shale (fossil zone)
47-2 [d 2005]		51	179.910	180.380	160.1 - 160.7	160.1 - 161.5	161.5 - 162.0		Lockport dolostone
47-2R	2005	51	177.080	177.880	159.6 - 160.1	159.6 - 160.4	160.4 - 175.8		Lockport dolostone
47-3 [d 2005]		51	180.140	180.440	167.0 - 169.7	167.0 - 178.5	178.5 - 179.2		Lockport dolostone
47-3R	2005	51	176.980	177.730	165.3 - 168.2	165.3 - 169.2	169.2 - 175.7		Lockport dolostone
47-4 [d 2005]		51	180.100	180.400	171.7 - 175.2	171.7 - 179.0	179.0 - 179.5		Overburden
47-4R	2005	51	176.960	177.710	169.1 - 173.3	169.1 - 174.0	174.0 - 176.4		Overburden
48-1	1988	51	185.260	185.260	162.0 - 162.6	162.6 - 163.9	163.9 - 174.5		Rochester shale (fossil zone)
48-2	1988	51	185.230	185.230	170.5 - 173.2	170.9 - 174.4	174.4 - 175.1		Lockport dolostone
48-3		51	185.250	185.250	176.0 - 178.8	176.6 - 183.9	183.9 - 184.2		Overburden
49-1	1988	51	184.220	184.220	159.5 - 160.1	160.1 - 161.8	161.8 - 174.0		Rochester shale (fossil zone)
49-2	1988	51	184.270	184.270	169.6 - 172.3	170.2 - 173.2	173.2 - 173.8		Lockport dolostone
49-3	1990	51	184.240	184.240	174.9 - 177.7	175.4 - 182.9	182.9 - 183.2		Overburden
50-1	1988	51	182.100	182.840	158.1 - 158.7	158.0 - 159.3	159.3 - 173.8		Rochester shale (fossil zone)
50-2	1988	51	182.100	182.800	166.3 - 166.9	166.2 - 167.7	167.7 - 172.7		Decew dolostone
50-3	1988	51	182.200	182.820	170.5 - 173.1	170.2 - 173.8	173.8 - 174.3		Lockport dolostone
50-4	1988	51	182.100	182.920	174.8 - 177.5	174.3 - 180.8	180.8 - 181.1		Overburden
51-1	1988	51	184.700	185.570	157.7 - 159.1	157.4 - 160.9	160.9 - 178.1		Rochester shale (fossil zone)
51-2	1988	51	184.700	185.480	165.4 - 166.8	165.3 - 168.6	168.6 - 181.1		Lockport dolostone
51-3	1988	51	184.700	185.280	174.6 - 177.3	174.3 - 177.6	177.6 - 177.9		Lockport dolostone
51-4	1988	51	184.700	185.410	179.4 - 182.1	179.1 - 183.4	183.4 - 183.7		Overburden
52-1	1988	51	179.200	180.020	163.3 - 163.9	163.0 - 165.1	165.1 - 169.0		Decew dolostone
52-2	1988	51	179.500	180.140	170.2 - 172.9	169.9 - 173.1	173.1 - 173.7		Lockport dolostone
52-3	1988	51	179.200	180.020	174.4 - 177.2	174.1 - 177.6	177.6 - 178.1		Overburden
53-1	1988	51	179.700	182.790	155.3 - 155.9	155.2 - 156.8	156.8 - 164.7		Decew dolostone
53-2 [d]	1988	51	179.800	183.930	166.2 - 168.9	165.9 - 169.0	169.0 - 169.9		Lockport dolostone
53-2R									Lockport dolostone
53-3	1988	51	179.700	182.800	170.1 - 172.9	169.7 - 178.7	178.7 - 179.2		Overburden
53-4	1990	51	179.700	181.760	148.2 - 149.8	148.2 - 150.5	150.5 - 179.7		Rochester shale (fossil zone)
54-1	1990	51	177.570	178.190	145.6 - 147.0	145.6 - 148.4	148.4 - 172.2		Rochester shale (fossil zone)
54-2	1990	51	177.400	178.270	154.4 - 155.7	154.4 - 156.4	156.4 - 177.1		Decew dolostone
54-3	1990	51	177.350	178.260	165.2 - 168.2	165.2 - 169.2	169.2 - 177.0		Lockport dolostone
54-4	1990	51	177.570	178.430	172.2 - 175.1	172.2 - 176.4	176.4 - 177.2		Overburden

Table B-1 Monitor Construction Details - Existing Wells

Well ID	Monitor Installation Date	Well Pipe Diameter mm	Ground Elevation	Top of Pipe Elevation	Screened Interval	Filter Pack	Seal	Surface Seal	Hydrostratigraphic Unit
55-1	1990	51	177.870	178.710	146.3 - 147.7	146.3 - 148.8	148.8 - 170.5		Rochester shale (fossil zone)
55-2	1990	51	177.890	178.800	153.9 - 155.2	153.9 - 156.9	156.9 - 177.5		Decew dolostone
55-3	1990	51	177.900	178.730	165.8 - 167.1	165.8 - 169.6	169.6 - 177.6		Lockport dolostone
55-4	1990	51	177.870	178.710	170.6 - 173.3		177.1 - 177.6		Overburden
56-1	1990		182.260	183.020	151.7 - 153.1	151.7 - 154.4	154.4 - 175.7		Rochester shale (fossil zone)
56-2	1992		182.230	183.080	158.5 - 159.6	158.5 - 161.2	161.2 - 181.8		Decew dolostone
56-3	2004		182.190	183.020	170.6 - 173.6	170.6 - 174.6	174.6 - 181.7		Lockport dolostone
56-4	1990		182.260	182.940	176.6 - 179.5	175.7 - 181.0	181.0 - 181.8		Overburden
61-1		51	185.900	186.610	148.8 - 150.3	149.0 - 150.7	150.6 - 185.7	172.0 185.7	Irondequoit limestone
61-2		51	185.840	186.390	157.1 - 158.7	157.1 - 158.9	158.9 -		Rochester shale (fossil zone)
61-3		51	185.770	186.490	163.4 - 164.9	163.4 - 165.1	165.1 -		Rochester shale
61-4		51	186.010	186.630	167.6 - 170.7	167.6 - 171.9	171.9 -		Decew dolostone
62-1		51	180.950	181.640	156.6 - 158.2	156.6 - 158.6	158.6 - 180.7	168.7 180.7	Rochester shale (fossil zone)
62-2		51	181.020	181.780	160.6 - 162.1	160.6 - 162.7	162.7 -		Rochester shale
62-3		51	180.990	181.670	164.2 - 167.3	164.2 - 168.4	168.4 -		Decew dolostone
63-1		51	175.690	176.450	155.7 - 157.3	155.9 - 157.8	157.8 - 176.8	170.5 176.8	Rochester shale (fossil zone)
63-2		51	175.830	176.600	159.0 - 160.5	-0.3 - 161.0	161.0 -		Rochester shale
63-3		51	175.830	176.530	164.7 - 167.7	-0.4 - 169.0	169.0 -		Decew dolostone
64-1		51	173.060	173.800	143.7 - 145.2	143.8 - 145.7	145.7 - 172.7	167.6 172.7	Irondequoit limestone
64-2		51	173.050	173.530	154.2 - 155.7	-0.4 - 155.6	155.6 -		Rochester shale (fossil zone)
64-3		51	173.050	173.410	158.2 - 159.7	-0.3 - 160.3	160.3 -		Rochester shale
64-4		51	172.990	173.590	164.5 - 167.6	-0.4 - 167.6	167.6 -		Lockport dolostone
65-1		51	181.360	182.120	155.2 - 156.7	155.2 - 157.0	157.0 - 181.0	168.5 181.0	Rochester shale (fossil zone)
65-2		51	181.410	182.100	159.0 - 160.5	-0.3 - 161.1	161.1 -		Rochester shale
65-3		51	181.420	182.120	165.9 - 168.6	-0.3 - 168.6	168.6 -		Lockport dolostone
66-1		51	182.010	182.750	154.5 - 156.0	154.5 - 156.6	156.6 - 181.6	170.7 181.6	Rochester shale (fossil zone)
66-2		51	182.000	182.700	158.2 - 159.7	-0.3 - 160.3	160.3 -		Rochester shale
66-3		51	182.050	182.750	165.8 - 167.3	-0.4 - 170.7	170.7 -		Lockport dolostone
67-1		51	182.690	183.360	144.0 - 145.5	144.0 - 146.5	146.5 - 182.4	172.6 182.4	Irondequoit limestone
67-2		51	182.710	183.450	155.8 - 157.3	0.5 - 157.9	157.9 -		Rochester shale (fossil zone)
67-3		51	182.650	183.410	157.8 - 159.3	-0.4 - 159.8	159.8 -		Rochester shale
67-4		51	182.630	183.540	167.9 - 170.9	-0.4 - 172.5	172.5 -		Lockport dolostone
68-1		51	183.260	184.020	155.3 - 157.0	155.3 - 157.6	157.6 -		Rochester shale (fossil zone)
68-2		51	183.190	184.020	159.6 - 161.1	-0.4 - 161.6	161.6 -		Rochester shale
68-3		51	183.180	183.920	166.0 - 169.0	-0.4 - 171.3	171.3 -		Lockport dolostone
69-1		51	182.790	183.550	156.5 - 158.2	156.5 - 158.5	158.5 -		Rochester shale (fossil zone)
69-2		51	182.850	183.610	161.3 - 163.0	-0.4 - 163.7	163.7 -		Rochester shale
69-3		51	182.800	183.440	168.3 - 174.4	-0.3 - 175.9	175.9 -		Lockport dolostone
70-1		51	168.500	169.260	156.4 - 157.9	-0.4 - -0.4	-0.4 -		Rochester shale (fossil zone)
70-2		51	168.560	169.290	160.2 - 163.2	-0.4 - -0.4	-0.4 -		Rochester shale
71-1		51	185.410	186.420	155.1 - 156.6	155.1 - 157.0	149.4 -		Rochester shale (fossil zone)
71-2		51	185.510	186.510	160.4 - 162.1	-0.4 - -0.4	-0.4 -		Rochester shale
71-3		51	185.470	186.590	170.7 - 175.3	-0.4 - -0.4	-0.4 -		Waste
72	2007	51	182.000	183.180	174.4 - 178.9	174.4 - 179.8	179.8 - 182.0		Overburden

