

REPORT

Geotechnical Review of Selected Sites

City of Windsor Sewer Master Plan, Windsor, Ontario

Submitted to:

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Table of Contents

1.0	INTRO	DDUCTION	1
2.0	BACK	(GROUND	1
3.0	METH	IODOLOGY	4
1.0	SITE	DESCRIPTION	5
5.0	SUBS	SURFACE CONDITIONS DISCUSSION FOR PROJECT LOCATIONS	7
	5.1	Dougall Underpass New Surcharge Surface Storage Pond	8
	5.1.1	Suburface Soil and Groundwater Conditions	8
	5.1.2	Discussion on Geotechnical Aspects of Functional Design	8
	5.1.3	Recommended Geotechnical Explorations for Detailed Design Phase	9
	5.2	Howard at E.C. Row New Surcharge Surface Storage Pond	10
	5.2.1	Suburface Conditions	10
	5.2.2	Discussion on Geotechnical Aspects of Functional Design	10
	5.2.3	Recommended Geotechnical Explorations for Detailed Design Phase	11
	5.3	Central Avenue, Pillette Road Expanded Central Pond	12
	5.3.1	Suburface Conditions	12
	5.3.2	Discussion on Geotechnical Aspects of Functional Design	12
	5.3.3	Recommended Geotechnical Explorations for Detailed Design Phase	13
	5.4	Chrysler Centre New Underground Surcharge Storage	14
	5.4.1	Suburface Conditions	14
	5.4.2	Discussion on Geotechnical Aspects of Functional Design	14
	5.4.3	Recommended Geotechnical Explorations for Detailed Design Phase	14
	5.5	Southwood Lakes Existing Ponds	16
	5.5.1	Suburface Conditions	16
	5.5.2	Discussion on Geotechnical Aspects of Functional Design	16
	5.5.3	Recommended Geotechnical Explorations for Detailed Design Phase	17
	5.6	Detroit Street Trunk Sewer Upgrade	18



5.6.1	Suburface Conditions	18
5.6.2	Discussion on Geotechnical Aspects of Functional Design	18
5.6.3	Recommended Geotechnical Explorations for Detailed Design Phase	19
5.7	Cameron Avenue Trunk Sewer Upgrade	20
5.7.1	Suburface Conditions	20
5.7.2	Discussion on Geotechnical Aspects of Functional Design	20
5.7.3	Recommended Geotechnical Explorations for Detailed Design Phase	21
5.8	Bruce Avenue Trunk Sewer	22
5.8.1	Suburface Conditions	22
5.8.2	Discussion on Geotechnical Aspects of Functional Design	22
5.8.3	Recommended Geotechnical Explorations for Detailed Design Phase	23
5.9	Marentette Avenue Trunk Sewer	24
5.9.1	Suburface Conditions	24
5.9.2	Discussion on Geotechnical Aspects of Functional Design	24
5.9.3	Recommended Geotechnical Explorations for Detailed Design Phase	25
5.10	Albert Road Trunk Sewer	26
5.10.1	Suburface Conditions	26
5.10.2	Discussion on Geotechnical Aspects of Functional Design	26
5.10.3	Recommended Geotechnical Explorations for Detailed Design Phase	27
5.11	Drouillard Underpass Pump Station	28
5.11.1	Suburface Conditions	28
5.11.2	Discussion on Geotechnical Aspects of Functional Design	28
5.11.3	Recommended Geotechnical Explorations for Detailed Design Phase	29
5.12	Pontiac Pump Station	30
5.12.1	Suburface Conditions	30
5.12.2	Discussion on Geotechnical Aspects of Functional Design	30
5.12.3	Recommended Geotechnical Explorations for Detailed Design Phase	31
5.13	St. Rose Pump Station	32



5.13.1	Suburface Conditions	32
5.13.2	Discussion on Geotechnical Aspects of Functional Design	32
5.13.3	Recommended Geotechnical Explorations for Detailed Design Phase	33
5.14	St. Paul Pump Station	34
5.14.1	Suburface Conditions	34
5.14.2	Discussion on Geotechnical Aspects of Functional Design	34
5.14.3	Recommended Geotechnical Explorations for Detailed Design Phase	35
5.15	Lakeview Pump Station	36
5.15.1	Suburface Conditions	36
5.15.2	Discussion on Geotechnical Aspects of Functional Design	36
5.15.3	Recommended Geotechnical Explorations for Detailed Design Phase	37
5.16	Brumpton Park Underground Stormwater Management Facility	38
5.16.1	Suburface Conditions	38
5.16.2	Discussion on Geotechnical Aspects of Functional Design	38
5.16.3	Recommended Geotechnical Explorations for Detailed Design Phase	38
5.16.4	Discussion on Geotechnical Aspects of Functional Design	39
5.17	Hawthorne Avenue, Lauzon Parkway, Jefferson Boulevard Offline Storage Volumes	40
5.17.1	Suburface Conditions	40
5.17.2	Discussion on Geotechnical Aspects of Functional Design	40
5.17.3	Recommended Geotechnical Explorations for Detailed Design Phase	41
5.18	Wyandotte Street East Off-Line Storage	42
5.18.1	Suburface Conditions	42
5.18.2	Discussion on Geotechnical Aspects of Functional Design	42
5.18.3	Recommended Geotechnical Explorations for Detailed Design Phase	42
5.19	Roseville Garden Drive and Hawthorne Avenue/Kew Drive Underground Stormwater Detention System	43
5.19.1	Suburface Conditions	43
5.19.2	Discussion on Geotechnical Aspects of Functional Design	43
5.19.3	Recommended Geotechnical Explorations for Detailed Design Phase	43



	5.20	Ypres Avenue Underground Stormwater Storage System	44
	5.20.1	Suburface Conditions	44
	5.20.2	Discussion on Geotechnical Aspects of Functional Design	44
	5.20.3	Recommended Geotechnical Explorations for Detailed Design Phase	44
	5.21	Prince Road Outlet at Chappelle/Sandwich Street	46
	5.21.1	Suburface Conditions	46
	5.21.2	Discussion on Geotechnical Aspects of Functional Design	46
	5.21.3	Recommended Geotechnical Explorations for Detailed Design Phase	47
	5.22	Earth Berm Along Riverside Drive Between Ford Boulevard and East City Limits	48
	5.22.1	Suburface Conditions	48
	5.22.2	Discussion on Geotechnical Aspects of Functional Design	48
	5.22.3	Recommended Geotechnical Explorations for Detailed Design Phase	48
	5.23	Low Impact Development Measures	49
	5.24	Environmental Contamination Considerations	49
6.0	CLOS	URE	51

Important Information and Limitations on this Report

FIGURES

- Figure 1: Location Plan
- Figure 2: Dougall Underpass New Surcharge Surface Storage Pond
- Figure 3: Howard at E.C. Row New Surcharge Surface Storage Pond
- Figure 4: Central Avenue, Pillette Road Expanded Central Pond
- Figure 5: Chrysler Center New Underground Surcharge Storage
- Figure 6: Southwood Lakes Lowered Normal Water Level in Existing Ponds
- Figure 7: Detroit Street Trunk Sewer Upgrade
- Figure 8: Cameron Avenue Trunk Sewer Upgrade
- Figure 9: Bruce Avenue Trunk Sewer
- Figure 10: Marentette Avenue Trunk Sewer
- Figure 11: Albert Road Trunk Sewer and Droulliard Underpass Pump Station
- Figure 12: Pontiac Pump Station
- Figure 13: St. Rose and St. Paul Pump Stations
- Figure 14: Lakeview Pumping Statin Capacity Increase
- Figure 15: Brumpton Park Underground Stormwater Management Facility
- Figure 16: Hawthorne Avenue, Lauzon Parkway, Jefferson Boulevard Offline Storage Volumes/Improvements
- Figure 17: Wyandotte Street East, West of Little River, Offline Storage
- Figure 18: Roseville Garden Drive and Hawthorne Avenue/Kew Drive Underground Stormwater Detention System
- Figure 19: Ypres Avenue Underground Stormwater Storage System
- Figure 20: Prince Road Outlet at Chappelle/Sandwich Street
- Figure 21A: Proposed Earth Berm Along Riverside Drive (Ford Boulevard to East City Limits) (1 of 4)



Figure 21B: Proposed Earth Berm Along Riverside Drive (Ford Boulevard to East City Limits) (2 of 4)

Figure 21C: Proposed Earth Berm Along Riverside Drive (Ford Boulevard to East City Limits) (3 of 4)

Figure 21D: Proposed Earth Berm Along Riverside Drive (Ford Boulevard to East City Limits) (4 of 4)

APPENDICES

APPENDIX A

Previous Records of Boreholes and Test Pits by Golder Associates Ltd.

APPENDIX B

Ontario Ministry of Environment, Conservation and Parks Well Records



1.0 INTRODUCTION

This report provides the results of a geotechnical assessment carried out to support the functional design being carried out by Dillon Consulting Limited (Dillon) for the City of Windsor Sewer Master Plan. As part of the functional design process, Dillon has requested that Golder carry out a geotechnical desktop review of several sites for proposed surcharge surface storage ponds, underground storage facilities, sewer outfalls, and pumping stations. It is understood that low impact development (LID) solutions such as exfiltration trenches are being considered for some of these locations.

The purpose of this geotechnical desktop review was to evaluate the subsurface soil and groundwater conditions, outline the general geotechnical conditions and delineate potential areas of geotechnical opportunities and constraints for the various project improvement areas consistent with the level of detailed required for functional design. These include comments on the geotechnical aspects of:

- anticipated subsurface groundwater conditions;
- anticipated soil conditions as they pertain to the functional design of surface storage ponds, underground storage facilities, sewer outfalls, pumping stations, and LID solutions;
- other potential geotechnical issues, as applicable; and
- recommended geotechnical explorations for the detailed design phase.

Authorization to proceed with the geotechnical desktop review, in accordance with our February 14, 2020 proposal, was provided by Mr. Flavio Forest, P.Eng. of Dillon via a work order dated February 24, 2020.

This report should be read in conjunction with the attached document "Important Information and Limitations of this Report", which comprises an integral component hereof. The reader's attention is specifically drawn to this material, as it is essential for proper use and interpretation of the information presented and discussed herein.

2.0 BACKGROUND

Golder Associates Ltd. ("Golder") has previously carried out investigations in the general vicinity of several of the project improvement areas. The results of the previous geotechnical work were provided in the following reports:

- Golder Report No. 71509 titled "Subsurface Investigation, Proposed R.C.M.P. Detachment Building, Riverside Drive, Windsor, Ontario", dated March 1971;
- Golder Report No. 764111 titled "Preliminary Geotechnical Investigation, Proposed Prince Road Storm Sewer, Windsor, Ontario", dated November 1976;
- Golder Report No. 791-4012 titled "Subsurface Investigation, Proposed External Sanitary Services Interim Works, Walker Farms Industrial Park, Windsor, Ontario", dated March 1979;
- Golder Report No. 991-4120 titled "Geotechnical Investigation, Proposed New Warehouse Building", dated June 1999;
- Golder Report No. 001-4009 titled "Subsurface Investigation, Windsor Riverfront Lands, Moy Avenue and Langlois Avenue, Windsor, Ontario", dated February 2000;
- Golder Report No. 001-4014 titled "Preliminary Geotechnical Investigation, Proposed 4-Storey Development, Existing Riverfront Property, 9150 Riverside Drive, Windsor, Ontario", dated February 2000;



■ Golder Report No. 001-4067 titled "Geotechnical Investigation, Rotary Gazebo, Lakeview Marina, Windsor, Ontario", dated April 2000;

- Golder Report No. 001-4238 titled "Geotechnical Investigation, Proposed Rose City Ford Auto Dealership, Forest Glade Drive Area, Windsor, Ontario", dated October 2000;
- Golder Report No. 001-4247 titled "Geotechnical Investigation, Proposed Beachview Villas, Townhouse Development, 10039/10049 Riverside Drive East, Windsor, Ontario", dated October 2000;
- Golder Report No. 011-4128 titled "Geotechnical Investigation, Proposed Addition, St. Rose Elementary School, St. Rose Avenue, Windsor, Ontario", dated June 12, 2001;
- Golder Letter No. 011-4136 titled "Riverfront Interceptor Project", dated July 6, 2001;
- Golder Report No. 011-4205 titled "Geotechnical Investigation, Riverside Drive Interceptor Sewer Extension, Albert Road to George Avenue, Windsor, Ontario", dated September 19, 2001;
- Golder Report No. 011-4226 titled "Geotechnical Investigation, Proposed Addition, Lajeunesse Ecole Catholique, Bruce Avenue, Windsor, Ontario", dated October 17, 2001;
- Golder Report No. 011-4276 titled "Geotechnical Investigation, Proposed Condominium Structure, Wyandotte Street East, City of Windsor, Ontario", dated January 3, 2002;
- Golder Report No. 021-4035 titled "Geotechnical Investigation, Grand Marais Drain Re-Alignment, Windsor, Ontario", dated June 10, 2002;
- Golder Report No. 031-140060 titled "Geotechnical Investigation, Ypres Boulevard Trunk Sanitary Sewer, Turner Road to Gladstone Avenue, Windsor, Ontario", dated April 29, 2003;
- Golder Report No. 031-140094 titled "Geotechnical Investigation, Proposed Classroom, Parking Lot and Athletic Track Addition, Lassaline School, Windsor, Ontario", dated June 2, 2003;
- Golder Draft Report No. 031-145072 titled "Phase II Environmental Site Assessment, Riverfront Property, Southwest Corner of Mill Street and Russell Street, Windsor, Ontario", dated June 17, 2003;
- Golder Report No. 031-140333 titled "Geotechnical Investigation, Proposed Bridge Over Little River, Wyandotte Street East Extension, City of Windsor, Ontario", dated February 27, 2004;
- Golder Report No. 06-1140-020 titled "Geotechnical Investigation, Tecumseh Road East Improvements from Canadian National Railway East of Jefferson Boulevard to Lauzon Parkway, Windsor, Ontario", dated June 16, 2006;
- Golder Report No. 06-1140-006 titled "Geotechnical Investigation, Walker-Wyandotte Intersection Improvements, Windsor, Ontario", dated July 4, 2006;
- Golder Report No. 041-140048 titled "Foundation Investigation Report, Walker Road Grade Separation Project, Windsor, Ontario", dated December 6, 2006;
- Golder Report No. 06-1140-142 titled "Geotechnical Investigation, Proposed Building Addition and New Material Recovery Facility, Central Avenue Transfer Station, Windsor, Ontario", dated August 31, 2006;



■ Golder Report No. 07-1140-0022 titled "Geotechnical Investigation, Sewer Replacement and Road Reconstruction, Lincoln Road, Memorial Avenue to Ypres Boulevard, Windsor, Ontario", dated March 23, 2007;

- Golder Report No. 07-1140-0027 titled "Geotechnical Investigation, Riverside Drive Barrier Landform, Windsor, Ontario", dated March 26, 2007;
- Golder Letter No. 07-1140-0098 titled "Factual Geotechnical Investigation, Proposed Sewer Upgrading and Road Reconstruction, Prado Place, Riverside Drive to Wyandotte Street, Windsor, Ontario", dated July 4, 2007;
- Golder Report No. 08-1140-W028 titled "Geotechnical Investigation, Grand Marais Drain Improvements, Phase I, Windsor, Ontario", dated May 12, 2008;
- Golder Report No. 08-1140-W054 titled "Geotechnical Investigation, Proposed Trunk Storm Sewer and Road Reconstruction, Parent Avenue and Lens Avenue, City of Windsor, Ontario", dated June 4, 2008;
- Golder Report No. 09-1140-W011 titled "Geotechnical Investigation, Grand Marais Drain Improvements, Phase II, Windsor, Ontario", dated March 11, 2009;
- Golder Report No. 09-1140-W091B-R01 titled "Geotechnical Investigation, Sandwich South Trunk Sanitary Sewer, Peppervine Street to Little River Pollution Control Plant, Windsor, Ontario", dated October 2009;
- Golder Report No. 09-1140-W037 titled "Supplemental Geotechnical Investigation, Highway 401 Undercrossing, Proposed Steel Casing, Trunk Sanitary Sewer, North Talbot Road, Town of Tecumseh, Ontario", dated December 2009;
- Golder Report No. 09-1140-W025-R01 titled "Geotechnical Design Report, Prince Road Storm Sewer Outlet, Prince Road Sewer, Phase 9, Outlet to Detroit River, City of Windsor, Ontario", dated May 2010;
- Golder Report No. 09-1140-W025 Ph2000 R01 titled "Supplementary Geotechnical Investigation, Storm Sewer Outlet, Prince Road Sewer, Phase 9B, City of Windsor, Ontario", dated June 2011;
- Golder Report 09-1140-W028 titled "Geotechnical Investigation, Proposed Wyandotte Street Extension, Florence Avenue to Bellagio Drive, Windsor, Ontario", dated April 7, 2009;
- Golder Letter No. 10-1140-0090 PH1000-L02 titled "Supplementary Geotechnical Investigation, Retention Treatment Basin (RTB) Facility, Contract No. 1B, Tender 34-10, City of Windsor, Ontario", dated July 6, 2010;
- Golder Report No. 11-1140-0200-R01 titled "Geotechnical Investigation, Parking Lot Reconstruction, St. Francis School, Windsor, Ontario", dated March 2012;
- Golder Report No. 13-1140-0026-R01 titled "Geotechnical Investigation, Proposed Road Reconstruction, Fairview Boulevard, Wyandotte Street East to St. Rose Avenue, Windsor, Ontario", dated March 2013;
- Golder Report No. 13-1140-0031-R01 titled "Geotechnical Investigation, Proposed Building Addition, St. John Vianney Catholic Elementary School, 8405 Cedarview Street, Windsor, Ontario", dated March 2013;
- Golder Report No. 13-1140-0207-R01 titled "Geotechnical Investigation, Proposed Utility Installation and Road Reconstruction, Outer Drive, Moro Drive and Burke Street, Town of Tecumseh, Ontario", dated December 2013;



■ Golder Report No. 1400977-R01 titled "Geotechnical Investigation, Abars on the River, Proposed Building and Parking Lot, Windsor, Ontario", dated April 2014;

- Golder Report No. 13-1140-0188-R01 titled "Geotechnical Investigation, Proposed Electrical Buildings, Elm Avenue and Dougall Avenue, CSO Interceptor Chambers, Windsor, Ontario", dated May 2014;
- Golder Report No. 1405019-R01 titled "Subsurface Investigation, Banwell Road and McHugh Street, Windsor, Ontario", dated October 2014;
- Golder Report No. 1405768-R01 titled "Geotechnical Investigation and Environmental Sampling, Roberts Pond Decommissioning and Storm Sewer Installation, City of Windsor, Ontario", dated July 2014;
- Golder Report No. 1406552-R01 titled "Geotechnical Investigation, Proposed 4 Storey Apartment Building and 2 Storey Townhouse, 8475 Wyandotte Street East, Windsor, Ontario", dated July 2014;
- Golder Report No. 1520407-2000-R03 titled "Supplemental Phase II Environmental Site Assessment, 75
 Mill Street, Windsor, Ontario", dated August 2015;
- Golder Report No. 1527635-1000-R01 titled "Preliminary Geotechnical and Hydrogeological Investigation, Parts of Lots 119 to 121, Concession 1, Geographic Township of Sandwich East, Windsor, Ontario", dated May 2015;
- Golder Report No. 1546452-R01 titled "Geotechnical Investigation, Proposed EMS Station Reconstruction, 2620 Dougall Avenue, Windsor, Ontario", dated May 2016;
- Golder Report No. 1660023-3000-R01 titled "Geotechnical Exploration, Proposed New Sandwich Library, 363 Mill Street, Windsor, Ontario", dated December 2016; and
- Golder Report No. 1668632-R01 titled "Geotechnical Exploration, Proposed Multi-Use Trail Underpass, CN Railway at Dougall Avenue, Windsor, Ontario", dated August 2017.

Relevant Record of Borehole and Test Pit Sheets from the above-listed Golder reports are attached in Appendix A and the approximate borehole and test pit locations are shown on Figures 2 to 20.

Relevant Ontario Ministry of the Environment, Conservation and Parks (MECP) well records are attached in Appendix B and the approximate well locations are shown on Figure 6. Well records were referenced where previous geotechnical exploration data was not available near the project area.

3.0 METHODOLOGY

The preliminary geotechnical assessment consisted of assembling and reviewing information from the following sources:

- topographic mapping;
- surficial soil and bedrock geological mapping;
- MECP well records; and
- existing Golder or publicly available geotechnical data for the improvement areas.

No new boreholes were drilled for this geotechnical assessment and it understood that intrusive exploration activities will be deferred to the detailed design phase. The available information referenced above was used to prepare this desktop geotechnical assessment report.

4.0 SITE DESCRIPTION

The subject sites are located throughout the City of Windsor. Based on the information provided by Dillon, geotechnical review has been requested for the following locations:

- Dougall Avenue Underpass New Surcharge Surface Storage Pond New surcharge surface storage pond on vacant land south of Northwood Street, will have 26,800 cubic metres (m³) of storage, a surface area of 15,000 square metres (m²), and a maximum depth of 4 metres (m);
- Howard Avenue at E.C. Row Expressway New Surcharge Surface Storage Pond New surcharge surface storage pond on land with existing building that will be removed, located at the north west corner of the Howard Avenue underpass at E.C. Row Expressway. The proposed pond will have 2,433 m³ of storage, a surface area of 3,500 m², and a maximum depth of 3 to 4 m;
- Central Avenue, Pillette Road Expanded Central Pond Expansion of Central pond to 105,300 m³ of storage on vacant lands having a surface area of 40,000 m², and a maximum depth of between 4 to 5 m;
- Chrysler Center New Underground Surcharge Storage New below grade surcharge storage with 11,000 m³ of storage under the existing Chrysler parking lot, with open bottomed storage chambers to permit infiltration. The parking lot is to be reinstated following construction. A footprint of 13,200 m² and depth of 3 m are planned;
- Southwood Lakes Lowered Normal Water Level in Existing Ponds Lowering of normal pond water levels by increasing depth of Lake Como, Lake Grande, and Lake Laguna by approximately 0.2 m, 0.5 m, and 0.5 m, respectively. The depth of the existing ponds will vary between 4.5 m and 7 m;
- Detroit Street Trunk Sewer Upgrade Upgrade of 300-m length of existing 900-millimetre (mm) diameter storm outfall to Detroit River with 1,200-mm diameter storm sewer;
- Cameron Avenue Trunk Sewer Upgrade New 2,700-mm diameter storm outfall to Detroit River with 2,400-mm by 3,300-mm box culvert;
- Bruce Avenue Trunk Sewer New 3,600-mm diameter storm outfall to Detroit River;
- Marentette Avenue Trunk Sewer New outfall to Detroit River with 1,800-mm diameter storm sewer at Marentette Avenue;
- Albert Road Trunk Sewer– New 1,650-mm diameter trunk sewer over a 350 m length. Existing 450-mm diameter to 600-mm diameter sewers to be replaced with new 450-mm and 750-mm diameter sewers over a 190 m length along Wyandotte Street East. A new outfall pipe will be constructed at Albert Road and the Detroit River;
- Droulliard Underpass Pump Station New pump station within Cadillac Street Park, located north east of the Drouillard Road underpass at Wyandotte Street East. Upgrade 270 m of downstream sewer with 825-mm diameter sewer;



■ Pontiac Pump Station – A new wet well pump station to be constructed directly adjacent to the existing Pontiac pump station with 2 new pumps having a 1.25 and 1.8 cubic metre per second (m³/s) capacity, 7.3 m depth;

- St. Rose Pump Station New St. Rose pump station having a proposed capacity of 11 m³/s, and a depth of 11.5 m;
- St. Paul Pump Station New St. Paul pump station having a proposed capacity of 15 m³/s, and a depth of 13 m;
- Lakeview Pumping Station Capacity Increase Lakeview pump station capacity increase from 0.7 m³/s to 1.4 m³/s by constructing a new pump station adjacent to the existing Lakeview pump station, with pump station depth of 10 m, outfall pipe size increase, and new outlet at Blue Heron Pond;
- Brumpton Park –New underground stormwater management facility at the southwest area of Brumpton Park. The underground facility will have a bottom elevation of 173.80 m measuring approximately 40 m by 100 m in plan with a storage volume capacity of 4,725 m³;
- Hawthorne Avenue, Lauzon Parkway, Jefferson Boulevard Offline Storage Volumes/Improvements New Lauzon golf course storm water management pond volume is 30,000 m³, surface area of 25,000 m² and depth of 4 to 5 m, new Meadowbrook Park underground storage facility volume is 10,000 m³, surface area of 2,200 m² with a depth of 3.5 m. Road regrading and low impact development (LID) swales are planned for Lauzon Parkway between Cantelon Avenue and Hawthorne Avenue;
- Wyandotte Street East, west of Little River, off-line storage Two new off-line underground stormwater management facilities having capacities of 8,000 m³ and 3,000 m³, surface areas of 5,400 m² and 1,400 m², respectively, and depths of about 3 m;
- Roseville Garden Drive and Hawthorn Avenue/Kew Drive Underground Stormwater Detention System Improvements New underground surcharge storage of 28,000 m³ having a footprint of 21,850 m² and depth of 5 m and open bottomed storage chambers to permit infiltration;
- Ypres Avenue Underground Storage System New below grade surcharge storage of 3,000 m³ under the existing Optimist Memorial Park parking lot. A footprint of 3,360 m² and depth of about 3 m are planned;
- Prince Road outlet at Chappelle/Sandwich St. This solution includes approximately 200 m of new storm sewer to the 2,700-mm diameter outlet to McKee Creek; and
- Proposed Earth Berm Along Riverside Drive between approximately Ford Boulevard and the east City Limits. The preferred solution is to construct the landform barrier crest to elevation 176.5 m. Existing property grading that meets or exceeds the target elevation will be utilized to limit the required new berm construction. Areas not meeting the target elevation will require new landform barriers to be constructed and localized improvements/grade alterations for areas of trail and road crossings.

It is understood that LID solutions such as exfiltration trenches are being considered for some of the project locations.

5.0 SUBSURFACE CONDITIONS DISCUSSION FOR PROJECT LOCATIONS

The subsurface conditions encountered in the previous boreholes and test pits within the general vicinity of the proposed project locations are detailed on the attached Record of Borehole and Record of Test Pit sheets in Appendix A, and MECP Well Records in Appendix B.

The soil boundaries indicated are inferred from non-continuous samples and observations of drilling and sampling resistance and typically represent transitions from one soil type to another rather than exact planes of geological change. Further, subsurface conditions may vary significantly between and beyond the borehole and test pit locations. It should be noted that the subsurface soil and groundwater conditions discussed in this report are based on previous boreholes and test pits from investigations dated as early as 1971 and may have been altered by subsequent development and infrastructure construction.



5.1 Dougall Underpass New Surcharge Surface Storage Pond

The proposed Dougall Avenue underpass surcharge surface storage pond will be located on vacant land south of Northwood Street. The pond will have a storage capacity of 26,800 m³, a surface area of 15,000 m², side slope inclinations of 4 horizontal to 1 vertical, and a depth of 4 m. The pond location is shown on Figure 2.

5.1.1 Suburface Soil and Groundwater Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the vicinity of the storage pond encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill. To the west of the pond, one borehole encountered a surficial deposit of silty sand overlying the silty clay. A measurement carried out for one groundwater monitoring well installed to the west of the pond location, where the surficial silty sand was encountered, indicated a groundwater level about 0.8 m below ground surface. This may indicate a perched groundwater level where surficial granular soils are present overlying the lower permeability cohesive materials. In general, the borehole logs indicate that the boreholes in this area remained dry during drilling.

5.1.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pond will be approximately 4 m in depth, with side slopes having an inclination of 4 horizontal to 1 vertical. Pond side slopes having an inclination of 4 horizontal to 1 vertical are not anticipated to be problematic and can be used for functional design purposes for ponds excavated into the native soils in this area. In areas proposed for equipment access for periodic maintenance, an inclination of 6 horizontal to 1 vertical or flatter should be considered.

Erosion protection should be provided around the perimeter of the surcharge storage pond at the elevation of the normal operating level. The form of erosion protection should match with the requirements of aquatic vegetation to be planted and developed. Consideration could be given to protecting the active water line zone (i.e., from the low-water level to the high-water level) with a minimum 150-mm thick layer of Ontario Provincial Standard Specification (OPSS).PROV 1004 (Aggregates) R-10 rip-rap, constructed in accordance with OPSS 150 (Rip-Rap, Rock Protection); however, this may not be necessary if appropriate vegetation can be established in this zone. The pond slopes above the operating water level should be vegetated as soon as practical after construction to address the potential for erosion due to surface water run-off. Care should be taken to ensure filter compatibility between the native soils and any imported granular materials.

Care should be taken to minimize construction traffic on the base of the pond following excavation and inspection to limit the generation of fines that will go into suspension when the pond is filled. Rip-rap should be provided over the full extent of the side slopes and base below and adjacent to the sewer inlet/outlet locations.

All excavations for the surcharge surface storage pond should be carried out in accordance with the current Ontario Occupational Health & Safety Act (OHSA, the Act) criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.



Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

Based on the subsurface conditions anticipated for the project area, headwalls associated with the stormwater management pond may be founded on the native soils at a minimum depth of 1.2 m below finished grade. The geotechnical resistance/reaction used for the design of headwall foundations should be confirmed in the detailed design phase.

5.1.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the surcharge surface storage pond. Geotechnical explorations for the pond should consist of a minimum of 4 soil borings advanced within the stormwater pond footprint, extending a minimum of 1.5 m below the pond bottom elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.



5.2 Howard at E.C. Row New Surcharge Surface Storage Pond

The proposed new surcharge surface storage pond at the north west corner of the Howard Avenue underpass at E.C. Row Expressway will be located on the land currently occupied by a commercial building which will be removed. The pond will have a storage capacity of 2,433 m³, a surface area of 3,500 m², side slope inclinations of 4 horizontal to 1 vertical, and a depth of 3 to 4 m. The pond location is shown on Figure 3.

5.2.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the storage pond encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill. One groundwater monitoring well installed to the east of the pond location indicated a groundwater level about 0.9 m below ground surface (see applicable Record of Borehole sheets). This may indicate a perched groundwater level where surficial granular soils are present overlying the lower permeability cohesive materials. In general, the borehole logs indicate that the boreholes in this area encountered groundwater seepage following drilling.

5.2.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pond will be approximately 3 to 4 m in depth, with side slopes having an inclination of 4 horizontal to 1 vertical. Pond side slopes having an inclination of 4 horizontal to 1 vertical are not anticipated to be problematic and can be used for functional design purposes for ponds excavated into the native soils in this area. In areas proposed for equipment access for periodic maintenance, an inclination of 6 horizontal to 1 vertical or flatter should be considered.

Erosion protection should be provided around the perimeter of the surcharge storage pond at the elevation of the normal operating level. The form of erosion protection should match with the requirements of aquatic vegetation to be planted and developed. Consideration could be given to protecting the active water line zone (i.e., from the low-water level to the high-water level) with a minimum 150-mm thick layer of OPSS.PROV 1004 (Aggregates) R-10 rip-rap, constructed in accordance with OPSS 150 (Rip-Rap, Rock Protection); however, this may not be necessary if appropriate vegetation can be established in this zone. The pond slopes above the operating water level should be vegetated as soon as practical after construction to address the potential for erosion due to surface water run-off. Care should be taken to ensure filter compatibility between the native soils and any imported granular materials.

Care should be taken to minimize construction traffic on the base of the pond following excavation and inspection to limit the generation of fines that will go into suspension when the pond is filled. Rip-rap should be provided over the full extent of the side slopes and base below and adjacent to the sewer inlet/outlet locations.

It is anticipated that the existing building, foundations, and surrounding pavement structures will be fully removed from within the pond footprint. All excavations for the surcharge surface storage pond should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that



might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

Based on the subsurface conditions anticipated for the project area, headwalls associated with the stormwater management pond may be founded on the native soils at a minimum depth of 1.2 m below finished grade. The geotechnical resistance/reaction used for the design of headwall foundations should be confirmed in the detailed design phase.

5.2.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the surcharge surface storage pond. Geotechnical explorations for the pond should consist of a minimum of 2 soil borings advanced within the stormwater pond footprint, extending a minimum of 1.5 m below the pond bottom elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.



5.3 Central Avenue, Pillette Road Expanded Central Pond

The existing Central Avenue and Pillette Road pond is proposed to be expanded to have a storage capacity of 105,300 m³, a surface area of 40,000 m², side slope inclinations of 6 horizontal to 1 vertical and existing side slope inclinations, and a maximum depth of between 4 and 5 m. The pond location is shown on Figure 4.

5.3.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the storage pond encountered native soils generally consisting of clayey silt, sand, and silty sand, underlain by an extensive deposit of silty clay. The native soils were encountered below surficial organic soils (topsoil), fill, and silty sand (where present). Groundwater monitoring wells installed in previous boreholes west of the pond had measured groundwater levels between about 2.8 m and 3 m below ground surface. A monitoring well south of the pond location had a recorded water level about 0.9 m below ground surface. In general, the borehole logs indicate that the boreholes were dry upon completion of drilling.

5.3.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pond will be approximately 4 to 5 m in depth, with side slopes having an inclination of 6 horizontal to 1 vertical. Pond side slopes having an inclination of 6 horizontal to 1 vertical are not anticipated to be problematic and can be used for functional design purposes for ponds excavated into the native soils in this area, and would be suitable for equipment access for periodic maintenance.

Erosion protection should be provided around the perimeter of the surcharge storage pond at the elevation of the normal operating level. The form of erosion protection should match with the requirements of aquatic vegetation to be planted and developed. Consideration could be given to protecting the active water line zone (i.e., from the low-water level to the high-water level) with a minimum 150-mm thick layer of OPSS.PROV 1004 (Aggregates) R-10 rip-rap, constructed in accordance with OPSS 150 (Rip-Rap, Rock Protection); however, this may not be necessary if appropriate vegetation can be established in this zone. The pond slopes above the operating water level should be vegetated as soon as practical after construction to address the potential for erosion due to surface water run-off. Care should be taken to ensure filter compatibility between the native soils and any imported granular materials.

Care should be taken to minimize construction traffic on the base of the pond following excavation and inspection to limit the generation of fines that will go into suspension when the pond is filled. Rip-rap should be provided over the full extent of the side slopes and base below and adjacent to the sewer inlet/outlet locations.

All excavations for the surcharge surface storage pond should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any to firm silty clay/clayey silt and loose to compact sand encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.



Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay/clayey silt materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

Based on the subsurface conditions anticipated for the project area, headwalls associated with the stormwater management pond may be founded on the native soils at a minimum depth of 1.2 m below finished grade. The geotechnical resistance/reaction used for the design of headwall foundations should be confirmed in the detailed design phase.

5.3.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the expanded central pond. Geotechnical explorations for the pond should consist of a minimum of 6 soil borings advanced within the stormwater pond footprint, extending a minimum of 1.5 m below the pond bottom elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.



5.4 Chrysler Centre New Underground Surcharge Storage

The proposed Chrysler Center underground surcharge storage will consist of a 11,000 m³ capacity tank under the existing Chrysler parking lot, with the possibility of having open bottomed storage chambers to permit infiltration. The parking lot will be reinstated following construction. The proposed tank will have a footprint of 13,200 m² and a depth of 3 m. The storage tank location is shown on Figure 5.