Table B-1 Monitor Construction Details - Existing Wells

Well ID	Monitor Installation Date	Well Pipe Diameter mm	Ground Elevation	Top of Pipe Elevation	Screened Interval	Filter Pack	Seal	Surface Seal	Hydrostratigraphic Unit
Subliner Manholes									
MM1-1		51	183.150	185.730	153.6 -	153.6 -			Deep Rochester shale
MM1-2		51	183.150	185.730	157.4 -	157.4 -			Shallow Rochester shale
MM1-3		51	183.150	185.730	162.4 -	162.4 -			Leachate Collection System
MM2-1	1991	51	183.120	185.000	150.6 - 151.1	150.6 - 151.7	151.7 - 159.9		Deep Rochester shale
MM2-2	1991	51	183.120	185.000	155.0 - 157.8	155.0 - 158.1	158.1 - 159.9		Shallow Rochester shale
MM2-3		51	183.120	185.000	161.7 -	161.7 -			Leachate Collection System
MM3-1	1991	51	180.770	182.900	149.3 - 149.8	149.3 - 150.2	150.2 - 159.5		Deep Rochester shale
MM3-2	1991	51	180.770	182.900	154.4 - 157.4	154.4 - 157.7	157.7 - 159.5		Shallow Rochester shale
MM3-3		51	180.770	182.900	161.2 -	161.2 -			Leachate Collection System
MM4-1	1995	51	162.500	192.490	154.9 - 156.3	154.5 - 156.6	156.6 - 163.7		Deep Rochester shale
MM4-2	1995	51	162.500	192.490	159.5 - 161.7	159.3 - 161.8	161.8 - 163.7		Shallow Rochester shale
MM4-3		51		192.490	164.8 -	164.8 -			Leachate Collection System

Table B-2 Monitor Construction Details - EA Field Program Wells

Well ID	Monitor Installation Date	Well Pipe Diameter mm	Ground Elevation	Top of Pipe Elevation	Screened Interval	Filter Pack	Seal	Surface Seal	Hydrostratigraphic Unit
75-I	2024	51	179.980	180.795	136.2 - 137.8	136.1 - 138.2	138.2 - 179.4	179.4 - 180.0	Irondequoit
75-II	2024	51	179.670	180.499	147.8 - 150.9	147.7 - 151.2	151.2 - 179.1	179.1 - 179.7	Rochester
75-III	2025	51	179.590	180.408	152.0 - 155.1	151.9 - 155.4	155.4 - 179.0	179.0 - 179.6	Rochester
75-IV	2024	51	179.900	180.693	157.5 - 160.5	157.3 - 161.0	161.0 - 179.3	179.3 - 179.9	Lockport
75-V	2024	51	179.780	180.624	164.7 - 166.2	164.5 - 169.1	169.1 - 179.2	179.2 - 179.8	Lockport
76-I	2025	51	180.050	180.785	150.8 - 152.3	150.6 - 152.9	152.9 - 179.4	179.4 - 180.1	Irondequoit
76-II	2025	51	180.120	180.871	155.7 - 158.8	155.6 - 159.4	159.4 - 179.5	179.5 - 180.1	Rochester
76-III	2025	51	180.200	180.908	160.4 - 163.4	160.2 164.0	164.0 179.6	179.6 - 180.2	Rochester
76-IV	2025	51	180.180	180.939	166.2 - 169.2	166.0 - 169.5	169.5 - 179.6	179.6 - 180.2	Rochester
77-I	2025	51	181.710	182.555	147.0 - 148.5	146.8 - 148.8	148.8 - 181.1	181.1 - 181.7	Irondequoit
77-II	2025	51	181.650	182.517	150.3 - 153.3	150.1 - 153.9	153.9 - 181.0	181.0 - 181.7	Rochester
77-III	2025	51	181.620	182.501	157.2 - 160.3	157.1 - 160.9	160.9 - 181.0	181.0 - 181.6	Rochester
77-IV	2025	51	181.560	182.458	162.1 - 165.1	161.9 - 165.6	165.6 - 181.0	181.0 - 181.6	Rochester
77-V	2025	51	181.590	182.428	168.9 - 172.0	168.8 - 172.3	172.3 181.0	181.0 - 181.6	Lockport
78-I	2025	51	182.140	182.904	141.6 - 143.1	141.4 - 143.4	143.4 - 181.5	181.5 - 182.1	Irondequoit
78-II	2025	51	182.070	182.887	147.2 - 150.2	147.0 - 150.7	150.7 - 181.5	181.5 - 182.1	Rochester
78-III	2025	51	182.110	182.867	156.0 - 159.1	155.9 - 159.6	159.6 - 181.5	181.5 - 182.1	Rochester
78-IV	2025	51	182.080	183.002	163.9 - 167.0	163.8 - 167.4	167.4 - 181.5	181.5 - 182.1	Lockport
78-V	2025	51	182.120	182.915	170.7 - 173.7	170.5 - 174.2	174.2 - 181.5	181.5 - 182.1	Lockport
79-I	2025	51	182.460	183.256	151.4 - 154.4	151.2 - 155.0	155.0 - 181.9	181.9 - 182.5	Rochester
79-II	2025	51	182.530	183.287	156.0 - 159.1	155.9 - 159.7	159.7 - 181.9	181.9 - 182.5	Rochester
79-III	2025	51	182.560	183.321	164.3 - 167.3	164.1 - 168.8	168.8 - 182.0	182.0 - 182.6	Lockport
79-IV	2025	51	182.540	183.351	172.8 - 175.8	172.6 - 176.4	176.4 - 181.9	181.9 - 182.5	Lockport
80-I	2025	51	182.260	183.035	154.2 - 157.3	154.1 - 157.9	157.9 - 181.7	181.7 - 182.3	Rochester
80-II	2025	51	182.290	183.075	158.5 - 161.6	158.4 - 162.2	162.2 - 181.7	181.7 - 182.3	Rochester
80-III	2025	51	182.260	183.070	169.5 - 172.5	169.3 - 172.8	172.8 - 181.7	181.7 - 182.3	Lockport
81-I	2025	51	182.780	183.566	158.4 - 161.4	158.2 - 161.7	161.7 - 182.2	182.2 - 182.8	Rochester
81-II	2025	51	182.860	183.623	166.1 - 169.1	165.9 - 169.4	169.4 - 182.3	182.3 - 182.9	Rochester
81-III	2025	51	182.920	183.671	171.9 - 175.0	171.8 - 175.3	175.3 - 182.3	182.3 - 182.9	Lockport