5.4.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the proposed underground surcharge storage tank encountered native soils generally consisting of silty clay/clayey silt, with occasional sand layers, below surficial organic soils (topsoil) and fill (where present). Many of the boreholes advanced within the area encountered groundwater seepage. Where encountered, water levels recorded in boreholes upon completion of drilling and in installed monitoring wells ranged between about 1.2 m and 16.5 m below ground surface (see Record of Borehole sheets for details).

5.4.2 Discussion on Geotechnical Aspects of Functional Design

It understood that the storage chamber planned in the Chrysler Centre parking lot will extend to a depth of approximately 3 m. The bearing resistance/reaction for the tank/chambers will be dependant on the soil conditions present at chamber location. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the foundations or base for the proposed tank/chambers will probably encounter firm to hard brown or grey silty clay. These soils in their undisturbed state are considered to be an acceptable founding medium to support the storage chambers. Based on the anticipated cohesive nature of the soils at and below the tank/chamber base elevation, infiltration rates would be very low.

All excavations for the storage chamber should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

5.4.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the underground surcharge storage tank. Geotechnical explorations for underground storage chamber in should consist of at least 4 soil borings advanced within the chamber/tank footprint, extending a minimum of 3 m below the chamber base elevation.



Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.



5.5 Southwood Lakes Existing Ponds

The normal water levels are proposed to be lowered in the existing Southwood Lakes subdivision ponds. Lowering of normal pond water levels will be achieved by increasing the depths of the Lake Como, Lake Grande, and Lake Laguna ponds by approximately 0.2 m, 0.5 m, and 0.5 m, respectively. The existing side slope inclinations of the ponds will not change. The depths of the ponds will vary between 4.5 m and 7 m in depth. The pond locations are shown on Figure 6.

5.5.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the storage pond encountered native soils generally consisting of an extensive deposit of silty clay. The native soils were encountered below surficial organic soils (topsoil), and fill, where present. One historical water well record for w well installed north of the ponds indicates an approximately 1.8 m thick sand layer extending to a depth of about 4.3 m. In general, the records for the boreholes east of the ponds indicate that the boreholes were dry upon completion of drilling.

5.5.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the existing pond depths will be marginally increased by up to 0.5 m, with the existing side slope inclinations remaining the same. If the existing pond side slopes have inclination of 3 horizontal to 1 vertical or flatter, the proposed deepening of the ponds are not anticipated to be problematic. Steeper side slopes may feasible, and can be analyzed for long term stability, if required.

At this time, it is anticipated that current erosion protection features will be kept in place; however, if instabilities and erosion of the existing pond side slopes are evident, additional erosion control measures should be considered to be incorporated with the pond deepening.

Care should be taken to minimize construction traffic on the base of the pond following excavation and inspection to limit the generation of fines that will go into suspension when the pond is filled. Rip-rap should be provided over the full extent of the side slopes and base below and adjacent to the sewer inlet/outlet locations.

All excavations for the surcharge surface storage ponds should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any to firm silty clay and loose to compact sand encountered in the project area and above the water table would be classified as Type 3 soils. Stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay/clayey silt materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.



5.5.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. Due to the nominal increase of the pond depths being proposed, a site-specific geotechnical exploration for the ponds may not be warranted provided there have been no stability issues with the current pond slopes. During detailed design, the geotechnical consultant should undertake a review of the final design for the pond deepening, any existing site-specific geotechnical information from the pond's original construction, and carry out a site review. Following this detailed review, if a geotechnical exploration is not warranted, a site review of the subgrade soils should be carried out during construction by the geotechnical engineer.

Following the completion of the detailed design review, the recommendations in this report may be revised based on the new information.



5.6 Detroit Street Trunk Sewer Upgrade

West of the intersection of Detroit Street and Sandwich street, an approximately 300 m length of existing 900-mm diameter storm outfall to Detroit River will be upgraded to a 1,200-mm diameter storm sewer with an outfall to the Detroit River, having a hydraulic invert elevation of 172.6 m and a ground elevation of 176.3 m at the river. The Detroit River 100-Year high water level elevation is 176.15 m. The sewer and outfall location are shown on Figure 7.

5.6.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes and test pits previously advanced in the general vicinity of the proposed outfall encountered native soils generally consisting of silty clay/clayey silt, with occasional sand and silt layers, below surficial organic soils (topsoil/peat) and fill (where present). The fill thickness in the available boreholes and test pits south of the outfall were measured to be between about 1.7 m and 4.5 m. The encountered fill has been described as having a mixed composition, consisting of silty clay, sand, and silt, with debris including wood, brick, concrete, cinders and organic materials. Groundwater level observations made in the available test pits located south of the outfall location indicated seepage into the test pits at depths of between about 1.2 m and 2.7 m below ground surface.

5.6.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed outfall invert will be about 3.7 m below existing ground elevation at the outfall location and about 3.6 m below the Detroit River 100-year high water level. Based on the available soils information from the nearby boreholes, the outfall is expected to be located within fill or the underlying native silty clay/clayey silt. The existing fill is not considered to be an acceptable founding medium to support the outfall pipe or associated headwall. If fill is present at the outfall founding elevation, consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level, with the steel sheeting extending into the underlying native silty clay/clayey silt. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. This approach would also require a cofferdam structure to reach the design invert elevations below the river level. The native silty clay encountered in the boreholes in the project vicinity are considered to be an acceptable founding medium to support the outfall pipe or associated headwall. Any excavations adjacent for the outfall at the river and extending below the river level would require a cofferdam structure to reach the design invert elevations. Further geotechnical exploration will be required to evaluate the thickness of fill in the area, and the depth to competent native soil for steel sheeting or deep foundations.

It is understood that some Detroit riverfront areas in Windsor are supported on dock structures. The presence and configuration of such structures will need to be determined during the detailed design phase either by review of as-built drawings (if available) or further field exploration.

All excavations for the outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA



criteria, the fill or firm silty clay or loose to compact silty encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow is expected to be significant, particularly for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.6.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Detroit Street Detroit River outfall. Geotechnical explorations for the outfall should consist of at least 4 soil borings advanced along the outfall alignment (west of Russell Street), extending a minimum of 5 m into the underlying native soils.



5.7 Cameron Avenue Trunk Sewer Upgrade

The construction of 2,700 m of new storm sewers is planned along Tecumseh Road, Curry Avenue, McKay Avenue, and Cameron Avenue to a new outfall at the Detroit River. The proposed new outfall will consist of a 2,400-mm by 3,300-mm box culvert, having a hydraulic invert elevation of 173.2 m and a ground elevation of 176.8 m at the river. The Detroit River 100 Year high water level elevation is 176.15 m. The location of the outfall and adjoining sewer are shown on Figure 8.

5.7.1 Suburface Conditions

Based on our review of the available information, quaternary geology mapping indicates the predominant native soils in the area to consist of glaciolacustrine silty clay. A previous borehole advanced east of the proposed outfall location and north of Riverside Drive encountered a significant thickness of fill material, extending to the maximum boring depth of about 5 m. The encountered fill has been described as silty clay, including wood, brick, concrete, and organic materials. The borehole was observed to be dry upon completion of drilling.

5.7.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed box culvert outfall invert will be about 3.6 m below existing ground elevation at the outfall location and 3 m below the Detroit River 100-year high water level. The bearing resistance/reaction for the box culvert will be dependent on several factors including the soil conditions present and the culvert founding elevations. Based on the available soils information from the nearby borehole, the outfall is expected to be located within fill. The existing fill soils are not considered to be an acceptable founding medium to support the outfall or associated headwall. Consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level, assuming there are suitable underlying silty clay or clayey silt soils to drive the sheet piles into to reduce the inflow of river water into the excavation. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. This approach would also require a cofferdam structure to reach the design invert elevations below the river level. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. In either approach, further geotechnical exploration will be required to evaluate the thickness of fill in the area, and the depth to competent native soil for steel sheeting or deep foundations.

It is understood that some Detroit riverfront areas in Windsor are supported on dock structures. The presence and configuration of such structures will need to be determined during the detailed design phase either by review of as-built drawings (if available) or further field exploration.

All excavations for the outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction,



the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow is expected to be significant, particularly for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.7.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Cameron Avenue Detroit River outfall. Geotechnical explorations for the outfall should consist of at least 2 soil borings advanced along the outfall alignment (north of Riverside Drive), extending a minimum of 5 m into the underlying native soils.



5.8 Bruce Avenue Trunk Sewer

The construction of 2,000 m of new storm sewers are planned along Bruce Avenue to a proposed outlet to the Detroit River. The proposed outfall at the Detroit River will consist of a 3,600-mm diameter pipe, having a hydraulic invert elevation of 171.8 m and a ground elevation of 176.9 m at the river. The Detroit River 100 Year high water level elevation is 176.15 m. The outfall and adjoining sewer location are shown on Figure 9.

5.8.1 Suburface Conditions

Based on our review of the available information, quaternary geology mapping indicates the predominant native soils in the area to consist of glaciolacustrine silty clay. A previous borehole advanced east of the proposed outfall location and north of Riverside Drive encountered a significant thickness of fill material, extending to the maximum boring depth of about 3.9 m. The encountered fill has been described as silty clay, silty sand, with pieces of wood, slag, and refuse debris consisting of concrete pieces and brick fragments. The borehole was terminated due to encountering an obstruction. Groundwater seepage was observed in the borehole at a depth of about 3 m during drilling.

5.8.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed outfall invert will be about 5.1 m below existing ground elevation at the outfall location and 4.4 m below the Detroit River 100-year high water level. Based on the available soils information from the nearby borehole, the outfall may be located within fill. The fill encountered nearby is not considered to be an acceptable founding medium to support the outfall pipe or associated headwall. Consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level, and assumes there are suitable underlying silty clay or clay silt soils to drive the sheet piles into to reduce the inflow of river water into the excavation. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. This approach would also require a cofferdam structure to reach the design invert elevations below the river level. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. In either approach, further geotechnical exploration will be required to evaluate the thickness of fill in the area, and the depth to competent native soil for steel sheeting or deep foundations.

It is understood that some Detroit riverfront areas in Windsor are supported on dock structures. The presence and configuration of such structures will need to be determined during the detailed design phase either by review of as-built drawings (if available) or further field exploration.

All excavations for the outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction,



the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow is expected to be significant, particularly for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.8.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Bruce Avenue Detroit River outfall. Geotechnical explorations for outfall should consist of at least 2 soil borings advanced along the outfall alignment (north of Riverside Drive), extending a minimum of 5 m into the underlying native soils.



5.9 Marentette Avenue Trunk Sewer

The construction of the new Marentette Avenue trunk sewer will include an 1,800-mm diameter outfall at the Detroit River, having a hydraulic invert elevation of 171.9 m and a ground elevation of 176.2 m at the river. The Detroit River 100 Year high water level elevation is 176.15 m. The location of the outfall and adjoining sewer are shown on Figure 10.

5.9.1 Suburface Conditions

Based on our review of the available information, quaternary geology mapping indicates the predominant native soils in the area to consist of glaciolacustrine silty clay. Previous borehole advanced east and west of the proposed outfall location and north of Riverside Drive encountered a significant thickness of fill material, extending to depths of between about 2.1 and 3.2 m. The encountered fill has been described as mixed, consisting of silty clay, sand, clayey silt, cinders, organics, and debris consisting of wood, metal and brick fragments. A layer of silty sand to sand and gravel was encountered under the fill, underlain by an extensive deposit of silty clay to clayey silt in borehole to the west (See Record of Borehole sheets for details). Groundwater seepage was observed in the boreholes at depths ranging between about 1.5 m and 3.1 m during drilling.

5.9.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed outfall invert will be about 4.3 m below existing ground elevation at the outfall location and 4.3 m below the Detroit River 100-year high water level. Based on the available soils information from the nearby boreholes, the outfall is expected to be located within fill or the underlying native silty clay to clayey silt. The existing fill is not considered to be an acceptable founding medium to support the outfall pipe or associated headwall. If fill is present at the outfall founding elevation, consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level, and assumes there is suitable underlying silty clay or clayey silt soils to drive the sheet piles into to reduce the inflow of river water into the excavation. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. This approach would also require a cofferdam structure to reach the design invert elevations below the river level. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. In either approach, further geotechnical exploration will be required to evaluate the thickness of fill in the area, and the depth to competent native soil for steel sheeting or deep foundations.

It is understood that some Detroit riverfront areas in Windsor are supported on dock structures. The presence and configuration of such structures will need to be determined during the detailed design phase either by review of as-built drawings (if available) or further field exploration.

All excavations for the outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill or firm silty clay or loose to compact silty encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based



on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow is expected to be significant, particularly for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.9.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Marentette Avenue Detroit River outfall. Geotechnical explorations for outfall should consist of at least 2 soil borings advanced along the outfall alignment (north of Riverside Drive), extending a minimum of 5 m into the underlying native soils.



5.10 Albert Road Trunk Sewer

The construction of a new 1,650-mm diameter trunk sewer over 350 m length, and replacing the existing 450-mm diameter to 600-mm diameter sewers with new 450-mm and 750-mm diameter sewers over a 190 m length along Wyandotte Street East and includes the construction of a new outfall pipe at Albert Road and the Detroit River. The proposed outfall at the Detroit River will consist of a 1,650-mm diameter pipe, having a hydraulic invert elevation of 173.4 m and a ground elevation of 176.9 m at the river. The Detroit River 100 Year high water level elevation is 176.15 m. The location of the outfall and adjoining sewer are shown on Figure 11.

5.10.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the outfall encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill. One groundwater monitoring well was installed to the east of the outfall location on Riverside Drive and a water level about 2.8 m below ground surface was recorded at the time of reading (see Record of Borehole sheets). Two boreholes in the area encountered groundwater seepage at depths of about 0.8 m and 5.3 m below ground surface. This may indicate a perched groundwater level where surficial granular soils are present overlying the lower permeability cohesive materials. The remaining boreholes in the area were observed to be dry upon completion of drilling.

5.10.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed outfall invert will be about 3.5 m below existing ground elevation at the outfall location and about 2.8 m below the Detroit River 100-year high water level. Based on the available soils information from the nearby boreholes, the outfall is expected to be located within underlying native silty clay; however, due to previous experiences with projects located on the Detroit riverfront, it is expected that fill from previous site uses will be encountered overlying the native silty clay. Any existing uncontrolled fill is not considered to be an acceptable founding medium to support the outfall pipe or associated headwall.

If fill is present at the outfall founding elevation, consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level into underlying silty clay soils to drive the sheet piles into to reduce the inflow of river water into the excavation. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick if present in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. The native silty clay encountered in the boreholes in the project vicinity are considered to be an acceptable founding medium to support the outfall pipe or associated headwall. Any excavations adjacent for the outfall at the river and extending below the river level would require a cofferdam structure to reach the design invert elevations. Further geotechnical exploration will be required to evaluate the thickness of fill in the area, depth to competent native soil for steel sheeting or deep foundations.

It is understood that some Detroit riverfront areas in Windsor are supported on dock structures. The presence and configuration of such structures will need to be determined during the detailed design phase either by review of as-built drawings (if available) or further field exploration.

All excavations for outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations



extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow should be expected and may be significant for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.10.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Albert Road Detroit River outfall. Geotechnical explorations for outfall should consist of at least 2 soil borings advanced along the outfall alignment (north of Riverside Drive), extending a minimum of 5 m into the underlying native soils.



5.11 Drouillard Underpass Pump Station

The construction of a new pump station is proposed within Cadillac Street Park, located north east of the Drouillard Road underpass at Wyandotte Street East and includes the upgrading of 270 m of downstream sewer with 825-mm diameter sewer. It is understood that the new pump station will have a footprint of 20 m by 15 m, a ground elevation of 181.4 m and bottom of wet well elevation of 171.6 m. The pump station location is shown on Figure 11.

5.11.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the pump station encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill. One ground water monitoring well was installed to the north of the pump station on Riverside Drive and a water level about 2.8 m below ground surface was recorded at the time of reading (see Record of Borehole sheets). Two boreholes in the area encountered groundwater seepage at depths of about 0.8 m and 5.3 m below ground surface. This may indicate a perched groundwater level where surficial granular soils are present overlying the lower permeability cohesive materials. The remaining boreholes in the area were observed to be dry upon completion of drilling.

5.11.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pump station will measure about 20 m by 15 m in plan, with a wet well depth of 9.8 m. The soil bearing resistance/reaction for the pump station will be dependant on several factors including the soil conditions present below the pump station and the pump station founding elevation. Based on the available soils information from the nearby boreholes, the pump station base is expected to be located within native silty clay. In general, the native silty clay soils are considered to be an acceptable founding medium to support a pump station. The silty clay material tends to decrease in shear strength with depth, therefore, the soil bearing capacity and base stability of the excavation will need to be confirmed by means of specific geotechnical exploration at the site. It is anticipated that the overburden pressure within the founding soils beneath the pumping station will be reduced by the construction of the station.

In the case of soft clays underlying the base of an excavation where the factor of safety against basal instability is less than 2, substantial deformations may occur and if sheeting is used it should be extended a distance of at least half the excavation width below the base of the excavation or unloading of the soil around the perimeter of the excavation will have to be carried out.

If the excavation is carried out in a closed driven sheeted excavation, no major problems due to groundwater are anticipated. The seepage volumes into the excavation can likely be controlled by means of pumping from conventional filtered sumps located within the base of the excavation.

All open excavations for the pump station should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand or silt encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that



might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

5.11.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Drouillard underpass pump station. Prior to final design, it is recommended that a borehole be advanced at the pump station location, extending to a depth of about 2 times the width of the pump station foundation below the pump station invert. A groundwater level monitoring well should be installed and monitored to evaluate if artesian groundwater conditions exist in underlying soil strata.



5.12 Pontiac Pump Station

A new wet well pump station is proposed to be constructed directly adjacent to the existing Pontiac pump station. The new wet well pump station will have a footprint of 13 m by 8m. The ground elevation is 175.9 m and the elevation of the bottom of wet well will be 168.6 m. The existing pump station is located north of the Little River Pollution Control Plant, as shown on Figure 12.

5.12.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the pump station encountered native soils generally consisting of silty clay/silty clay with sandy silt and sand layers, below surficial organic soils (topsoil) and fill where present. One ground water monitoring well installed east of pump station recorded a water level about 5.1 m below ground surface at the time of reading (see Record of Borehole sheets). Two boreholes recorded water levels at depths of about 5.1 m and 9.5 m upon completion of drilling. The remaining boreholes in the area were observed to be dry upon completion of drilling.

5.12.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the wet well pump station will measure about 13 m by 8 m in plan, with a depth of 7.3 m. The soil bearing resistance/reaction for the pump station will be dependent on several factors including the soil conditions present below the pump station and the pump station founding elevation. Based on the available soils information from the nearby boreholes, the wet well base is expected to be located within native silty clay. In general, the native silty clay soils are considered to be an acceptable founding medium to support a wet well. The silty clay material tends to decrease in shear strength with depth, therefore, the soil bearing capacity and base stability of the excavation will need to be confirmed by means of specific geotechnical exploration at the site. It is anticipated that the overburden pressure within the founding soils beneath the wet well will be reduced by its construction. There is the potential for the base of the wet well to be located within or above a silty sand or sandy silt stratum, and exploration will be required to confirm whether such layers are present, and whether artesian groundwater conditions exist in them.

In the case of soft clays underlying the base of an excavation where the factor of safety against basal instability is less than 2, substantial deformations may occur and if sheeting is used it should be extended a distance of at least half the excavation width below the base of the excavation or unloading of the soil around the perimeter of the excavation will have to be carried out.

In general, temporary excavations into the predominantly silty clay nearby Little River should not encounter significant groundwater inflow, however, it is possible that more permeable sand lenses, hydraulically connected to Little River may be present within the excavation area. It may be advantageous to carry out construction during at a time of the year when the Little River water level is at its lowest. Excavations for the wet well base extending to Little River's water edge will likely require a cofferdam to keep out river water. If the excavation is carried out in a closed driven sheeted excavation, no major problems due to groundwater are anticipated. The seepage volumes into the excavation can likely be controlled by means of pumping from conventional filtered sumps located within the base of the excavation.

All open excavations for the pump station should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand or silt encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be



classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

5.12.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the new wet well at the Pontiac pump station. Prior to final design, it is recommended that a borehole be advanced at the pump station location, extending to a depth of about 2 times the width of the wet well foundation below the wet well invert. A groundwater level monitoring well should be installed and monitored to evaluate if artesian groundwater conditions exist in underlying soil strata.



5.13 St. Rose Pump Station

The proposed new St. Rose pump station is to be located north east of the intersection of St. Rose Avenue and Riverside Drive. The new pump station will have a footprint of 32 m by 21 m. The ground elevation is 176.5 m and bottom of wet well elevation will be 165.0 m. The location of the pump station is shown on Figure 13.

5.13.1 Suburface Conditions

Quaternary geology mapping in the area of the pump station indicates glaciolacustrine silty clay as the predominant soil deposit in the area. The available borehole data in this area is somewhat distant from the pump station location, however, the soil conditions encountered in the boreholes south and south east of the pump station were comprised mainly of silty clay, below surficial topsoil and fill (where present). These boreholes were observed to be dry upon completion of drilling.

5.13.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pump station will measure about 32 m by 21 m in plan, with a wet well depth of 11.5 m. The soil bearing resistance/reaction for the pump station will be dependant on several factors including the soil conditions present below the pump station and the pump station founding elevation. Based on the available soils information from the nearby boreholes, the pump station base is expected to be located within native silty clay. In general, the native silty clay soils are considered to be an acceptable founding medium to support a pump station. The silty clay material tends to decrease in shear strength with depth, therefore, the soil bearing capacity and base stability of the excavation will need to be confirmed by means of specific geotechnical exploration at the site. It is anticipated that the overburden pressure within the founding soils beneath the pump station will be reduced by the construction of the station.

From aerial imaging of the pump station location, it appears that the west and north sides of the site fronting the Detroit river are lined with steel sheeting. Alterations to the site from its natural condition has likely resulted in fill placement, which should be expected to be encountered, the depth and extent of which will need to be explored.

In the case of soft clays underlying the base of an excavation where the factor of safety against basal instability is less than 2, substantial deformations may occur and if sheeting is used it should be extended a distance of at least half the excavation width below the base of the excavation or unloading of the soil around the perimeter of the excavation will have to be carried out.

If the excavation is carried out in a closed driven sheeted excavation into underlying silty clay, no major problems due to groundwater are anticipated. The seepage volumes into the excavation can likely be controlled by means of pumping from conventional filtered sumps located within the base of the excavation.

All open excavations for the pump station should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand or silt encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.



For open excavations below the prevailing river elevation, groundwater inflow from soil layers hydraulically connected to the river should be expected to be significant. Careful planning will be required to control water levels and inflows.

5.13.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the St. Rose pump station. Prior to final design, it is recommended that a borehole be advanced at the pump station location, extending to a depth of about 2 times the width of the pump station foundation below the pump station invert. A groundwater level monitoring well should be installed and monitored to evaluate if artesian groundwater conditions exist in underlying soil strata. Several shallow boreholes should be advanced across the site to explore the possible variation of fill thicknesses across the site.



5.14 St. Paul Pump Station

The proposed expansion of the St. Paul pump station will be located east of the existing pump station building and will include new outlet sewers to the Detroit River from the proposed expansion. The new pump station will have a footprint of 23 m by 13 m. The ground elevation is 176.5 m and the bottom of wet well elevation will be 163.5 m. The location of the pump station is shown on Figure 13.

5.14.1 Suburface Conditions

Quaternary geology mapping in the area of the pump station indicates that glaciolacustrine silty clay is the predominant soil deposit in the area. Available borehole data east of the pump station on the riverfront encountered soils comprised mainly of native silty sand to sand, with underlying clayey silt to silty clay at depth, all below surficial topsoil and fill (where present). Where fully explored by the boreholes, the sand and silty sand deposit extended to depths of between about 11.6 m and 14 m blow ground surface. Ground water levels in the boreholes were observed between 1.2 m and 2.1 m below ground surface upon completion of drilling.

5.14.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pump station will measure about 23 m by 13 m in plan, with a wet well depth of 13 m. The soil bearing resistance/reaction for the pump station will be dependent on several factors including the soil conditions present below the pump station and the pump station founding elevation. Based on the available soils information from the nearby boreholes, the pump station base is expected to be located within native sand or silty clay/clayey silt. In general, the native silty clay soils are considered to be an acceptable founding medium to support a pump station. The silty clay material tends to decrease in shear strength with depth, therefore, the soil bearing capacity and base stability of the excavation will need to be confirmed by means of specific geotechnical exploration at the site. It is anticipated that the overburden pressure within the founding soils beneath the pump station will be reduced by the construction of the station. Founding of the pump station on the underlying sand/silty sand if present at the foundation elevation may be feasible, however precautions will need to be taken to ensure the sand is not disturbed during construction and disturbance due to differential hydraulic head inside and surrounding the excavation.

From aerial imaging of the pump station locations, it appears that the north side of the site fronting the Detroit river are lined with steel sheeting. Alterations to the site from its natural condition has likely resulted in fill placement, which should be expected to be encountered, the depth and extent of which will need to be explored.

In the case of soft clays underlying the base of an excavation where the factor of safety against basal instability is less than 2, substantial deformations may occur and if sheeting is used it should be extended a distance of at least half the excavation width below the base of the excavation or unloading/excavation of the soil around the perimeter of the excavation will have to be carried out.

If the excavation is carried out in a closed driven sheeted excavation into underlying silty clay, it is anticipated that groundwater seepage volumes into the excavation can likely be controlled by means of pumping from conventional filtered sumps located within the base of the excavation.

All open excavations for the pump station should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand or silt encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA



soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

For open excavations below the prevailing river elevation, groundwater inflow from the sand layers hydraulically connected to the river should be expected to be significant. Careful planning will be required to control water levels and inflows.

5.14.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the St. Paul pump station. Prior to final design, it is recommended that a borehole be advanced at the pump station location, extending to a depth of about 2 times the width of the pump station foundation below the pump station invert. A groundwater level monitoring well should be installed and monitored to evaluate if artesian groundwater conditions exist in underlying soil strata. Several shallow boreholes should be advanced across the site to explore the possible variation of fill thicknesses.



5.15 Lakeview Pump Station

The proposed improvements to the Lakeview pump station will include outlet and pump station improvements, including increased pump station capacity by constructing a new pump station adjacent to the existing Lakeview pump station, larger outlet sewers to Lake St. Clair, and new outlet at Blue Heron Pond. The pump station will have a footprint of 8 m by 7 m. The ground elevation is 176.9 m and bottom of wet well elevation will be 167.0 m. The pump station location is shown on Figure 14.

5.15.1 Suburface Conditions

Based on our review of the available information, quaternary geology mapping indicates the predominant native soils in the area to consist of glaciolacustrine silty clay, with modern beach deposits consisting of sand, gravel and cobbles present north of Riverside Drive. Shallow boreholes advanced south west of Blue Heron Pond encountered silty clay below surficial fill. No existing borehole data was available in the vicinity of the new pump station and the Detroit river.

5.15.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pump station will measure about 8 m by 7 m in plan, with a wet well depth of 9.9 m. The soil bearing resistance/reaction for the pump station will be dependent on several factors including the soil conditions present below the pump station and the pump station founding elevation. Based on the limited available soils information, the pump station base is expected to be located within native silty clay. In general, the native silty clay soils are considered to be an acceptable founding medium to support a pump station. The silty clay material tends to decrease in shear strength with depth, therefore, the soil bearing capacity and base stability of the excavation will need to be confirmed by means of specific geotechnical exploration at the site. It is anticipated that the overburden pressure within the founding soils beneath the pump station will be reduced by the construction of the pump station.

In the case of soft clays underlying the base of an excavation where the factor of safety against basal instability is less than 2, substantial deformations may occur and if sheeting is used it should be extended a distance of at least half the excavation width below the base of the excavation or unloading of the soil around the perimeter of the excavation will have to be carried out.

If the excavation is carried out in a closed driven sheeted excavation, no major problems due to groundwater are anticipated. The seepage volumes into the excavation can likely be controlled by means of pumping from conventional filtered sumps located within the base of the excavation. If open cut techniques are used, proactive dewatering may be required if saturated granular layers are present within the silty clay.

All open excavations for the pump station should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay and loose to compact sand or silt encountered in the project area and above the water table would be classified as Type 3 soils. Stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay/clayey silt or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.



5.15.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Lakeview pump station. Prior to final design, it is recommended that a borehole be advanced at the pump station location, extending to a depth of about 2 times the width of the pump station foundation below the pump station invert. A groundwater level monitoring well should be installed and monitored to evaluate if artesian groundwater conditions exist in underlying soil strata.



5.16 Brumpton Park Underground Stormwater Management Facility

The proposed Brumpton Park underground stormwater management facility will consist of a 4,725 m³ capacity facility at the southwest area of Brumpton Park. The proposed tank/chambers will have a footprint of 4,000 m² and a depth of 2.2 m. The stormwater management facility location is shown on Figure 15.

5.16.1 Suburface Conditions

Based on our review of the available information, boreholes previously advanced in the general vicinity of the underground stormwater management facility encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill (where present). In general, boreholes advanced in the area were dry upon completion of drilling, with one borehole having a recorded water level at about 6.4 m depth below ground surface upon completion of drilling.

5.16.2 Discussion on Geotechnical Aspects of Functional Design

It understood that the underground storage facility planned in Brumpton Park will extend to a depth of approximately 2.2 m. The bearing resistance/reaction for the tank/chambers will be dependent on the soil conditions present at the tank/chamber location. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the foundations or base for the proposed stormwater management facility tank/chambers will likely encounter firm to stiff brown or grey silty clay. These soils in their undisturbed state are considered to be an acceptable founding medium to support underground stormwater storage tank/chambers.

All excavations for the underground stormwater management facility should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

5.16.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the underground surcharge storage facility. Geotechnical explorations for underground stormwater management facility should consist of at least 3 soil borings advanced within the stormwater management facility chamber/tank footprint, extending a minimum depth of 3 m below the base elevation.



Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.



5.17 Hawthorne Avenue, Lauzon Parkway, Jefferson Boulevard Offline Storage Volumes

The proposed Hawthorne Avenue, Lauzon Parkway, Jefferson Boulevard Offline Storage Volumes/Improvements include a new stormwater management pond at Little River golf course having 30,000 m³ of storage capacity, surface area of 25,000 m², side slope inclinations of 4 horizontal to 1 vertical, and depth of 4 to 5 m.

The proposed Meadowbrook Park underground surcharge storage will consist of a 10,000 m³ capacity tank. The tank will have a footprint of 2,200 m² and depth of 3.5 m. Road regrading and low impact development (LID) swales are planned for Lauzon Parkway between Cantelon Avenue and Hawthorne Avenue. The pond and storage tank locations are shown on Figure 16.

5.17.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in previously boreholes advanced in the general vicinity of the storage pond encountered native soils generally consisting of silty clay below surficial organic soils (topsoil) and fill (where present). In general, boreholes advanced in the area were dry upon completion of drilling, however in two boreholes, groundwater seepage into the boreholes was encountered to depths of 2.3 m and 4 m below ground surface upon completion of drilling.

5.17.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the pond will be approximately 4 to 5 m in depth, with side slopes having an inclination of 4 horizontal to 1 vertical. Pond side slopes having an inclination of 4 horizontal to 1 vertical are not anticipated to be problematic and can be used for functional design purposes for ponds excavated into the native soils in this area. In areas proposed for equipment access for periodic maintenance, an inclination of 6 horizontal to 1 vertical or flatter should be considered.

Erosion protection should be provided around the perimeter of the surcharge storage pond at the elevation of the normal operating level. The form of erosion protection should match with the requirements of aquatic vegetation to be planted and developed. Consideration could be given to protecting the active water line zone (i.e., from the low-water level to the high-water level) with a minimum 150-mm thick layer of OPSS.PROV 1004 (Aggregates) R-10 rip-rap, constructed in accordance with OPSS 150 (Rip-Rap, Rock Protection); however, this may not be necessary if appropriate vegetation can be established in this zone. The pond slopes above the operating water level should be vegetated as soon as practical after construction to address the potential for erosion due to surface water run-off. Care should be taken to ensure filter compatibility between the native soils and any imported granular materials.

Care should be taken to minimize construction traffic on the base of the pond following excavation and inspection to limit the generation of fines that will go into suspension when the pond is filled. Rip-rap should be provided over the full extent of the side slopes and base below and adjacent to the sewer inlet/outlet locations.

It understood that the storage tank planned in Meadowbrook Park will extend to a depth of approximately 3.5 m. The bearing resistance/reaction for the tank will be dependent on the soil conditions present at tank location. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the foundations or base for the proposed tank will probably encounter stiff to very stiff brown or grey silty clay. These soils in their undisturbed state are considered to be an acceptable founding medium to support the storage tank.



All excavations for the surcharge surface storage pond and storage tank should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

Based on the subsurface conditions anticipated for the project area, headwalls associated with stormwater management ponds may be founded on the native soils at a minimum depth of 1.2 m below finished grade. The geotechnical resistance/reaction used for the design of headwall foundations should be confirmed in the detailed design phase.

5.17.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the surcharge surface storage pond. Geotechnical explorations for the pond should consist of a minimum of 6 soil boring carried out within the stormwater pond footprint, extending a minimum of 1.5 m below the pond bottom elevation.

Geotechnical explorations for underground storage tank in Meadowbrook Park should consist of at least 2 soil borings advanced within the tank footprint, extending a minimum of 3 m below the tank base elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.



5.18 Wyandotte Street East Off-Line Storage

The two proposed underground surcharge storage tanks on Wyandotte Street East, west of Little River have capacities of 8,000 m³ and 3,000 m³ and surface areas of 5,400 m² and 1,400 m², respectively, and depths of about 3 m. The locations of the storage tanks are shown on Figure 17.

5.18.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in previously boreholes advanced in the general vicinity of the proposed underground surcharge storage tanks encountered native soils generally consisting of silty clay, below surficial organic soils (topsoil) and fill (where present). The available boreholes advanced within the area were dry upon completion of drilling.

5.18.2 Discussion on Geotechnical Aspects of Functional Design

It understood that the storage tanks planned for Wyandotte Street East will extend to a depth of approximately 3 m. The bearing resistance/reaction for the tanks will be dependent on the soil conditions present at the tank locations. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the foundations or base for the proposed tanks will probably encounter stiff to very stiff grey silty clay. These soils in their undisturbed state are considered to be an acceptable founding medium to support the storage chambers.

All excavations for the storage tanks should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

5.18.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the underground surcharge storage tanks. Geotechnical explorations for underground storage chamber in should consist of at least 2 soil borings advanced within each of the tank footprints, extending a minimum of 3 m below the tank base elevation.



5.19 Roseville Garden Drive and Hawthorne Avenue/Kew Drive Underground Stormwater Detention System

The proposed Roseville Garden Drive and Hawthorn Avenue/Kew Drive underground surcharge storage will consist of a 28,000 m³ tank. The tank will have a footprint of 21,850 m² and depth of 5 m and open bottomed storage chambers to permit infiltration. The location of the storage tank is shown on Figure 18.

5.19.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the proposed underground surcharge storage tank encountered native soils generally consisting of silty clay, below surficial organic soils (topsoil) and fill (where present). The available boreholes advanced within the area were dry upon completion of drilling.