Notes: • Elevations provided in metres above sea level (mASL)
• Survey for ground surface / top of pipe elevations completed in 2025 by JD Barnes.
• Blank indicates that data is not available

APPENDIX C

Geophysical Survey Reports

Report on
Borehole Surveys

at BH-C
Walker South Landfill Expansion

Niagara Falls, Ontario

- December 2024 -

ClearView Geophysics Inc.

Report on
Borehole Surveys
at BH-C
Walker South Landfill Expansion
Niagara Falls, Ontario
December 2024

On behalf of:

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Contact: Joe Mihelcic, P.Eng., M.B.A., Geophysicist

ClearView Ref.: AC1205
Issued: December 31, 2024

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Appendix - Plates

Plate 1: BH-C Log, scale 1:10
Plate 2: BH-C Log, scale 1:40

Project Digital Files Download: The file is available for download until June 15, 2025 (e.g., using Filezilla https://filezilla-project.org/): Important: go to tabs <File>, <Site Manager>, <New site> and fill-in as below:

Host = **home607381407.1and1-data.host**
Protocol = **SFTP – SSH File Transfer Protocol**
Logon Type = **Normal** Username = acc407397014
Password= Jr7Y#3P*ZvtWo@jrb9

1. Introduction

ClearView Geophysics Inc. carried out borehole surveys for **WSP Canada Inc.** at BH-C which is part of the Walker South Landfill Expansion in Niagara Falls, Ontario (refer to Figure 1). The purpose of the work was to determine water flow, locate contacts (e.g., carbonate vs. shale) and fractures.

The fieldwork was completed on December 5 and 6, 2024.

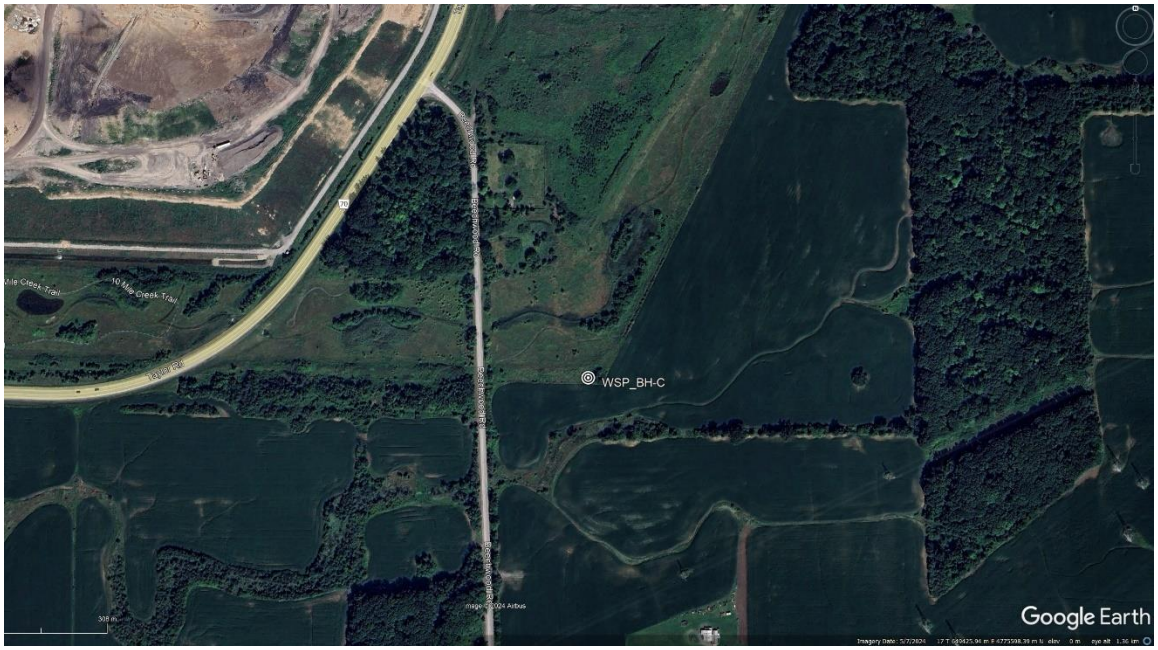


Figure 1: Location Map.

2. Personnel

Joe Mihelcic, P.Eng.; Geophysicist:

Mr. Mihelcic carried out the work and prepared this report.

3. Geophysical Survey Equipment

Mount Sopris Instruments gear was used for the borehole surveys. This gear included a 5MXA-1000 Matrix Logging Console and 4MXA-1000 Winch (500m) with Tripod. The probes included the following:

- 2PCA-1000 Three-Arm Poly**Caliper** Probe,

- 40LGR-1000 Lithology **Gamma, Resistance (SPR)** & **Spontaneous Potential (SP)** Probe,
- 2PIA-1000 Poly **Induction** Probe,
- QL40-FTC **Fluid Temperature & Conductivity** Probe,
- QL40-OBI-2G **Optical Televiewer** Probe.

An HFP-2293 **Heat Pulse Flowmeter** was also used with measurements taken at 1-metre intervals over the length of the borehole; however, it malfunctioned at the site and the data were not deemed reliable. Also, it was not possible to lower the probe beyond the drill bit with the centralizers and flow obstruction petals, so they were removed for the survey, which is not ideal.

A mini-winch (i.e., 200-m cable) was used on December 5 for the **Caliper, Gamma/SPR/SP, Fluid Temperature/Conductivity** and **Heat Pulse Flowmeter** logs. The motor malfunctioned so it was replaced with the 4MXA-1000 Winch (500m) for the **Induction** and **Optical Televiewer** logs on December 6.

A brief discussion of each survey follows.

3.1 Caliper

The caliper measurement is made with arms attached to a mechanical assembly that drives a linear potentiometer. A constant reference voltage is applied across the potentiometer. The DC output voltage from the wiper of the potentiometer is converted to a frequency. A microprocessor applies a quadratic correction to this frequency so that the frequency is linearly related to borehole diameter. Depending on the polarity of the probe power, the microprocessor selects two frequencies to be transmitted up the cable line. The frequencies correspond to the caliper and natural gamma measurements (when 2PGA-1000 is attached), or the temperature and fluid resistivity measurements (when the 2SFB-1000 is attached). The processor controls the pulse driver circuit that sends positive pulses up the cable line for the first frequency, and negative pulses for the second frequency. An anti-coincidence circuit ensures that a positive and negative pulse will not occur simultaneously. The microprocessor also controls the motor that opens and closes the caliper mechanism. The mechanism opens or closes as appropriate when power is applied.

Length Tip to cable head = 173.5 cm,
Cable head to reading = 141.5 cm closed to 140.5 cm open to 4 inches.

3.2 Resistance (SPR), Spontaneous Potential (SP) & Gamma

This probe can take electrical and natural gamma radiation measurements.

3.2.1 SINGLE POINT RESISTANCE

The single point resistance measurement is made by passing an AC current between a surface electrode or (mud plug), and the probe electrode. The probe electrode is located just below the probe top and is the only piece of metal exposed on the probe during the logging process. The Matrix electronics reads the varying AC signal between these two electrodes and produces a voltage measured by the Matrix Logger. Then by use of Ohms law the tool file calculates the resistance between them.

Ohms law: R=V/I

R = resistance in ohms,
V = potential in volts,
I = current in amperes.

The SPR measurement is the sum of cable resistance, and the resistance based on the composition of the medium, the cross-sectional area and length of the path through the medium. Therefore, the single point resistance log is not quantitative.

3.2.2 SPONTANEOUS POTENTIAL

The spontaneous potential, also known as self-potential or SP uses the same electrodes as the SPR measurement. This natural potential, which originates from electrochemical differences between borehole and formation fluid, or electro-kinetic "streaming" is measured by the surface electronics. The circuit measures a small DC voltage, typically in the mV range between the surface electrode and the

probe electrode. This potential may be positive or negative with respect to the surface electrode.

3.2.3 GAMMA

The natural gamma measurement is made using a Sodium Iodide crystal, which when struck by a gamma ray emits a pulse of light. This pulse of light is then amplified by a photo multiplier tube, which outputs a current pulse. These pulses are then detected, shaped, and sent to a DSP where they are counted, sent to the modem and the digital data is transmitted up the cable line.

Length Tip to cable head = 111 cm,
Cable head to gamma reading = 95 cm,
Cable head to SPR & SP reading = 12 cm,
Surface electrode = 17 cm long.

3.3 Induction

The conductivity measurements are made by using a magnetic field to induce an electric field, which in turn produces electric currents in the material being surveyed. Because the magnitude of these currents is proportional to the conductivity of the material being measured, the magnetic field generated by the induced electric currents is measured. At high conductivities the accuracy of the induction tool diminishes due to the electrical 'skin effect.'

The coil array in the induction probe has been designed so that it is not sensitive to material at a radial distance smaller than about 10 cm from the probe axis. The reason for this is to reduce sensitivity to the borehole fluid. The vertical resolution of the tool is 65 cm. This is measured as the vertical distance where the response is more than half the maximum response to an infinitely thin bed. *Geonics Limited technical note TN-20* provides more details on the theory of the induction logging and the response of the EM-39 conductivity probe.

The receiver circuit rectifies the received signal using a synchronous rectifier and generates two DC voltages, one proportional to the average value of the quadrature phase component of the received signal (with respect to the primary

magnetic field), and another proportional to the inphase component of the received signal. The quadrature phase component is proportional to the conductivity and the inphase component is related to the magnetic susceptibility.

These DC voltages are then converted into pulse trains whose frequencies are proportional to the measurements. These pulses are sent up the logging cable for counting at the surface. The probe sends an ~12.5 kHz pulse train to indicate a measurement of zero, and ~17.5 kHz pulse train indicates a full-scale measurement. Positive pulses are sent and represent the mS/m apparent conductivity. Negative pulses are sent to indicate either the magnetic susceptibility if the tool is connected to a 2ADP-1000 adapter or the gamma count rate from the Poly - Gamma tool if the unit is connected to a 2PGA-1000.

The reason a zero-count rate of 12.5 kHz was selected is that in the presence of metallic objects negative readings occur. These objects are commonly smaller than the volume of the investigation of the probe, thus the mechanism used to subtract the primary field and the response from borehole fluid can cause negative readings. This can be useful information.

Different measurement ranges are selected by changing the gain of the receiver circuit. The gain can be changed manually in the probe or by applying different polarities to the probe for power. These polarities set a latching relay in the tool, which controls the gain setting. Only two different ranges are achievable by this method.

This information is from the *"Geonics EM39 Borehole Conductivity Logger Operating Manual"*.

Length Tip to cable head = 173.5 cm,
Cable head to Apparent Conductivity reading = 114.5 cm.

3.4 Fluid Temperature & Fluid Conductivity

This probe collects fluid temperature and fluid conductivity readings from within a housing located at the bottom of the probe.

3.4.1 FLUID TEMPERATURE

Borehole fluid temperature is measured with a sensor based on a fast response semiconductor device whose output current changes proportionally to absolute temperature. The temperature sensor is in a stinger at the top of the sensor body in the center of the three exit ports where the borehole fluid returns to the well bore.

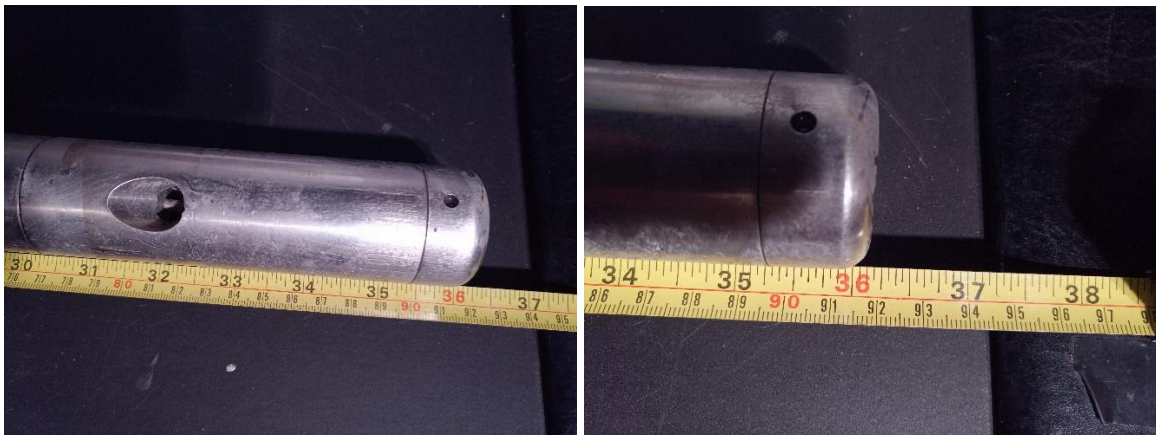
3.4.2 FLUID CONDUCTIVITY

Borehole fluid conductivity is measured using a seven-electrode mirrored Wenner array. The conductivity array is an internal cylindrical array open at the bottom of the probe. Borehole fluid passes by the array as the probe is lowered down the borehole. The array is completely shielded from the outside borehole, so that only fluid conductivity is measured.

The following table provides an overview of typical water categories and associated conductivities.

Drinking water ---------- Up to 500 uS/cm
Fresh water rivers -------- 30 – 500 uS/cm
Marginal river water ------ 500 – 1,500 uS/cm
Brackish water ---------- 1,500 – 5,000 uS/cm
Industrial waters---------- 100 – 10,000 uS/cm
Sea water ---------- 50,000 - … uS/cm

Boreholes are usually logged in the downward direction. This typically results in a better flow of the fluid through the sensor cell and ensures sediment has not clogged the sensors if pressed into the bottom of the borehole.



Length Tip to cable head = 91.5 cm,
Cable head to Temperature reading = 82 cm,
Cable head to Conductivity reading = 84 cm.