5.19.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the storage chamber planned for Roseville Garden Drive and Hawthorn Avenue/Kew Drive will extend to a depth of approximately 5 m. The bearing resistance/reaction for the chamber will be dependent on the soil conditions present at the chamber location. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the foundations or base for the proposed chamber will probably encounter stiff to very stiff grey silty clay. These soils in their undisturbed state are considered to be an acceptable founding medium to support the storage chambers. Based on the anticipated cohesive nature of the soils at and below the tank/chamber base elevation, infiltration rates would be very low.

All excavations for the storage chamber should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to very stiff silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills or native sands or silt overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

5.19.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the underground surcharge storage tank. Geotechnical explorations for underground storage chamber in should consist of at least 6 soil borings advanced within the chamber footprint, extending a minimum of 3 m below the chamber base elevation.



5.20 Ypres Avenue Underground Stormwater Storage System

The proposed Ypres Avenue underground surcharge storage system will have a storage capacity of 3,000 m³ under the existing Optimist Memorial Park parking lot. The proposed storage system will have a footprint of 3,360 m² and a depth of about 3 m. The storage system location is shown on Figure 19.

5.20.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in boreholes previously advanced in the general vicinity of the proposed underground surcharge storage tank encountered native soils generally consisting of silty clay, with occasional sand layers, below surficial organic soils (topsoil) and fill (where present). In general, boreholes advanced in the area were dry upon completion of drilling; however, in two boreholes, groundwater seepage into the boreholes was encountered to depths of 2.3 m and 4 m below ground surface upon completion of drilling. Many of the boreholes advanced within the area encountered groundwater seepage. Where encountered, water levels recorded in boreholes upon completion of drilling and in installed monitoring wells ranged between about 0.3 m and 0.6 m below ground surface (see Record of Borehole sheets for details).

5.20.2 Discussion on Geotechnical Aspects of Functional Design

It understood that the storage chambers planned in the Optimist Memorial Park parking lot will extend to a depth of approximately 3 m. The bearing resistance/reaction for the tank/chambers will be dependant on the soil conditions present at chamber location. Based on the general soil conditions encountered from previous geotechnical explorations in the area, it is anticipated that the excavations for the foundations or base for the proposed tank/chambers will probably encounter very stiff to hard brown silty. These soils in their undisturbed state are considered to be an acceptable founding medium to support the storage chambers. Based on the anticipated cohesive nature of the soils at and below the tank/chamber base elevation, infiltration rates would be very low.

All excavations for the storage system should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, the fill, topsoil, and any firm silty clay encountered in the project area and above the water table would be classified as Type 3 soils. The stiff to hard silty clay would be classified as a Type 2 soil. Any soft to very soft silty clay or silty sand, sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. Water inflows due to perched groundwater within surficial granular fills overlying the less permeable cohesive materials should be expected. It is anticipated that an experienced contractor should be able to handle the anticipated seepage volumes by pumping from properly constructed and filtered sumps within the excavation. Care should be taken to direct all surface water away from the excavations.

5.20.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing



program should be carried out for the underground stormwater storage chamber. Geotechnical explorations for the underground storage chamber should consist of at least 3 soil borings advanced within the chamber footprint, extending a minimum of 3 m below the chamber base elevation.

Following the completion of the exploration and testing program, the recommendations in this report may be revised based on the new information.



5.21 Prince Road Outlet at Chappelle/Sandwich Street

The proposed Prince Road outlet at Chappelle/Sandwich Street will consist of approximately 200 m of new storm sewer including the construction of a new outfall pipe to McKee Creek. The proposed outfall at McKee Creek will consist of a 2,700-mm diameter pipe, having a hydraulic invert elevation of 172.1 m and a ground elevation of 176.6 m at the river. The Detroit River 100-year high water level elevation is 176.15 m. The location of the outfall and adjoining sewer are shown on Figure 20.

5.21.1 Suburface Conditions

Based on our review of the available information, the subsurface soils encountered in previously boreholes advanced in the general vicinity of the outfall encountered native soils generally consisting of silty clay/clayey silt below surficial sand, organic soils (topsoil) and fill (where present). One borehole encountered seepage at a depth of about 1.5 m (see Record of Borehole sheets). The remaining boreholes in the area were observed to be dry upon completion of drilling.

5.21.2 Discussion on Geotechnical Aspects of Functional Design

It is understood that the proposed outfall invert will be about 4.5 m below existing ground elevation at the outfall location and about 4.1 m below the Detroit River 100-year high water level. Based on the available soils information from the nearby boreholes, the outfall is expected to be located within underlying native silty clay/clayey silt, however, due to previous experiences with projects located on the Detroit Riverfront it is expected that fill from previous site uses will be encountered overlying the native silty clay. Any existing uncontrolled fill is not considered to be an acceptable founding medium to support the outfall pipe or associated headwall.

If fill is present at the outfall founding elevation, consideration could be given to excavating existing uncontrolled fill materials from underneath the outfall, and backfilling with engineered fill. This approach would require an excavation to be carried out in braced sheeting, extending below the river level into underlying silty clay soils to drive the sheet piles into to reduce the inflow of river water into the excavation. The driving of sheeting through the existing fill may be difficult due to the presence of concrete rubble or other deleterious materials such as wood and brick if present in the fill. An alternative to the removal of the existing fill material would be to support the outfall pipe and associated structures on a grade beam type foundation, supported on deep foundations. The deep foundations could consist of relatively small diameter caissons or helical piles extending into underlying competent native soils. Similarly, deleterious materials encountered in the existing fill may require additional effort to advance helical piles and caissons through the fill. The native silty clay encountered in the boreholes in the project vicinity are considered to be an acceptable founding medium to support the outfall pipe or associated headwall. Any excavations for the outfall at the river and extending below the river level would require a cofferdam structure to reach the design invert elevations. Further geotechnical exploration will be required to evaluate the thickness of fill in the area, depth to competent native soil for steel sheeting or deep foundations.

All excavations for the outfall should be carried out in accordance with the current OHSA criteria. The OHSA regulations governing excavation support and maximum side wall slope inclinations apply only to excavations extending to depths of greater than 1.2 m below the adjacent ground surface. In general, under the OHSA criteria, fill, topsoil, and any to firm silty clay/clayey and loose to compact sand encountered in the project area and above the water table would be classified as Type 3 soils. Any soft to very soft silty clay/clayey silt or silty sand, and silt layers below the water table would be classified as Type 4 soils. In all cases, the OHSA soil type categories are based on generalized ground behaviour conditions with respect to the need for worker protection and compliance with the Act. Further, layered soil types or construction staging of excavations can



change the OHSA categorization that might apply. During construction, the exposed ground should be observed by experienced geotechnical personnel to confirm the OHSA classification that will apply.

Based on the available borehole information and site location, groundwater inflow is expected to be nominal from the fine-grained silty clay materials. However, water inflows due to perched groundwater or within surficial sands overlying the less permeable cohesive materials should be expected. Inflows from sand layers hydraulically connected to the river should be expected to be significant, particularly for excavations near the river and extending below the prevailing river water level. Careful planning will be required to control water levels and inflows.

5.21.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the Prince Road McKee Creek outfall. Geotechnical explorations for the outfall should consist of at least 2 soil borings advanced along the outfall alignment (west of Russel Street), extending a minimum of 5 m into the underlying native soils.



5.22 Earth Berm Along Riverside Drive Between Ford Boulevard and East City Limits

The proposed landform barrier along Riverside Drive would extend between Ford Boulevard and the east City limits. The objective of constructing the landform barrier is to reduce the potential for inland flooding due to coastal high water levels. The preferred solution is to construct the landform barrier crest to elevation 176.5 m. Existing property grading that meets or exceeds the target elevation were utilized to limit the required berm construction. Areas not meeting the target elevation will require new landform barriers to be constructed and localized improvements/grade alterations for areas of trail and road crossings. The general areas along Riverside Drive between Ford Boulevard and the east City limits are shown on Figures 21A to 21D.

5.22.1 Suburface Conditions

Based on our review of the available information, quaternary geology mapping indicates the predominant native soils in the area to consist of either glaciolacustrine silty clay or modern beach deposits consisting of sand, gravel and cobbles present north of Riverside Drive. In the area shown on Figure 21A, some of the glaciolacustrine silty clay deposits are indicated by geological mapping to be overlain by thin discontinuous sand and gravel deposits.

The subsurface soils encountered in previously boreholes advanced along the proposed land barrier length generally encountered native soils consisting of silty clay underlying organic soils (topsoil) and fill (where present). In some areas of Riverside Drive, sand to silty sand of varying thickness was encountered over the silty clay.

5.22.2 Discussion on Geotechnical Aspects of Functional Design

The proposed landform barrier is intended to use the existing Ganatchio trail and landform features meeting the target elevation to reduce the potential for inland flooding. The landform barrier being proposed will fill in gaps to create a nearly continuous barrier along the project length. In constructing the new landform barrier, existing topsoil and deleterious fill materials should be removed prior to soil placement for the embankment construction.

To optimize containment of water on the river side of the barrier, the new landform barrier should be constructed of silty clay/clayey silt free of organics. Where underlying silty clay material is present, the embankment soils should be keyed into the underlying materials. In areas where significant thicknesses of underlying sand are present, this approach may not be practical due to required depth of excavation to reach underlying silty clay. The landform barrier could also be constructed with other materials such as sand or granular fill; however, in this case, seepage through the barrier should be expected if it is containing flood waters on one side. More seepage should be expected the more permeable the landform barrier material is. During placement, the materials for the landform barrier should be placed in maximum loose lift thicknesses of 300 mm and uniformly compacted to at least 98 per cent standard Prcotor maximum dry density.

5.22.3 Recommended Geotechnical Explorations for Detailed Design Phase

Continued geotechnical involvement is required during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out for the landform barrier. Geotechnical explorations should consist of relatively shallow boreholes approximately 1.5 m deep and spaced along the berm length to explore existing fill and topsoil thicknesses, and the presence of underlying native sand or silty clay.



5.23 Low Impact Development Measures

It is understood that low impact development (LID) measures such as exfiltration trenches are being considered for various project locations. The suitability of the soils at the various site locations to provide drainage for exfiltration trenches is dependent on several soil properties, including the soil gradation, density, clay percentage, mineralogy of clay portion, plasticity characteristics of the soil and organic content. For functional design purposes, the following table provides approximate coefficients of permeability and percolocation time ranges for the typical soils encountered at the project locations.

Table 1: Approximate Relationship of Permeability and Percolation Time by Soil Type¹

Soil Type (Unified Soil Classification System)	Coefficient of Permeability, K – cm/sec	Percolation Time, T – mins/cm	
SW – Well graded sands, gravelly sands little or no fines	10 ⁻¹ – 10 ⁻⁴	10-4 2-12	
SP – Poorly graded sands, gravelly sand, little or no fines	10 ⁻¹ – 10 ⁻³	2-8	
SM - Silty sands, sand-silt mixtures	10 ⁻³ – 10 ⁻⁵	8-20	
ML – Inorganic silts and very fine sands, rock flour, silty or clayey fine snads, clayey silts with slight plasticity	10 ⁻⁵ – 10 ⁻⁶	20-50	
CL – Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	10 ⁻⁶ and less	Over 50	

The predominantly silty clay soils encountered at the project locations will have very low permeabilities. Where encountered, sands will have a relatively medium permeability, with silty sands having a medium to low permeability and may be suitable depending on the required exfiltration rates. The suitability of soils for exfiltration trenches will need to be evaluated on a site-by-site basis.

Geotechnical involvement is required to evaluate the actual permeability of the soils present at each site and at the proposed depth of the LIDs during the design and construction stages of this project. As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out to evaluate the permeability of the soils. Methods to evaluate soil permeability can include grain size analyses and Atterberg limits tests on samples of the site soils, laboratory permeability of a relatively undisturbed samples (Shelby tube samples) of the soil, or in situ percolation or permeability testing. In situ testing is recommended.

5.24 Environmental Contamination Considerations

Ontario Regulation (O.Reg.) 406/19 (which comes into effect January 1, 2021), will govern the management of excess soils that are anticipated to be generated during construction activities associated with the above-

¹ From 2012 Ontario Building Code Compendium, Volume 2, SB-6.



discussed projects. Specifically, O.Reg. 406/19 imposes new requirements on both generators and receivers of excess soil, outlines a defined process for assessing excess soil, and provides new standards for the assessment of excess soil quality (including specific considerations for the management of excess soils and sediments from stormwater ponds).

Central to O.Reg. 406/19, and the accompanying "Soil Rules", are prescribed planning and reporting requirements. Although many types of projects are exempt from certain regulatory requirements, proper characterization and documentation is still recommended, and in many cases, are ultimately required by O.Reg. 406/19. The sampling requirements (frequency and analytical parameters) and reporting requirements for the above-noted project sites will ultimately depend on a number of factors, including (but not necessarily limited to) the volume of excess soil (or sediment) to be removed from the site, the specific requirements of the intended receiver of the soil (the "Re-Use Site"), and on the results of the initial site characterization activities.

Understanding of Site Conditions

During the construction of the above-discussed projects, there is the possibility of encountering contaminants as a result of historical site use or placement of fill materials on the sites. Specific contaminants of concern may be identified through understanding the origin(s) of the fill (or sediment) material in consideration, and historical operations on and near the site where the fill was placed (or sediment has accumulated) (i.e., through completion of "Phase I Environmental Site Assessment" or "Assessment of Past Uses").

With respect to the above-discussed projects, we understand that there is a potential for these project sites to be situated near existing railways and/or in locations where foundry sand fill is likely to be encountered during constuction.

Typical contaminants of concern associated with general **rail activity** (rail corridors) include heavy metals and polycyclic aromatic hydrocarbons (PAHs) associated with rail ballast, as well as petroleum hydrocarbons associated with the use of diesel fuel. Additional contaminants of concern for areas where engine or rail car maintenance has been carried out include volatile organic compounds (VOCs) (i.e., related to solvent use).

Contaminants of concern associated with **foundry sand** vary, depending on the source of the foundry sand. Typical contaminants of concern for foundry sand include heavy metals and petroleum hydrocarbons. Where foundry sand has been re-used as fill material, and mixed in with other fill materials, there is also the potential for other contaminants (associated with general industrial activities at the originating property) to be present (e.g., VOCs, PAHs).

With respect to **storm water managment (SWM) ponds**, O.Reg. 406/19 sets out minimum sampling and analysis requirements based on the likelihood for various contaminants to be present (petroleum hydrocarbons, PAHs, metals and other inorganics). Due to the physical properties of SWM pond sediment (primarily high-water content silts and clays, potentially with significant organic content), beneficial reuse opportunities may be limited even if the material meets the applicable soil quality standards. O.Reg. 406/19, and the accompanying Soil Rules, outline specific requirements relating to dewatering or solidifying liquid soils (i.e., including, but not limited to, sediment).



6.0 CLOSURE

As the functional design progresses to the detailed design phase, a site-specific geotechnical exploration and testing program should be carried out to address design aspects relating to each of the proposed structures discussed in this report. Following the completion of the exploration and testing program, the comments provided in this report may be revised based on the new information.

The factual data, interpretation and recommendations presented in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location or elevation, or if the project is not initiated within eighteen months of the date of the report, Golder Associates Ltd. should be given an opportunity to confirm that the recommendations are still valid. The subject geotechnical assessment and this report address only the geotechnical aspects of the proposed project. Potential environmental impacts or related issues are beyond the defined scope of the work and have not been addressed.

We trust that this report provides the preliminary geotechnical information currently required. Should any point require further clarification, please contact this office.



Signature Page

Golder Associates Ltd.



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https://golderassociates.sharepoint.com/sites/122185/project files/6 deliverables/rev0/20138323-r01-rev0 aug 7 2020 (final) geo review dillon cow master sewer plan.docx



IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Ground Water Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

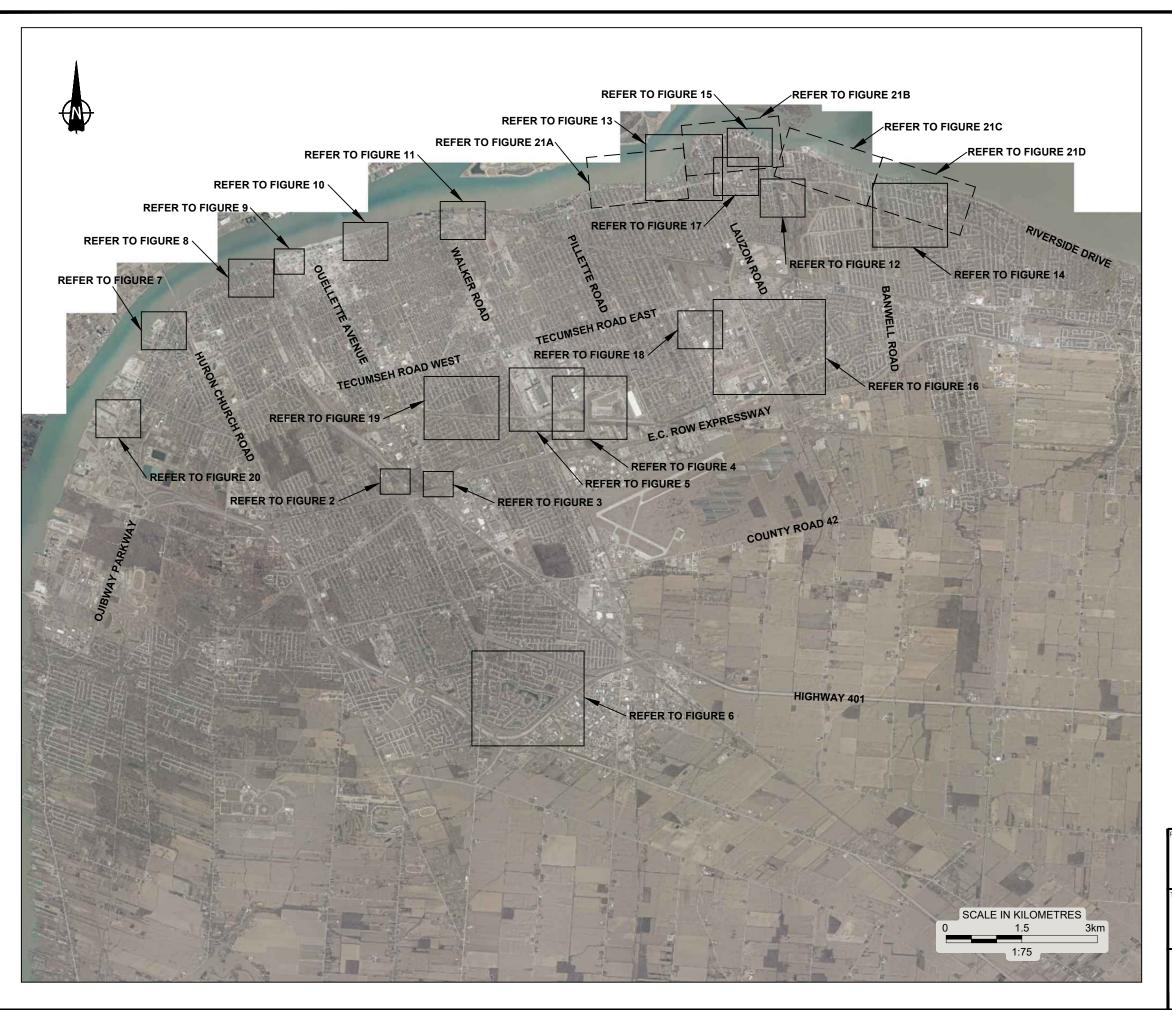
During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.



Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.





REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

TITLE

LOCATION PLAN

	PROJECT	ΓNo.	20138323	FILE No	. 201383	323-R0100
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GOLDER	CADD	ZJB	May 19/20			
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PROPOSED SURCHARGE STORAGE POND OUTLINE

BOREHOLE PREVIOUS GOLDER REPORT:





QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay

REFERENCE

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MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

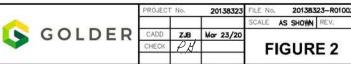
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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

DOUGALL UNDERPASS NEW SURCHARGE SURFACE STORAGE POND





PROPOSED SURCHARGE STORAGE POND OUTLINE

BOREHOLE PREVIOUS GOLDER REPORT:



-0- 021-4035

QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay

REFERENCE

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GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

HOWARD AT E.C. ROW NEW SURCHARGE SURFACE STORAGE POND



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			SCALE	AS SHOWN	REV.	
ADD	ZJB	Mar 23/20				
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PROPOSED SURCHARGE STORAGE POND OUTLINE

EXISTING STORM RETENTION POND

BOREHOLE PREVIOUS GOLDER REPORT:

09-1140-W011



791-4012

1405768

QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay

REFERENCE

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MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

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GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

CENTRAL AVENUE, PILLETTE ROAD EXPANDED CENTRAL POND



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	3254		ZJB Mar 23/20	SCALE AS ZJB Mor 23/20	ZJB Mor 23/20	SCALE AS SHOWN REV.



PROPOSED UNDERGROUND SURCHARGE STORAGE TANK

BOREHOLE PREVIOUS GOLDER REPORT:





08-1140-W028-R01



-0- 041-140048

QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay

REFERENCE

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MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

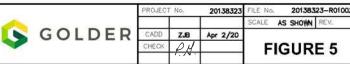
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GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

CHRYSLER CENTER NEW UNDERGROUND SURCHARGE STORAGE





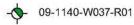
PROPOSED SURCHARGE STORAGE POND OUTLINE

EXISTING STORM RETENTION POND

WATER WELL AS LISTED IN MECP RECORDS

BOREHOLE PREVIOUS GOLDER REPORT:





QUATERNARY GEOLOGY



REFERENCE

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MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING; AND WATER WELLS AS LISTED IN MECP RECORDS AS OF DECEMBER 2019.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

SOUTHWOOD LAKES LOWERED NORMAL WATER LEVEL IN EXISTING PONDS

ILE No. 20138323-R0100

FIGURE 6





PROPOSED NEW OR UPGRADED STORM SEWER

PROPOSED NEW STORM SEWER OUTFALL

BOREHOLE PREVIOUS GOLDER REPORT:

1660023-3000-R01

1520407-2000-R03

-Ø- 11-1140-0200-R01

TEST PIT PREVIOUS GOLDER REPORT:

031-145072

QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay

REFERENCE

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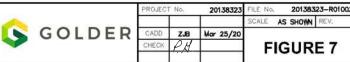
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GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

DETROIT STREET TRUNK SEWER UPGRADE

FIGURE 7





PROPOSED NEW OR UPGRADED STORM SEWER

PROPOSED NEW STORM SEWER OUTFALL

BOREHOLE PREVIOUS GOLDER REPORT:



QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay

REFERENCE

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MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

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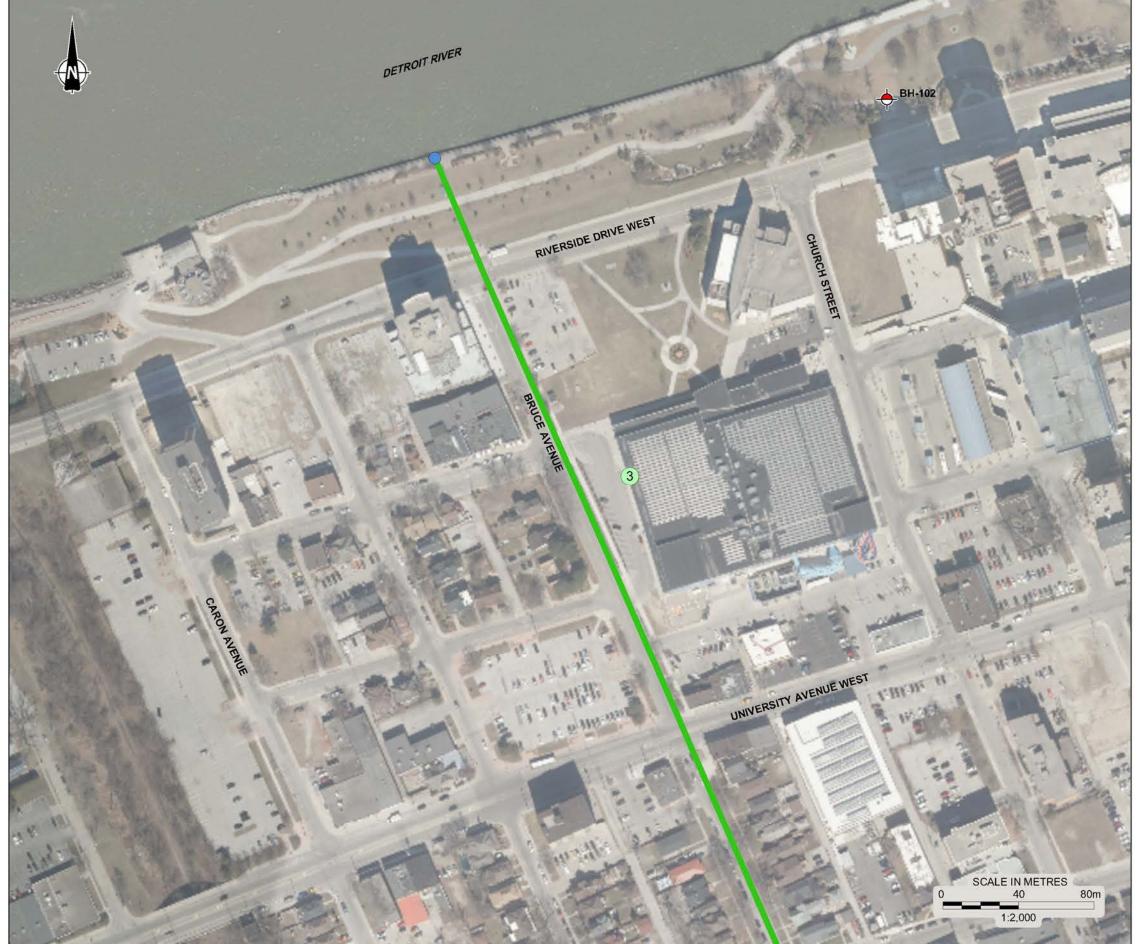
ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

CAMERON AVENUE TRUNK SEWER UPGRADE



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FIGURE		P.H.	ECK





PROPOSED NEW OR UPGRADED STORM SEWER

PROPOSED NEW STORM SEWER OUTFALL

BOREHOLE PREVIOUS GOLDER REPORT:



QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay

REFERENCE

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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

BRUCE AVENUE TRUNK SEWER



ILE No. 20138323-R0100 SCALE AS SHOWN REV. FIGURE 9

PROPOSED NEW OR UPGRADED STORM SEWER

PROPOSED NEW STORM SEWER OUTFALL

BOREHOLE PREVIOUS GOLDER REPORT:

10-1140-0090-1000-L02

-6- 001-4009

QUATERNARY GEOLOGY

3 Glaciolacustrine Silty Clay

REFERENCE

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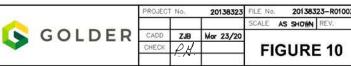
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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

MARENTETTE AVENUE TRUNK SEWER





PROPOSED NEW OR UPGRADED STORM SEWER

PROPOSED NEW STORM SEWER OUTFALL

DROUILLARD UNDERPASS PUMP STATION

BOREHOLE PREVIOUS GOLDER REPORT:

06-1140-006

011-4205

- 011-4136

QUATERNARY GEOLOGY

(3) Glaciolacustrine Silty Clay

REFERENCE

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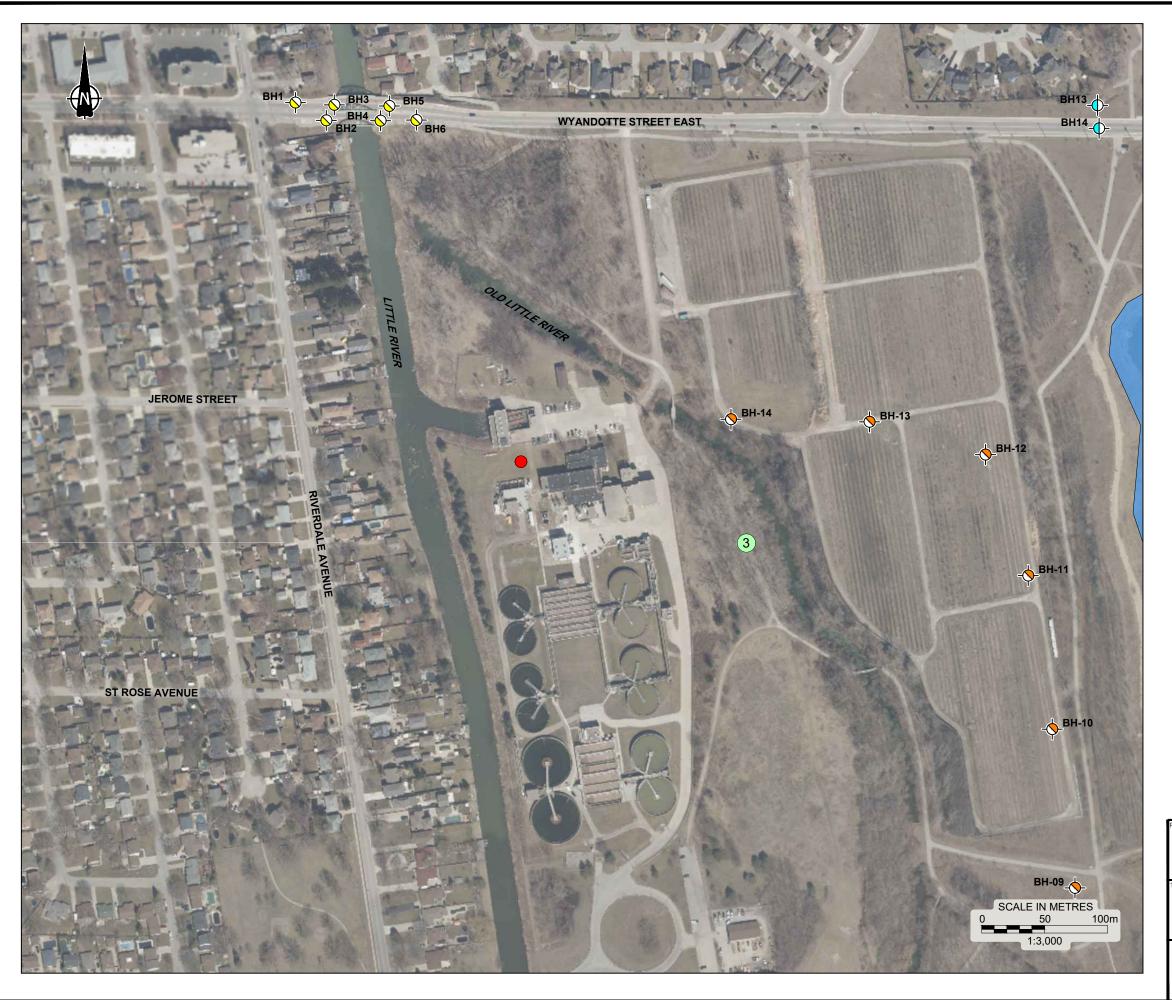
ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

ALBERT ROAD TRUNK SEWER AND DROUILLARD UNDERPASS PUMP STATION

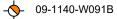
FIGURE 11





PONTIAC PUMP STATION

BOREHOLE PREVIOUS GOLDER REPORT:





-031-140333

QUATERNARY GEOLOGY



(3) Glaciolacustrine Silty Clay

REFERENCE

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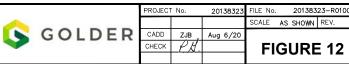
NOTES

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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

PONTIAC PUMP STATION





ST. ROSE PUMP STATION

ST. PAUL PUMP STATION

BOREHOLE PREVIOUS GOLDER REPORT:

- 1400977-R01

- 13-1140-0026-R01

-011-4128

QUATERNARY GEOLOGY

Glaciolacustrine Silty Clay:

3c. Glaciolacustrine: silty clay deposits overlain by thin, discontinuous sand and gravel deposits

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;

MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

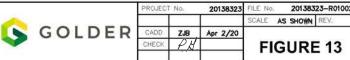
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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

ST. ROSE AND ST. PAUL PUMP STATIONS



LAKEVIEW PUMP STATION

PROPOSED NEW OR UPGRADED STORM SEWER

EXISTING STORM RETENTION POND

BOREHOLE PREVIOUS GOLDER REPORT:



-**(**)- 1405019-R01

QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay



7 Modern Beach Deposits: sand, gravel and cobbles

REFERENCE

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MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

LAKEVIEW PUMPING STATION CAPACITY INCREASE



TILE No. 20138323-R0100 SCALE AS SHOWN REV. CADD ZJB, Apr 2/20 FIGURE 14





PROPOSED UNDERGROUND STORMWATER MANAGEMENT FACILITY

BOREHOLE PREVIOUS GOLDER REPORT:



-()- 13-1140-0031-R01



-001-4014

QUATERNARY GEOLOGY



(3) Glaciolacustrine Silty Clay

REFERENCE

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MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

BRUMPTON PARK UNDERGROUND STORMWATER MANAGEMENT FACILITY



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PROPOSED SURCHARGE STORAGE POND OUTLINE



BOREHOLE PREVIOUS GOLDER REPORT:



031-140094



QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay

REFERENCE

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NOTES

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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

HAWTHORNE AVENUE, LAUZON PARKWAY, JEFFERSON BOULEVARD OFFLINE STORAGE VOLUMES/IMPROVEMENTS



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CK	PH		FIGURE 16
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PROPOSED UNDERGROUND SURCHARGE STORAGE TANK

BOREHOLE PREVIOUS GOLDER REPORT:



1406552-R01



-O- 13-1140-0031-R01



-**O**- 011-4276

QUATERNARY GEOLOGY



Glaciolacustrine Silty Clay

REFERENCE

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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

WYANDOTTE STREET EAST, WEST OF LITTLE RIVER, OFFLINE STORAGE



TILE No. 20138323-R0100 CADD ZJB Apr 2/20 FIGURE 17

PROPOSED UNDERGROUND SURCHARGE STORAGE TANK

BOREHOLE PREVIOUS GOLDER REPORT:



-**(**)- 1527635-1000-R01

06-1140-020

QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay

REFERENCE

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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

ROSEVILLE GARDEN DRIVE AND HAWTHORNE AVENUE/KEW DRIVE UNDERGROUND STORMWATER DETENTION SYSTEM



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PROPOSED UNDERGROUND SURCHARGE STORAGE TANK

BOREHOLE PREVIOUS GOLDER REPORT:



_**(**)- 08-1140-W054





QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;

MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

YPRES AVENUE UNDERGROUND STORMWATER STORAGE SYSTEM

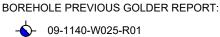


OJECT	ΓNo.	20138323	FILE No. 20138323-R01002
			SCALE AS SHOWN REV.
ADD	ZJB	May 19/20	
HECK	PH		FIGURE 19



PROPOSED NEW OR UPGRADED STORM SEWER

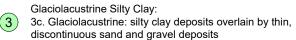
PROPOSED NEW STORM SEWER OUTFALL





764111

QUATERNARY GEOLOGY



Lacustrine Beach, Bar and near shore deposits: sand with minor gravel



Cultural Features: quarries, landfills, mine waste, aggregate excavations and sewage lagoons

REFERENCE

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ALL LOCATIONS ARE APPROXIMATE.