3.5 Optical Televiewer

The Optical Televiewer incorporates a high resolution, high sensitivity CCD digital camera with matching Pentax optics. The CCD camera, located above a conical mirror, captures the reflection of the borehole wall. The light source is provided by a light ring assembly located in the optical head. The camera CCD sensor consists of an array of light sensors, each representing one pixel of the complete image. Due to manufacturing limitations individual sensors have a slightly different response and calibration factor. To produce a coherent image the camera processing system checks all the pixels and compensates for variations (white balance). Azimuthal resolutions available are 720, 360, 180 and 90 points per recorded circle. By using processed camera data in combination with deviation sensor data, the tool can generate an unwrapped 360° oriented image.

Length Tip to cable head = 158 cm,
Tip to sensors = 12 cm.

4. Discussion of Results

The physical property logs are presented in the *WellCAD* format file **BH-C.wcl.** They are presented in the Appendix as Plate 1 for the 'stretched' 1:10 format and Plate 2 for the 'condensed' 1:40 format.

The first panel on the left presents the Optical Televiewer image oriented to the 'high side'. The second panel displays the 3-arm Caliper profile, Total Counts Gamma profile and the colour-shaded Inductive Conductivity profile. The third column presents the Fluid Temperature and Fluid Conductivity profiles. A calculated temperature gradient (i.e., 1st vertical derivative) is also presented with colour shading to highlight potentially flowing fractures and contacts.

The fourth panel presents the Single Point Resistivity (SPR) and Spontaneous Potential (SP) data. The SPR reference electrode was located on surface 10 ½ metres north of the borehole. The electrode was buried in a few

inches of top-soil and soaked with tap water. A calculated 1st vertical derivative of the SPR results accentuates inflection points in the curve.

The fifth panel displays the geologic formation intervals and the interpreted fractures. The fractures are interpreted from the Optical Televiewer results. The sixth panel displays an interpretation of possible flow sources. These are primarily derived from the Fluid Temperature and Fluid Conductivity results.

The fractures are labeled **A** through **R** in the 'Formations' panel. The 'Flow Source' panel indicates the interpreted possible flow source depths in metres from ground surface. The following Table 1 displays a list of the possible flow sources and associated fractures or geologic contacts.

Depth	Formation	Interpreted Fracture	Description
31.02	Rochester	**N**	Major Fluid Cond. Inflection Point; SPR/SP/Gamma/Ind. Cond Anomalies.
38.64	Rochester	Not visible	Variable Temp, broad Cond. Inflect.
39.17	Rochester	Not visible	Variable Temp, broad Cond. Inflect.
39.69	Rochester	Not visible	Variable Temp, broad Cond. Inflect.
41.54	Rochester/ Irondequoit	Contact	Variable Temperature, SPR/SP shifts.
42.04	Irondequoit	**P**	Minor Temp. Inflection Point.
43.19	Irondequoit	**Q**	Minor Temp. Inflection Point.
43.91	Irondequoit/ Reynales	**R**, Contact	Minor Temp. Inflection Point.

Table 1: Potential Flow Sources.

A possible flow source is at fracture **N** (i.e., 31.02 m depth). It is at a major Fluid Conductivity inflection point that could indicate flow. It also contains anomalous SPR, SP, Gamma and Inductive Conductivity.

A number of discrete possible flow sources are indicated from 38.64 m to 39.69 m. They are within the Rochester formation and although there are no fractures interpreted from the Optical Televiewer results, the Fluid Temperature and Fluid Conductivity results indicate variability that could indicate flow sources.

Possible flow sources are also seen within the Irondequoit formation. Three discrete sources are interpreted from 41.54 m to 43.91 m depth below ground surface. Corresponding fractures **P**, **Q** and **R** are associated with minor Fluid Temperature variations that could indicate flow. The 41.54 m possible flow source is located at the Rochester/Irondequoit formation contact, which is also clearly defined from the Single Point Resistivity and Spontaneous Potential results.

The Caliper results presented in the second panel display very little variation, which indicates fairly 'smooth' borehole surface through the section.

Well-defined fractures such as at **A** and **B** located just below the drill rod are not detected with the caliper probe.

The Total Counts Gamma and Inductive Conductivity logs are generally proportional to each other. This indicates that higher gamma and conductivity zones are the result of different rock types or potentially more weathered rocks.

In general, the Single Point Resistivity and Spontaneous Potential results appear to show the highest variability (e.g., 'SPR 1st Derivative' colour-shading) through the highest variable Total Counts Gamma and Inductive Conductivity zones. This indicates minor geologic variations within the formation are associated with these changes.

5. Conclusions

The borehole surveys detected several fractures and geologic contacts with a number of them indicating possible fluid flow. In general, there are three possible flow source locations. They are interpreted at 31.02 m, 38.64-39.69m and 41.54 m-43.91 m. These three locations represent the range of interpreted discrete flow sources. The possible flow zones could extend beyond these limits although likely not beyond corresponding fractures. It was not possible to interpret carbonate vs. shale with certainty based on the potential weathering of the rocks which also causes colour variations and changes to the physical properties measured.

If there are any questions about the surveys or the interpretation, please do not hesitate to contact the undersigned.

Sincerely,

ClearView Geophysics Inc.
Per:

Joe Mihelcic, P.Eng., M.B.A.
Geophysicist/President

Appendix – Plates

Plate # 2

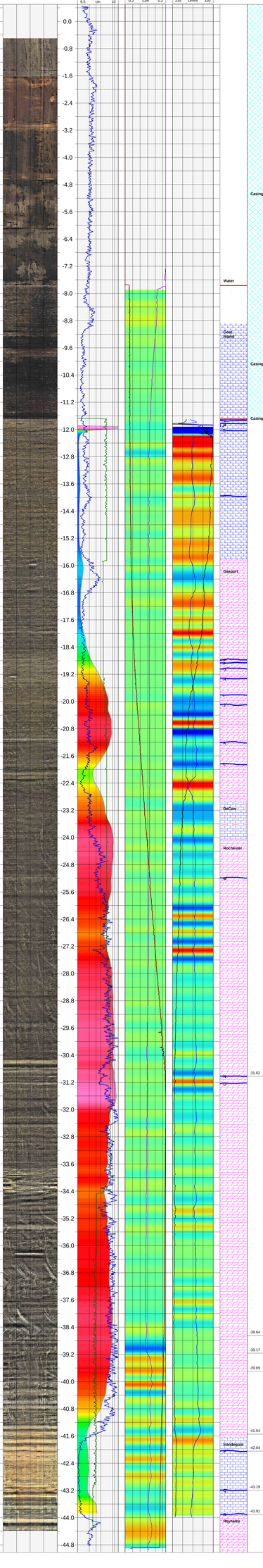
Borehole Geophysical Surveys

CLEARVIEW Geophysics Inc.

Client:	WSP Canada Inc.	**Date(s) Logged:**	December 5 & 6, 2024
Borehole:	BH-C		
Project:	Walker South Landfill Expansion	**Logged By:**	Joe Mihelcic, Geophysicist
Location	Niagara Falls, Ontario ~400 m SE of the intersection of Taylor Rd/Beechwood Rd.	**Comments:**	Formation names/intervals provided by WSP. Depths relative to ground surface.
Bit Size:	HQ, drill rod and bit left in hole through loose rock.	**Casing Stickup:**	1.39 m grnd to top rod; 36 cm grnd to top casing.

Geophysical Equipment & Probes: **--- To be read with accompanying report ---**

- Matrix Data Logger
- Mini Winch with 200m of 0.125"
- 4MXA Winch - 500m
- QL40-CAL 3-Arm Caliper
- * HFP-2293 Heat Pulse Flowmeter - data not used
- 40LGR-1000 Gamma, SP, SPR
- 2PIA-1000 Poly Induction Probe
- QL40-OBI-2G Optical Televiewer
- QL40-FTC Fluid Temperature & Conductivity



Report on
Borehole Surveys

at BH-A, BH-B, BH-D

Walker South Landfill Expansion
Niagara Falls, Ontario

- February 2025 -

ClearView Geophysics Inc.

Report on
Borehole Surveys
at BH-A, BH-B and BH-D
Walker South Landfill Expansion
Niagara Falls, Ontario
February 2025

On behalf of:

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ClearView Ref.: AC1205a
Issued: May 9, 2025

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Project Digital Files Download: The file is available for download until September 15, 2025 (e.g., using Filezilla https://filezilla-project.org/): Important: go to tabs <File>, <Site Manager>, <New site> and fill-in as below:

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Protocol = **SFTP – SSH File Transfer Protocol**
Logon Type = **Normal** Username = acc407397014
Password= Jr7Y#3P*ZvtWo@jrb9

1. Introduction

ClearView Geophysics Inc. carried out borehole surveys for **WSP Canada Inc.** at BH-A, BH-B, and BH-D which is part of the Walker South Landfill Expansion in Niagara Falls, Ontario (refer to Figure 1). The purpose of the work was to determine water flow, locate contacts (e.g., carbonate vs. shale) and fractures.

The fieldwork was completed from February 14 through February 17, 2025.

Figure 1: Boreholes Location Map.

2. Personnel

Joe Mihelcic, P.Eng.; Geophysicist:

Mr. Mihelcic carried out the work and prepared this report.

3. Geophysical Survey Equipment

Mount Sopris Instruments gear was used for the borehole surveys. This gear included a 5MXA-1000 Matrix Logging Console and Mini-winch (200m) with Tripod. The probes included the following:

- 2PCA-1000 Three-Arm Poly**Caliper** Probe,
- 40LGR-1000 Lithology **Gamma, Resistance (SPR)** & **Spontaneous Potential (SP)** Probe,
- 2PIA-1000 Poly **Induction** Probe,
- QL40-FTC **Fluid Temperature & Conductivity** Probe,
- QL40-OBI-2G **Optical Televiewer** Probe.

A brief discussion of each survey follows.

3.1 Caliper

The caliper measurement is made with arms attached to a mechanical assembly that drives a linear potentiometer. A constant reference voltage is applied across the potentiometer. The DC output voltage from the wiper of the potentiometer is converted to a frequency. A microprocessor applies a quadratic correction to this frequency so that the frequency is linearly related to borehole diameter. Depending on the polarity of the probe power, the microprocessor selects two frequencies to be transmitted up the cable line. The frequencies correspond to the caliper and natural gamma measurements (when 2PGA-1000 is attached), or the temperature and fluid resistivity measurements (when the 2SFB-1000 is attached). The processor controls the pulse driver circuit that sends positive pulses up the cable line for the first frequency, and negative pulses for the second frequency. An anti-coincidence circuit ensures that a positive and negative pulse will not occur simultaneously. The microprocessor also controls the motor that opens and closes the caliper mechanism. The mechanism opens or closes as appropriate when power is applied.

Length Tip to cable head = 173.5 cm,
Cable head to reading = 141.5 cm closed to 140.5 cm open to 4 inches.

3.2 Resistance (SPR), Spontaneous Potential (SP) & Gamma

This probe can take electrical and natural gamma radiation measurements.

3.2.1 SINGLE POINT RESISTANCE

The single point resistance measurement is made by passing an AC current between a surface electrode or (mud plug), and the probe electrode. The probe electrode is located just below the probe top and is the only piece of metal exposed on the probe during the logging process. The Matrix electronics reads the varying AC signal between these two electrodes and produces a voltage measured by the Matrix Logger. Then by use of Ohms law the tool file calculates the resistance between them.

Ohms law: R=V/I

R = resistance in ohms,
V = potential in volts,
I = current in amperes.

The SPR measurement is the sum of cable resistance, and the resistance based on the composition of the medium, the cross-sectional area and length of the path through the medium. Therefore, the single point resistance log is not quantitative.

3.2.2 SPONTANEOUS POTENTIAL

The spontaneous potential, also known as self-potential or SP uses the same electrodes as the SPR measurement. This natural potential, which originates from electrochemical differences between borehole and formation fluid, or electro-kinetic "streaming" is measured by the surface electronics. The circuit measures a small DC voltage, typically in the mV range between the surface electrode and the probe electrode. This potential may be positive or negative with respect to the surface electrode.

3.2.3 GAMMA

The natural gamma measurement is made using a Sodium Iodide crystal, which when struck by a gamma ray emits a pulse of light. This pulse of light is then amplified by a photo multiplier tube, which outputs a current pulse. These pulses are then detected, shaped, and sent to a DSP where they are counted, sent to the modem and the digital data is transmitted up the cable line.


Length Tip to cable head = 111 cm,
Cable head to gamma reading = 95 cm,
Cable head to SPR & SP reading = 12 cm,
Surface electrode = 17 cm long.

3.3 Induction

The conductivity measurements are made by using a magnetic field to induce an electric field, which in turn produces electric currents in the material being surveyed. Because the magnitude of these currents is proportional to the conductivity of the material being measured, the magnetic field generated by the induced electric currents is measured. At high conductivities the accuracy of the induction tool diminishes due to the electrical 'skin effect.'

The coil array in the induction probe has been designed so that it is not sensitive to material at a radial distance smaller than about 10 cm from the probe axis. The reason for this is to reduce sensitivity to the borehole fluid. The vertical resolution of the tool is 65 cm. This is measured as the vertical distance where the response is more than half the maximum response to an infinitely thin bed. *Geonics Limited technical note TN-20* provides more details on the theory of the induction logging and the response of the EM-39 conductivity probe.

The receiver circuit rectifies the received signal using a synchronous rectifier and generates two DC voltages, one proportional to the average value of the quadrature phase component of the received signal (with respect to the primary magnetic field), and another proportional to the inphase component of the received signal. The quadrature phase component is proportional to the conductivity and the inphase component is related to the magnetic susceptibility.

These DC voltages are then converted into pulse trains whose frequencies are proportional to the measurements. These pulses are sent up the logging cable for counting at the surface. The probe sends an ~12.5 kHz pulse train to indicate a measurement of zero, and ~17.5 kHz pulse train indicates a full-scale measurement. Positive pulses are sent and represent the mS/m apparent conductivity. Negative pulses are sent to indicate either the magnetic susceptibility

if the tool is connected to a 2ADP-1000 adapter or the gamma count rate from the Poly - Gamma tool if the unit is connected to a 2PGA-1000.

The reason a zero-count rate of 12.5 kHz was selected is that in the presence of metallic objects negative readings occur. These objects are commonly smaller than the volume of the investigation of the probe, thus the mechanism used to subtract the primary field and the response from borehole fluid can cause negative readings. This can be useful information.

Different measurement ranges are selected by changing the gain of the receiver circuit. The gain can be changed manually in the probe or by applying different polarities to the probe for power. These polarities set a latching relay in the tool, which controls the gain setting. Only two different ranges are achievable by this method.

This information is from the *"Geonics EM39 Borehole Conductivity Logger Operating Manual"*.

Length Tip to cable head = 173.5 cm,
Cable head to Apparent Conductivity reading = 114.5 cm.

3.4 Fluid Temperature & Fluid Conductivity

This probe collects fluid temperature and fluid conductivity readings from within a housing located at the bottom of the probe.

3.4.1 FLUID TEMPERATURE

Borehole fluid temperature is measured with a sensor based on a fast response semiconductor device whose output current changes proportionally to absolute temperature. The temperature sensor is in a stinger at the top of the sensor body in the center of the three exit ports where the borehole fluid returns to the well bore.