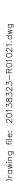
GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

PRINCE ROAD OUTLET AT CHAPPELLE/SANDWICH STREET



FIGURE 20

FILE No. 20138323-R010







ST. ROSE PUMP STATION



PROPOSED BERM ALIGNMENT BOREHOLE PREVIOUS GOLDER REPORT:



07-1140-0098



011-4128 71509



QUATERNARY GEOLOGY





Glaciolacustrine Silty Clay: 3c. Glaciolacustrine: silty clay deposits overlain by thin, discontinuous sand and gravel deposits

REFERENCE

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GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

PROPOSED EARTH BERM ALONG RIVERSIDE DRIVE (FORD BOULEVARD TO EAST CITY LIMITS) (1 OF 4)

FIGURE 21A





ST. PAUL PUMP STATION

PROPOSED UNDERGROUND STORMWATER MANAGEMENT FACILITY



PROPOSED BERM ALIGNMENT

BOREHOLE PREVIOUS GOLDER REPORT:



400977-R01



13-1140-0031-R01



QUATERNARY GEOLOGY



(3) Glaciolacustrine Silty Clay

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;

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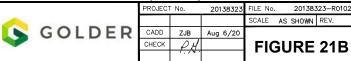
NOTES

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ALL LOCATIONS ARE APPROXIMATE.

GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

PROPOSED EARTH BERM ALONG RIVERSIDE DRIVE (FORD BOULEVARD TO EAST CITY LIMITS) (2 OF 4)





PROPOSED BERM ALIGNMENT

BOREHOLE PREVIOUS GOLDER REPORT:



09-1140-W028-R01



07-1140-0027



001-4247



QUATERNARY GEOLOGY



3 Glaciolacustrine Silty Clay



Modern Beach Deposits: sand, gravel and cobbles

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;

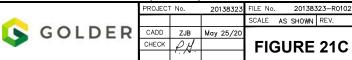
MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

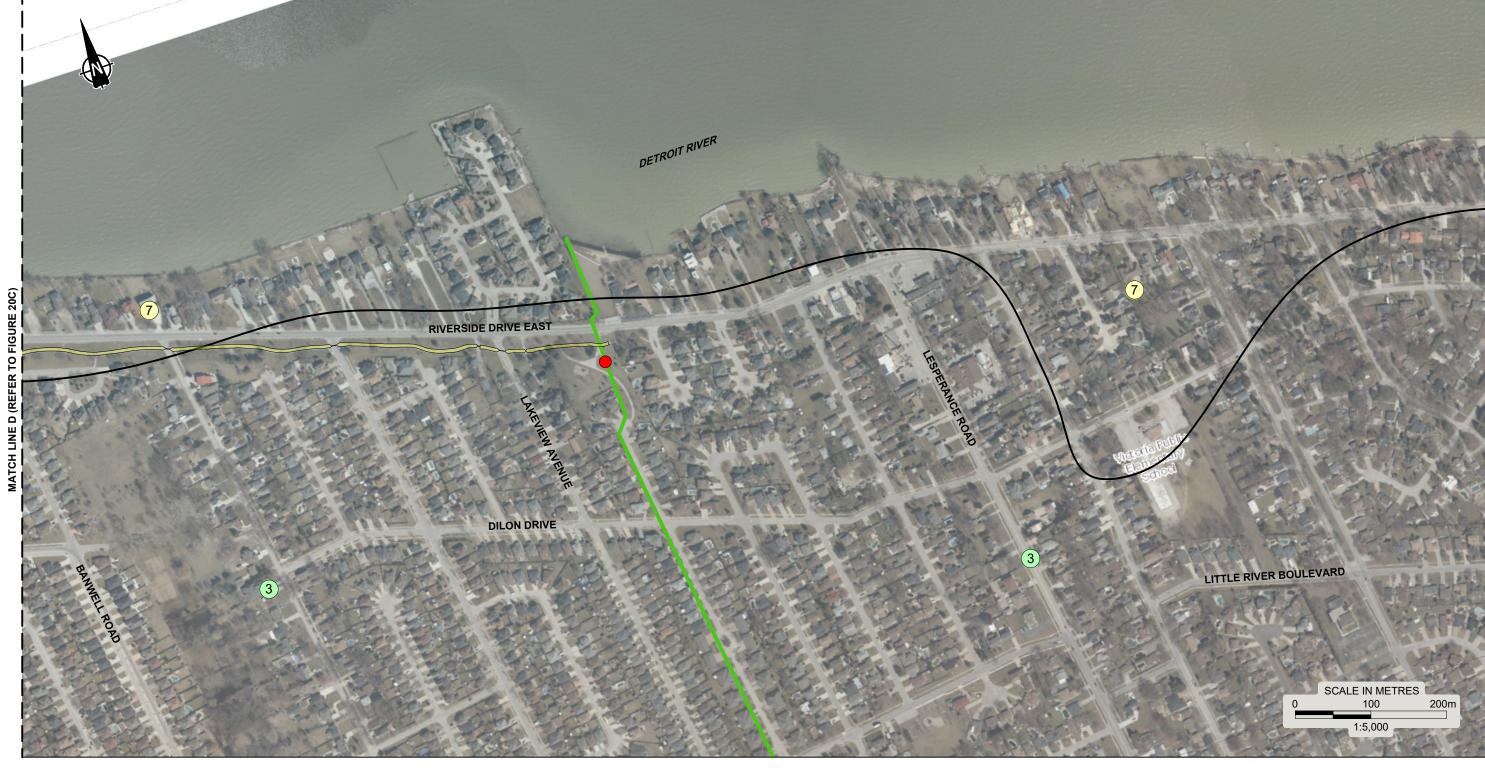
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GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

PROPOSED EARTH BERM ALONG RIVERSIDE DRIVE (FORD BOULEVARD TO EAST CITY LIMITS) (3 OF 4)





EXISTING PUMP STATION PROPOSED NEW OR UPGRADED STORM SEWER PROPOSED BERM ALIGNMENT

QUATERNARY GEOLOGY



(3) Glaciolacustrine Silty Clay



7 Modern Beach Deposits: sand, gravel and cobbles

REFERENCE

DRAWING BASED ON 2019 AERIAL IMAGE PROVIDED BY THE COUNTY OF ESSEX INTERACTIVE WEB MAPPING SITE, BY PERMISSION;

MINISTRY OF NORTHERN DEVELOPMENT AND MINES, MAP P.3253, QUATERNARY GEOLOGY, ESSEX COUNTY AREA (WEST HALF) SOUTHERN ONTARIO, 1994; AND DATA PROVIDED BY DILLON CONSULTING.

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GEOTECHNICAL REVIEW OF SELECTED SITES CITY OF WINDSOR SEWER MASTER PLAN WINDSOR, ONTARIO

PROPOSED EARTH BERM ALONG RIVERSIDE DRIVE (FORD BOULEVARD TO EAST CITY LIMITS) (4 OF 4)



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June 2020 20138323-R01-RevB

APPENDIX A

Previous Records of Boreholes and Test Pits by Golder Associates Ltd.

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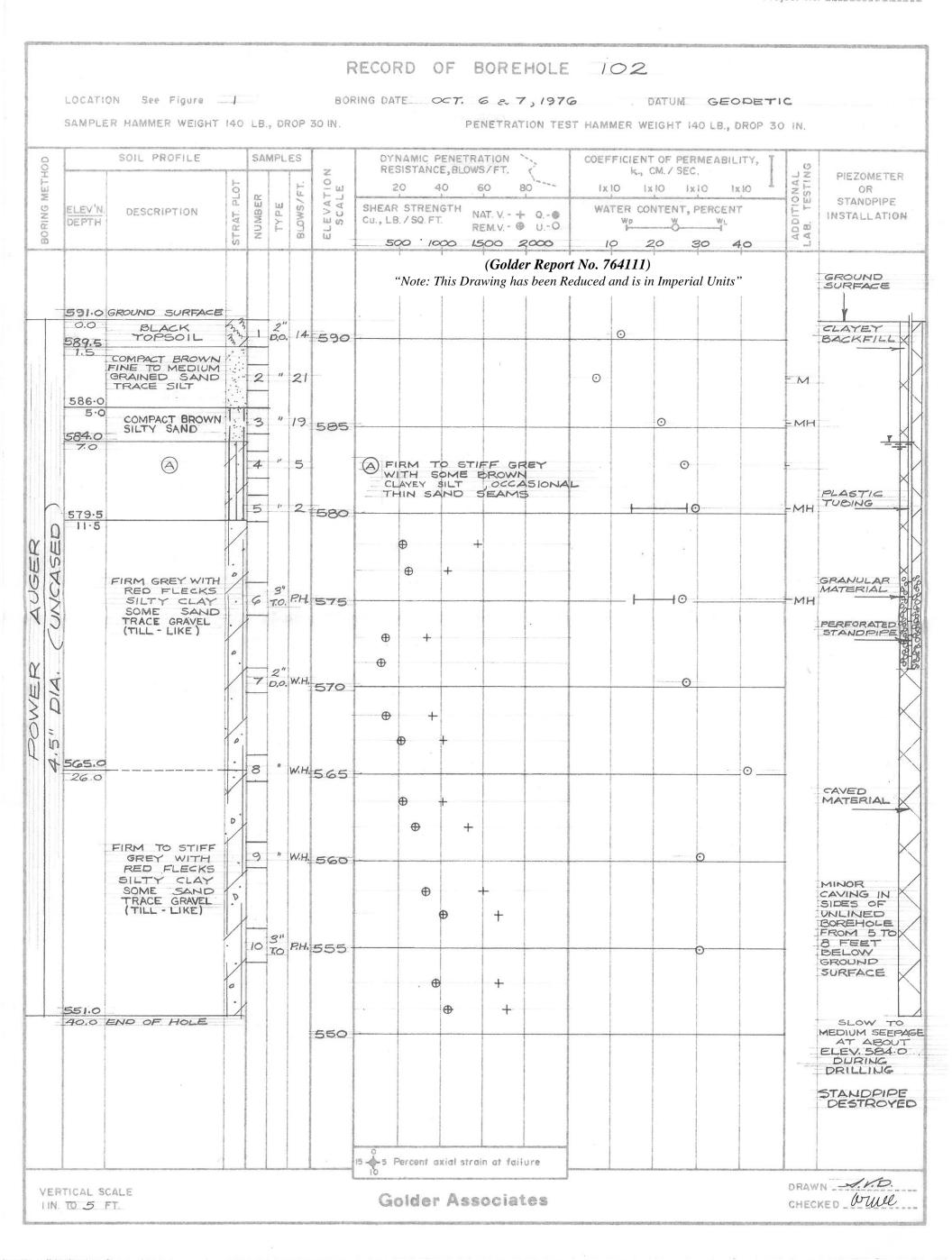
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								0 15 4 5 F	Percent a	xial stra	in at fai	lure					,		
	TICAL S							Go	lder	Asso	ociat	es	J					DRAWN	KED B

RECORD OF BOREHOLE BORING DATE FEB. 15,1971 LOCATION See Figure DATUM. GEODETIC PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN. SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. SOIL PROFILE SAMPLES DYNAMIC PENETRATION COEFFICIENT OF PERMEABILITY, LEVATION SCALE TIONAL TESTING RESISTANCE, BLOWS/FT. K., CM./SEC. PIEZOMETER 60 80---1x10 IxIO IxIO BLOWS/FT. OR NUMBER STANDPIPE SHEAR STRENGTH ELEV'N. DEPTH WATER CONTENT, PERCENT DESCRIPTION NAT. V. - + Q.-● REM.V.- ⊕ U.-O INSTALLATION ADDI LAB. Cu., LB./SQ.FT. 500 1000 1500 2000 (Golder Report No. 71509) 577.0 CIZÓUNO LEVEL "Note: This Drawing has been Reduced and is in Imperial Units" EN CRIEF 575 2 0.019 572.0 5.0 ... 14 0 570 3 8 11.0 4 52 0 +1 ()TEN1) 5 11 34 0 560.5 100.4 -MH -0-11 1 11 クログ 555 7 50 Pn 0.0 FIRM TO STIFF CLAY, SOME SALID, STA CTILL-LIKE) 80.0. Ŋ \oplus +545 9 8 540 10 6 \oplus 530 12 " 6 0 is s Percent axial strain at failure DRAWN V.J.K. VERTICAL SCALE Golder Associates CHECKED _____ IIN. TO 5 FT.

BORING METHOD	деней найтеля оснужения станорей сосновност. В повыте натератил вет настепным у энектеп	ELEV'N. DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	NUMBER	MPL	BLOWS/FT. 0	SCALE	RESIS 20 SHEAR S Cu., LB. /	TRENCE SQ.FT.	RI RI OO IE	AT. V 4 EM.V 6 (Gold	ou0 der Repo	wat ort No. 2	ER CON 2	M. / SE IO I ITENT,		0	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
OWER AUGE	4.5. CIA. CONCASED	580.5 3.5 576.0 8.0	STIFF TO VERY STIFF GREY TO BROWN SILTY CLAY TRACE SAND STIFF GREY WITH RED FLECKS SILTY CLAY SOME SAND TRACE GRAVEL (TILL-LIKE)	The same same same same same same same sam	2	1	20 G P.H.	585 575 575		→	+		2560+		•	•	•			GROUND SURFACE CLAYET BACKFILL PLASTIC TUBING GRANULAR MATERIAL PERFORATEIO STANDPIPE STANDPIPE OF UNLINED BOREHOLE STABLE DURIN DRILLING OF DRILLING OCTOBER 5, 197 STANDPIPE DESTROYED



		ON SEE SIGURE . I		_B ,	OROP	BOR	ECORD OF BOREHOLE 703 ING DATE OCT. 5,7976 DATUM GEODET PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 3		
BORRIS METHOD	ELEV'M ORPTH	SON PROFILE DESCRIPTION	1074	ir	BLDWS/FT.	ELEVATION SCALE	COEFFICIENT OF PERMEABILITY, L., CM./SEC. 20 40 60 80 IXIO IXIO IXIO IXIO IXIO SHEAR STRENGTH NAT.V. + Q. 8 CU., LB./SO.FT. REM.V. 90 U-0 500 1500 2000 ISD 2000 IO 20 30 40 (Golder Report No. 764111) Note: This drawing has been reduced and is in Imperials units.	ADDITIONAL LAB TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
Z.5" DIA, HOLLOW STEM	574.0 2.0 2.0 10.0 14.5	WERY LOOSE GREY TO BLACK SILTY SAND TRACE CLAY AND ORGANICS VERY LOOSE GREY FINE TO MEDIUM GRANED SAND TRACE TO SOME SILT FIRM GREY WITH RED FLECKS SILTY GLAY SOME SAND TRACE FINE GRAVEL (TILL-LIKE)		2 3 4 5 6 7	" 3		A COMPACT BROWN AND GREY STONE, ASH, CINCER AND TOPSOIL FILL MATERIALS	MH	WATER LEVEL AT ELEVATION 571-0 ON COMPLETION OF DRILLING OCTOBER 5,1977
	TICAL S						Golder Associates	DRAW	KED WWILL

NOT TO SCALE

RECORD OF BOREHOLE 3

LOCATION See Figure |

BORING DATE FEB. 12, 1979

DATUM GEODETIC

SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN.

PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN.

RESISTANCE, BLOWS/FT.	o T		SOIL PROFILE		SAI	MPL	PLES	T	DYNAMIC PENETRATION COEFFICIENT OF PERMEABILITY, T	
GO.9 ICE SURFACE GIO GO.9 ICE SURFACE GO.9 ICE SURFACE GO.9 ICE GO.9 I	METHO			LOT	\vdash	T	\top	Z	RESISTANCE, BLOWS/FT. K., CM./SEC.	OR
GO.9 ICE SURFACE GO.9	BORING	ELEV'N. DEPTH	DESCRIPTION	STRAT. F	NUMBE	TYPE	TYPE BLOWS/	ELEVA	SHEAR STRENGTH NAT. V + Q WATER CONTENT, PERCENT Cu., LB./SQ.FT. REM.V & U O 500 1000 1500 2000 10 20 30 40	INSTALLATION
580-	4.5" O.D. SOLID STEMS O	609.9 1.0 603.9 7.0	VERY STIFF TO HARD BROWN SILTY-CLAY SOME SAND OCC. GRAVEL OCC. OXIDIZED FISSURES (TILL-LIKE) HARD TO VERY STIFF GREY SILTY-CLAY SOME SAND OCC. GRAVEL OCC. FISSURES AT ELEVATION 602.5 FEET (TILL-LIKE)		3 4 5 6 7 8 9 .	2"DO.	" 22 " 24 " 19 " 16 " 17	600 595 595	(Golder Report No. 791-4012) "Note: This Drawing has been Reduced and is in Imperial Units"	BOREHOLE DRY DURING DRILLING FEB, 12, 1979.

VERTICAL SCALE IIN. TO 5 FT.

Golder Associates

DRAWN L. BORTOLUSSI
CHECKED JHM

RECORD OF BOREHOLE 4

LOCATION See Figure I

BORING DATE FEB. 12, 1979.

DATUM GEODETIC

9		SOIL PROFILE	_	ŞAI	MPLE	Z	DYNAMIC PENETRATION COEFFICIENT OF PERMEABILITY, TRESISTANCE, BLOWS/FT. K., CM./SEC.	PIEZOMETER
BORING METHOD	ELEV'N. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FT. ELEVATION SCALE	20 40 60 80 IXIO IXIO IXIO IXIO IXIO IXIO IXIO I	OR STANDPIPE INSTALLATION
	6I0.5 609.6 0.9	ICE SURFACE ICE VERY STIFF TO HARD BROWN SILTY-CLAY SOME SAND OCC. GRAVEL OCC. OXIDIZED FISSURES (TILL-LIKE) HARD TO STIFF GREY SILTY-CLAY SOME SAND OCC. GRAVEL (TILL-LIKE)	STRAI		2" 000.	610 26 40 605 36 39 600 36 24 595 21 590 18	(Golder Report No. 791-4012) "Note: This Drawing has been Reduced and is in Imperial Units" o -X 14 p.c	PLASTIC TUBING
	574.0	END OF BOREHOLE		13	" 2	580 7 9		GRAVEL FILTER STANDPIPE
	36.5	END OF BOREHOLE				570		BOREHOLE DRY DURING DRILLIN FEB. 12, 1979. WATER LEVEL IN STANDPIPE AT ELEVATION 606.7 FEET FEB. 19, 1979.