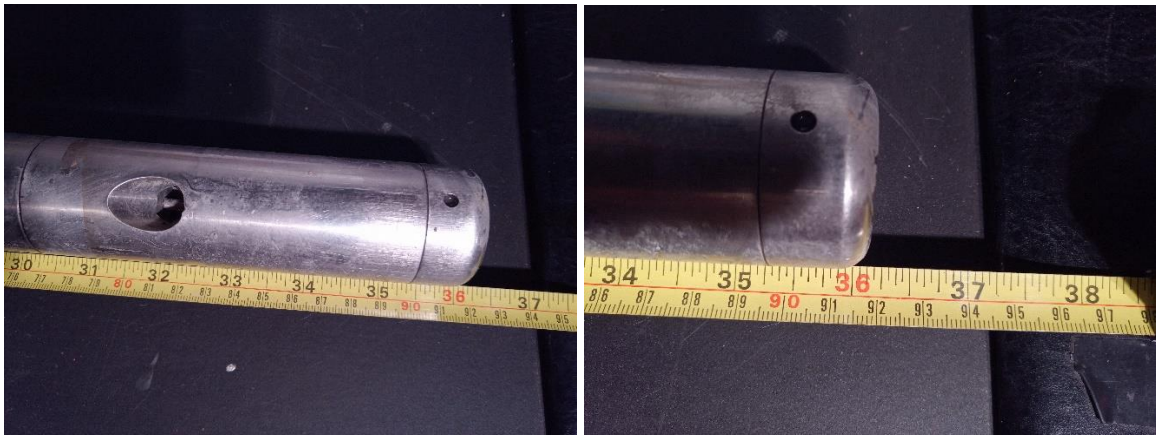
3.4.2 FLUID CONDUCTIVITY

Borehole fluid conductivity is measured using a seven-electrode mirrored Wenner array. The conductivity array is an internal cylindrical array open at the bottom of the probe. Borehole fluid passes by the array as the probe is lowered down the borehole. The array is completely shielded from the outside borehole, so that only fluid conductivity is measured.

The following table provides an overview of typical water categories and associated conductivities.

Drinking water ---------- Up to 500 uS/cm
Fresh water rivers -------- 30 – 500 uS/cm
Marginal river water ------ 500 – 1,500 uS/cm
Brackish water ---------- 1,500 – 5,000 uS/cm
Industrial waters ---------- 100 – 10,000 uS/cm
Sea water ---------- 50,000 - … uS/cm

Boreholes are usually logged in the downward direction. This typically results in a better flow of the fluid through the sensor cell and ensures sediment has not clogged the sensors if pressed into the bottom of the borehole.



Length Tip to cable head = 91.5 cm,
Cable head to Temperature reading = 82 cm,
Cable head to Conductivity reading = 84 cm.

3.5 Optical Televiewer

The Optical Televiewer incorporates a high resolution, high sensitivity CCD digital camera with matching Pentax optics. The CCD camera, located above a conical mirror, captures the reflection of the borehole wall. The light source is provided by a light ring assembly located in the optical head. The camera CCD sensor consists of an array of light sensors, each representing one pixel of the complete image. Due to manufacturing limitations individual sensors have a slightly different response and calibration factor. To produce a coherent image the camera processing system checks all the pixels and compensates for variations (white balance). Azimuthal resolutions available are 720, 360, 180 and 90 points per recorded circle. By using processed camera data in combination with deviation sensor data, the tool can generate an unwrapped 360° oriented image.

Length Tip to cable head = 158 cm,
Tip to sensors = 12 cm.

4. Discussion of Results

The physical property logs are presented in the *WellCAD* format files:

BH-A.wcl

BH-B.wcl

BH-D.wcl

They are presented in the Appendix as Plate 3,5,7 for the ‘stretched’ 1:10 format and Plate 4,6,8 for the ‘condensed’ 1:40 format.

The first panel on the left presents the Optical Televiewer image oriented to the ‘high side’. The second panel displays the 3-arm Caliper profile, Total Counts Gamma profile and the colour-shaded Inductive Conductivity profile. Note that the caliper profile can show minor DC-shifts above and below open fractures or voids. These shifts are likely mechanical in nature. Broad shifts in the total counts gamma

profiles are typically the result of geologic changes. The third column presents the Fluid Temperature and Fluid Conductivity profiles. A calculated temperature gradient (i.e., 1st vertical derivative) is also presented with colour shading to highlight potentially flowing fractures and contacts.

The fourth panel presents the Single Point Resistivity (SPR) and Spontaneous Potential (SP) data. The SPR reference electrode was located several metres from the borehole collars. The electrode was buried in a few inches of top-soil and soaked with bottled water. A calculated 1st vertical derivative of the SPR results accentuates inflection points in the curve that typically result from geologic variations.

The fifth panel displays the geologic formation intervals, supplied by WSP Canada Inc., and the interpreted fractures. The fractures are interpreted primarily from the Caliper and Optical Televiewer results. The sixth panel displays an interpretation of possible flow sources. These are primarily derived from the Fluid Temperature and Fluid Conductivity results.

A brief discussion of the interpreted fractures, geologic contacts and interpreted flow sources follows for each borehole.

4.1 BH-A

The fractures and geologic contacts are labeled **A** through **Z** in the 'Formations' panel. The 'Flow Source' panel indicates the interpreted possible flow source depths in metres from ground surface.

The following Table 1 displays a list of the possible flow sources and associated fractures or geologic contacts.

Depth (m)	Formation	Interpreted Fracture	Description
5.21, 7.13, 7.39	Gasport, Decew	**A**, **B**, **C**	Above water, fractures and **C** also a contact, flow uncertain as no fluid data.
8.67	Decew	**D**	Fracture with possible flow based on conductivity and SP changes.
9.24	Decew	**E**	Minor fluid temperature and conductivity change at SPR and SP shifts, possible flow.
10.30	Decew	**H**	Caliper feature associated with fluid temperature and conductivity, possible flow.

11.29	Rochester	**L**	Minor fluid conductivity and temperature changes possibly indicating flow.
27.85	Irondequoit	**U**	Possible flow within lighter optical televiewer geologic unit between contacts **T** & **X**, likely emanating from **U**.

Table 1: BH-A Potential Flow Sources.

The Total Counts Gamma and Inductive Conductivity logs indicate a broad zone of elevated responses through most of the Rochester formation. Elevated responses are also seen below approximately 29 metres depth into the Reynales formation. In general, darker coloured Optical Televiewer images have higher Inductive Conductivity and higher Gamma responses.

The SPR and SP logs also indicate broad changes at the Rochester boundaries. Generally higher values are seen above the formation, and lower values are seen below the Rochester formation.

4.2 BH-B

The fractures and geologic contacts are labeled **A** through **Z** and **AA** through **LL** in the 'Formations' panel. The 'Flow Source' panel indicates the interpreted possible flow source depths in metres from ground surface. The casing extends to approximately 8.8 metres below ground surface.

The following Table 2 displays a list of the possible flow sources and associated fractures or geologic contacts.

Depth (m)	Formation	Interpreted Fracture	Description
9.06-9.48	Gasport	**A-B**	Fluid conductivity and temperature indicate possible flow at or between fractures.
10.20 & 10.69 & 23.15	Gasport & Gasport & Rochester	**C** & **D** & **T**	Possible flow at fractures – temperature change.
26.81	Rochester	**X**	Shift in fluid temperature indicating possible flow from fracture.
28.22-28.49-28.67-28.86	Rochester	**Z** through **CC**	Fluid temperature/conductivity and SP/SPR changes indicating possible flow from fractures and geologic contacts.

34.85	Irondequoit	**EE**	Broad fluid temperature change indicating possible flow from fracture/contact.
36.83	Reynales	**LL**	Possible flow from geologic contact based on fluid temperature change.

Table 2: BH-B Potential Flow Sources.

Most fractures from **N** through **W** show gravity staining. These could result from natural impurities within the formations. The Total Counts Gamma and Inductive Conductivity logs generally have lower amplitudes above and below the Rochester formation, as was the case for BH-A previously discussed. Similarly, darker geologic features visible with the Optical Televiewer image coincide with higher counts and conductivity.

The highest variability of SPR and SP response are within the Gasport formation and to approximately 23 metres depth through intermittent light and dark sub-units within the Decew and Rochester formations. A relatively large smooth decrease in SP response is seen from approximately 32.5 metres depth below the Rochester formation to the Irondequoit formation.

4.3 BH-D

The fractures and geologic contacts are labeled **A** through **X** in the 'Formations' panel. The 'Flow Source' panel indicates the interpreted possible flow source depths in metres from ground surface. The casing extends to approximately 7.7 metres below ground surface.

The following Table 3 displays a list of the possible flow sources and associated fractures or geologic contacts.

Depth (m)	Formation	Interpreted Fracture	Description
12.90	Gasport	**C**	Fluid temperature and conductivity anomaly indicating potential flow source.
19.09	Decew	**J**	Possible flow at contact/fracture.
20.10,20.24, 20.33,20.39, 20.57,20.78	Decew	**K**	Series of 6 fractures with possible flow.
21.24,21.40, 21.60, 22.05,22.13, 22.24	Decew and Rochester	**L** and **M**	Series of fractures with possible flow.

23.00	Rochester	**N**	Possible flow at fracture.
23.23	Rochester	**O**	Significant SPR/SP shifts indicating geologic contact/fault and possible flow.
24.37	Rochester	**P**	Fluid temperature and conductivity change indicating possible flow source.
25.88	Rochester	**Q**	Possible flow at fracture, also with SPR/SP anomalies.
27.86, 27.99, 28.08	Rochester	**R**	Series of 3 fractures with corresponding SPR/SP anomalies, possible flow sources based on fluid temperature broad variation.
35.75	Rochester	**V**	Fracture with minor flow likely based on small fluid conductivity change.
39.42	Irondequoit	**X**	Fracture with possible flow based on fluid temperature and conductivity change.

Table 3: BH-D Potential Flow Sources.

Total Counts Gamma and Inductive Conductivity are elevated through darker units such as the Rochester formation. SPR and SP responses are generally flat through the Rochester formation except in the region of fractures **R** and **S** where a lighter unit is visible in the Optical Televiewer image. Lower SP amplitudes are seen below 38.4 metres depth where the televiewer image is lighter indicating a change to the Irondequoit formation.

5. Conclusions

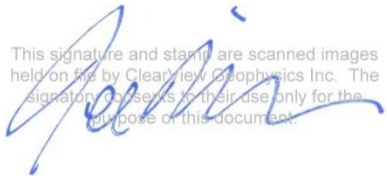
The borehole surveys detected numerous fractures and geologic contacts with a number of them indicating possible fluid flow. The possible flow zones could extend beyond these limits although likely not beyond corresponding fractures. It was not possible to interpret carbonate vs. shale with certainty based on the potential weathering of the rocks which also causes colour variations and changes to the physical properties measured.

If there are any questions about the surveys or the interpretation, please do not hesitate to contact the undersigned.

Sincerely,

ClearView Geophysics Inc.

Per:



Joe Mihelcic, P.Eng., M.B.A.
Geophysicist/President

Appendix – Plates

Plate # 4

Borehole Geophysical Surveys

CLEARVIEW Geophysics Inc.

Client:	WSP Canada Inc.	**Date(s) Logged:**	February 17, 2025
Borehole:	BH-A (BH76)		
Project:		**Logged By:**	Joe Mihelcic, Geophysicist
Location	Niagara Falls, Ontario ~425 m NE of the intersection of Taylor Rd./Mountain Rd.	**Comments:**	Formation names/intervals provided by WSP. Depths relative to ground surface
Bit Size:	HQ	**Casing Stickup:**	0.87 m gnd to top casing

--- To be read with accompanying report ---

Geophysical Equipment & Probes:

- Matrix Data Logger
- Mini Winch with 200m of 0.125"
- QL40-CAL 3-Arm Caliper
- 40LGR-1000 Gamma, SP, SPR
- 2PIA-1000 Poly Induction Probe
- QL40-OBI-2G Optical Televiewer
- QL40-FTC Fluid Temperature & Conductivity

Plate # 6

Borehole Geophysical Surveys

CLEARVIEW Geophysics Inc.

Client:	WSP Canada Inc.	**Date(s) Logged:**	February 15, 2025
Borehole:	BH-8 (BH77)		
Project:	Walker South Landfill Expansion	**Logged By:**	Joe Mihelcic, Geophysicist
Location	Niagara Falls, Ontario ~495 m SSW of the intersection of Garner Rd./Mountain Rd.	**Comments:**	Formation names/intervals provided by WSP. Depths relative to ground surface
Bit Size:	HQ	**Casing Stickup:**	25 cm above ground surface

--- To be read with accompanying report ---

Geophysical Equipment & Probes:

- Matrix Data Logger
- Mini Winch with 200m of 0.125"
- QL40-CAL 3-Arm Caliper
- 40 LGR-1000 Gamma, SP, SPR
- 2PIA-1000 Poly Induction Probe
- QL40-OBI-2G Optical Televiewer
- QL40-FTC Fluid Temperature & Conductivity

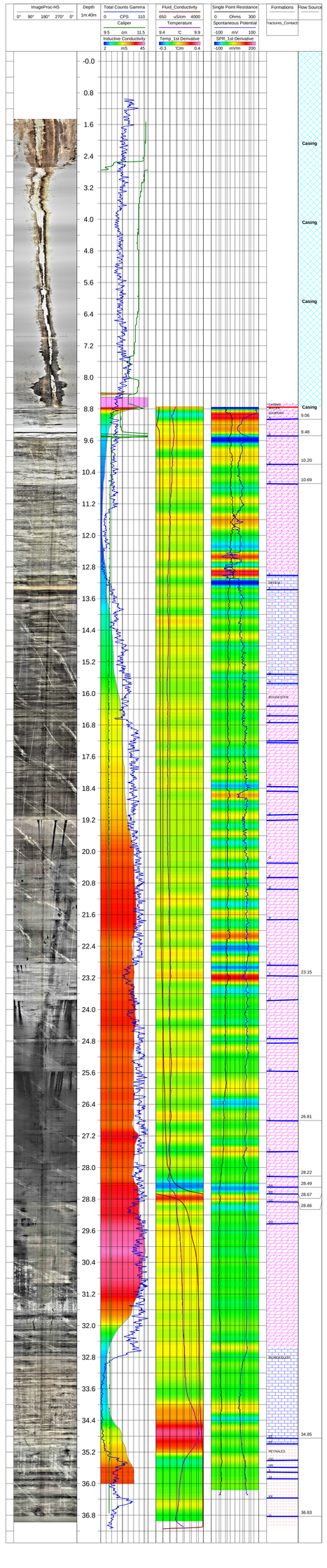


Plate # 8

Borehole Geophysical Surveys

CLEARVIEW Geophysics Inc.

Client:	WSP Canada Inc.	**Date(s) Logged:**	February 14 & 16, 2025
Borehole:	BH-D (BH78)		
Project:	Walker South Landfill Explansion	**Logged By:**	Joe Mihelcic, Geophysicist
Location	Niagara Falls, Ontario	**Comments:**	Formation names/intervals provided by WSP.
	~720 m NE of the intersection of Taylor Rd./Beechwood Rd.		Depths relative to ground surface
Bit Size:	HQ	**Casing Stickup:**	8 cm above ground surface

Geophysical Equipment & Probes: **--- To be read with accompanying report ---**

- Matrix Data Logger
- Mini Winch with 200m of 0.125"
- QL40-CAL 3-Arm Caliper
- 40 LGR-1000 Gamma, SP, SPR
- 2PIA-1000 Poly Induction Probe
- QL40-OBI-2G Optical Televiewer
- QL40-FTC Fluid Temperature & Conductivity