IIN. TO 5 FT.

Golder Associates

CHECKED PM

RECORD OF BOREHOLE 5,687 LOCATION See Figure 1 BORING DATE FEB. 13, 1979 DATUM GEODETIC PENETRATION TEST HAMMER WEIGHT 140 LB., DROP 30 IN. SAMPLER HAMMER WEIGHT 140 LB., DROP 30 IN. SOIL PROFILE SAMPLES DYNAMIC PENETRATION COEFFICIENT OF PERMEABILITY, BORING METHOD ADDITIONAL LAB. TESTING K., CM./SEC. EVATION SCALE RESISTANCE, BLOWS/FT. PIEZOMETER 80---STRAT. PLOT IXIO IxIO 1x10 OR BLOWS/FT. NUMBER STANDPIPE ELEV'N DEPTH SHEAR STRENGTH WATER CONTENT, PERCENT DESCRIPTION INSTALLATION NAT. V. - + Q.-Cu., LB./SQ.FT. REM.V.- ⊕ U.-O 1500 2000 10 30 40 500 1000 20 BOREHOLE 5 (Golder Report No. 791-4012) 615 "Note: This Drawing has been Reduced and is in Imperial Units" GROUND SURFACE 613.0 BLACK CLAYEY TOPSOIL SOLID STEMS 611.5 AUGER STIFF MOTTLED BROWN AND GREY SILTY-CLAY SOME SAND OCC. GRAVEL (TILL-LIKE) 2" DO 1.5 0 9 BOREHOLE DRY DURING DRILLING FEB. 13, 1979. 2 610 HARD BROWN SILTY-CLAY SOME SAND OCC. GRAVEL OCC. OXIDIZED FISSURES (TILL-LIKE) 2 12 4.5 " O.D. 608.0 5.0 0 3 36 606.5 END OF BOREHOLE 6.5 605 615 BOREHOLE 6 GROUND SURFACE 611.3 BLACK CLAYEY TOPSOIL 0.0 PLASTIC TUBING-610.3 STEMS 610 . 1.0 VERY STIFF MOTTLED BROWN AND GREY SILTY-CLAY SOME SAND OCC. GRAVEL (TILL-LIKE) 2" DO. 15 AUGER CLAY BACKFILL 0 SOLID 2 17 POWER HARD BROWN SILTY-CLAY SOME SAND OCC. GRAVEL OCC. OXIDIZED FISSURES (TILL-LIKE) 0 3 23 605 0.D GRAVEL FILTER 604.3 7.0 4.5 11 0 4 48 STANDPIPE BOREHOLE DRY DURING DRILLING FEB. 13, 1979. BOREHOLE DRY ON FEB. 19, 1979. 9.0 END OF BOREHOLE 600. BOREHOLE 7 615 BLACK CLAYEY TOPSOIL 612.9 GROUND SURFACE 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 912.9 91 2" DO. VERY STIFF TO HARD MOTTLED BROWN AND GREY SILTY-CLAY SOME SAND OCC. GRAVEL (TILL-LIKE) 18 AUGER \mathbf{u} 0 2 16 610 BOREHOLE DRY DURING DRILLING FEB. 13, 1979 HARD BROWN SILTY-CLAY SOME SAND OCC. GRAVEL OCC. OXIDIZED FISSURES (TILL-LIKE) 3 40 9 POWER 4 57 0 606.4 6.5 END OF BOREHOLE 605-♦ 5 Percent axial strain at failure DRAWN L. BORTOLUSSI VERTICAL SCALE Golder Associates CHECKED MM IIN. TO 5 FT.

RECORD OF BOREHOLE

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 25, 2000

1

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

ALE S		T F S	SOIL PROFILE		r	SA	MPI	LES	Z	DYN. RESI	AMIC PEN STANCE,	BLOW	ION S/0.3m	1	HYDR	AULIC C k, cm/s	ONDUC	TIVITY,	T	۾ ٿ	INSTALLATION
DEPTH SCALE METRES		BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION		AR STRE	NGTH	nat V. + rem V. €	80 + Q - • • U - O	w w	ATER C	ONTEN	PERCE	10 ⁻³ — ENT WI 40	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		\Box	GROUND SURFACE		177.56			Г	(C)	1140	20 4	1	60 No. 4	001	1	1		1	40	†	
			Black clayey topsoil (FILL)	₩	0.09	1	AS		(Ga	nae. •	r к ер	ori .	. vo. (001-4	1009 _. 1	,	þ	İ			
			Compact granular (FILL)	₩	177.17 0.40	ı									٠	1	0				
1			Stiff to very stiff brown silty clay, mixed with topsoil, some sand and gravel (FILL)			2	1		177							0					:
	POWER AUGER	SOLID STEM	Compact black fine to medium sand, mixed with slag and cinders (FILL)		176.34 1.22	4	50 DO										0				
2	Юd	S	Firm brown silty clay, some sand, occ. gravel mixed with occ. topsoil pockets (FILL)		175.73 1.83 175.28	5	50 DO	7								o ^c					<u>.</u> Water seepage
			Loose brown clayey silt, occ. pockets and lenses of sand (FILL)		2.29 174.82	6	50 DO	6	175	-	-					0					encountered into borehole at elevation 175.8 m. during drillir on January 25, 2000
3			Firm grey silty clay, some sand, layers of organic material (FILL) END OF BOREHOLE		2.74 174.36 3.20		50 DO	6										0			
6																					
9																					
10		-																			,,,,
DEF			CALE						(Go Asso	lder	toc								LOGGED: R.W.V

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 25, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

	Γ		SOIL PROFILE			٥,	MPL	E6		DYNA	MIC PENE	TRATI	ION		HYDR	AULIC C	ONDUC	TIVITY		_	I
CALE		ETHO	OUE! NOTICE	15		5	I		NO NO		MIC PENE TANCE, BI			_ \	1	k, cm/s			. I	₹ NG NG	INSTALLATION
DEPTH SCALE METRES		BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION	SHEA Cu, kF		HT	nat V. + rem V. ⊕		w	/ATER C	ONTEN	PERCE	WI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
- 0			GROUND SURFACE		177.03				(C_0)		Repo		,	01 1			0	30 4	40		
·			Compact granular (FILL)	\bowtie	176.85	1	AS		(00	uer	керо	I L T	νυ. υ	U1-4	<i>009)</i> 1	. '	b		†	1	
			Very stiff brown silty clay, some sand, trace of gravel (FILL)	▓	0.18 176.45	_										0	ł				
			Dense black slag and cinders (FILL)	₩	0.58 176.12	2	50 DO	33													
1			Compact brown fine to medium sand (FILL)	₩	0.91 175.81	3	50 DO	10	176							0				-	
	UGER	TEM			1.22											0					
	POWER AUGER	SOLID STEM	Stiff brown to grey SILTY CLAY, some sand, trace of gravel with pockets and	₩		4	50 DO	8								0					
2	ž	ľ	lenses of sand (FILL)	₩		5	50 DO	9	175				ļ					ļ	<u> </u>		•
			Very stiff grey SILTY CLAY, with occ. partings of black organic silt and peat	₩	174.74 2.29																
			partings of black organic silt and peat (FILL)	×	174.44 2.59	6	50 DO	62								0	0				- <u>₹</u> -
3			Dense brown medium to coarse SAND and GRAVEL	\$0°0°	173,83	7	50 DO	34	174							0		1			Water seepage encountered into
			END OF BOREHOLE		3.20																borehole at elevation 174.4 m. during drilling on January 25, 2000
		-																			on building 25, 2000
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DEPTH SCALE

1:50

LDN_BHS 001-4009.GPJ GLDR_CAN.GDT 2/21/00 DATA INPUT: Tony Mastrolanni



LOGGED: R.W.W.

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 25, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

S		Ŧ 1		F	I	Т	T	П	Ž			BLOWS					ONDUC			48	INSTALLATION
METRES		BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION	SHEA Cu, kF	R STREM	I IGTH	nat V. + rem V. €	80 - Q - • 9 U - O	w w	ATER (ONTENT OW	PERCE	WI	ADDITIONAL LAB. TESTING	AND GROUNDWATEI OBSERVATIONS
0	Ľ	口	GROUND SURFACE	Ė	177.11				(C_{α})		Rono	ort A	60 E	80 01-40		1		30 4	40		
•			Compact granular (FILL)	₩	176.96 0.15		AS		(<i>301</i> 1	ut <i>i .</i> I	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	1	<i>u. u</i> t	υ ⊥-4 (<i>ルプ)</i> I		1	-	-		
			Brown SILTY CLAY, some sand, trace of gravel (FILL)	₩		L										0					
	ŀ		J	₩	176.50 0.61	2	50 DO	32									0				
1		Н	Dense to compact black slag and			L	100			l		İ									
Ì			cinders (FILL)	₩	175.89	3	50 DO	10	176			<u> </u>	 				0		<u> </u>		
	JGER	Ē	Compact brown fine to medium sand, \trace of slag (FILL)	₩	175.74 1.37	<u> </u>										0					
	ER AL	SOLID STEM				4	50 DO	7									0				
	POW	ဖွ	Firm brown to grey silty clay, some sand, trace of gravel with pockets and lenses			_							i								
2			trace of gravel with pockets and lenses of black peat (FILL)	₩		5	50 DO	6	175	-	ļ		 	ļ		ļ	0		ļ		
				₩													0				
				₩	174.46 2.65	6	80	27	:							ļ	Ĭ				7
3			Compact brown SILTY SAND, and		2.00	7	50	27													-₹
٦	_	Ц	gravel		173.91		DO	1	174				-		0		-		ļ		Water seepage encountered into
			END OF BOREHOLE		3.20								}								borehole at elevation 174.4 m. during drillir
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1:50

Golder Associates

LOGGED: R.W.W. CHECKED:

RECORD OF BOREHOLE 4

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 25, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

YLE ,		E POP	SOIL PROFILE	1.	T	S/	MPI	.ES	z	DYNA RESIS	MIC PER	NETRATI BLOWS	ON 5/0.3m	\	HYDR	AULIC C k, cm/s	ONDUC	TIVITY,	T	٦̈́٥	INSTALLATION
DEPTH SCALE METRES		BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION	SHEA Cu, kF	R STRE	NGTH	nat V. + rem V. €	80 + Q - • • U - O	w	/ATER C	ONTEN	T PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0			GROUND SURFACE	Ť	177.29	Τ	T	10	7 .1 .1	- D	20	40 • N Io	60	4000		Ĭ		1	Ĭ		
U		П	Compact granular (FILL)		0.00 177.02		1		_	r Ke	port	1 VO.	UUI	-4009)	b					
			Stiff brown silty clay, some sand, trace of gravel (FILL.)		0.27				177								0				•
1			Dense to compact black slag and cinders (FILL)		176.53 0.76	Г	-	33							c						
	UGER	TEM	Compact brown fine to medium sand (FILL)	▓	176.07 175.92 1.37		50 DO		176			ļ				8					
2	POWERA	SOLID STEM	Stiff to firm to stiff brown to grey SILTY CLAY, some sand, trace of gravel, pockets and lenses of sand and peat (FILL)				50 DO 50 DO	5	175							0	0				
3			Compact brown SILTY SAND, and gravel		174.55 2.74 174.09	7	50 DO	19							(<u> </u>
	Γ		END OF BOREHOLE	1	3.20		1		ŀ												Water seepage
5																					
8																					
10																					-
DE:			CALE								G	older ocia	• •								LOGGED: RANGE

RECORD OF BOREHOLE 5

BORING DATE: January 28, 2000

SHEET 1 OF 1

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No. No.	' II.o	IIVIIY, -	RAULIC CONDUCTI k, cm/s	""	Į	TION VS/0.3m	, BLOW	STANCE	RES		.ES	SAMP	Ľ			SOIL PROFILE	L	Ş	7
CROUND SUPFACE 177.00	RCENT GROUNDWAT OBSERVATIO	T PERCENT	10° 10° 10° WATER CONTENT I	ļ .	Q - O	nat VI rem V. 6	40 NGTH	20 R STRE		ELEVATION		TYPE	AH IMBED	DEPTH	STRATA PLOT	DESCRIPTION		PODING MET	METRES
Black clayery logool (Fill 1	40	30 40		000				_	ldo	(Co	H	+	+	177.90	٣	GROUND SURFACE	+	Τ	_
firm to slift proving ally clay, some sand unit of specific provided with clayer (opsoid for the specific provided with clayer (opsoid for the specific provided with clayer (opsoid for the specific provided with clayer (opsoid for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided for the specific provided			. 1 1	UUY		1 10. 0	ori .	кер	ıaeı	(Go			-	1	₩				U
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Sand - (Table grapher (Filt) 1985 5 5 5 5 5 5 5 5 5			0									4	4	1.28 176.16			OLID STEM	WER AUGER	
Firm to stiff brown SILTY CLAY, some sand and gravel mixed with occ. organic pockets (FILL) Very dense brown SILTY SAND and gravel T174,70 END OF BOREHOLE T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,70 T174,7		<u> </u>	90	ļ				-	┝	176		١,,		1.74 175.95	₩	Compact brown to black fine to coarse sand, trace gravel (FILL)		ğ	2
Very dense brown SILTY SAND and gravel END OF BOREHOLE TO SAD TO SO SAD TO SO SAD TO SO SAD TO SO SAD TO SO SAD TO SO SAD TO SO SAD Water encour encour boreho 175.2 r on Jan To SO SAD Water encour encour boreho 175.2 r on Jan To SO SAD To SO SAD To SO SAD Water encour encour encour boreho 175.2 r on Jan To SO SAD To SO SAD Water encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour encour en												-	6	175.16		Firm to stiff brown SILTY CLAY, some sand and gravel mixed with occ. organic pockets (FILL)			
END OF BOREHOLE 3.20 4 5 6 7 7	Water seepage		 							175	53	50 DO	7			Very dense brown SILTY SAND and gravel	,		3
	175.2 m. during dri																		8 8

DEPTH SCALE

1:50

DN_BHS 001-4009.GPJ GLDR_CAN.GDT 2/21/00 DATA INPUT: Tony Mastroianni

LOGGED: B.W.W. CHECKED:

RECORD OF BOREHOLE 6

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

_																					JP, 19305mm
	2	D D	SOIL PROFILE		_	ŞA	MPL	ES	z	DYNA RESIS	MIC PEN TANCE,	ETRATI BLOWS	ON 5/0.3m)	HYDR	AULIC C k, cm/s	ONDUC	TIVITY,	T	۵۲	INSTALLATION
METRES	DOBING METHOD	BORING ME	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION	SHEA Cu, kF	R STREM	IGTH	60 8 nat V. + rem V. ⊕		w w	ATER C	ONTENT OW	PERCE	WI	ADDITIONAL LAB. TESTING	GROUNDWATER OBSERVATIONS
o			GROUND SURFACE		178.67				(Go				lo. 00			<u>U</u>		304	10	\vdash	
۱			Brown clayey topsoil (FILL) Brown silty clay, some sand and gravel	₩	178.43	1]		(0 01	ıucı	ı	<i>) </i>	1		1		0				
			(FILL) Compact granular (FILL)	▩	0.24 178.21	1	AS								0		_				
			Compact grandial (FICE)	₩	0.46		50		170												
ł	İ			₩		2	50 DO	10	178			l				0				ĺ	
1				₩			50														
١	æ		Stiff to very stiff brown silty clay, some sand and gravel mixed with black clayey topsoil (FILL)	₩		3	50 DO	11					}			0					
١	AUG	SOLID STEM	topsoil (FILL)	₩			50					İ				_					
ı	WER	OLD SOLD		₩		4	50 DO	10	177							0		<u> </u>			
2	۲			₩	176.60	5	50 DO	20								0					
			Compact black slag and cinders (FILL)	₩	176.60 2.07 176.38	n	DO	30								0					
			Compact brown SILTY SAND, and		2.29	6	50 DO	13								0		İ			
			gravel		176.02 2.65	Ľ	DO	٠.5	176							0		ļ	_		<u>.</u>
3	ı		Stiff brown SILTY CLAY, some sand, trace of gravel with pockets and lenses			7	50 DO	10								0					
		Ц	of sand	\mathbb{Z}	175.47		DO									Ŭ					Water seepage encountered into
ı		١	END OF BOREHOLE		3.20																borehole at elevation 175.9 m. during drillir
-																					on January 28, 2000
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DEPTH SCALE

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LDN_BHS 001-4009.GPJ GLDR_CAN.GDT 2/21/00 DATA INPUT: Tony Mastrolanni

Golder

LOGGED: R-W.W.

RECORD OF BOREHOLE 7

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: January 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

ALE S	9		SOIL PROFILE	T =	r	S/	MPL	ES.	z	DY RE	(NAMIC PEN ESISTANCE,		ION 5/0.3m	\			ONDUC	TIVITY,	T	NG.P.	INSTALLATION
DEPTH SCALE METRES		BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION	SH Cu	HEAR STREI	NGTH	nat V. + rem V. €	- 1	V	/ATER C	IO ⁻⁵ 1 CONTENT	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
	Ľ	_	CDOUND CHDEACE	S.		┞	+		<u> </u>	╀	20 4	10 T	60	80 I		10 :	20 3	30 ·	40	_	
0	-	op	GROUND SURFACE Brown clayey topsoil (FILL)	Jesse Jesse	177.61 0.06	\vdash	1			dei	r Repo	rt N	o. 00	1-400	<i>09</i>)	_					
			Stiff to very stiff brown silty clay, some sand and gravel mixed with topsoil (FILL)			2	AS 50 DO		177	_							0				
1	AUGER	STEM	Dense to compact black slag and cinders (FILL)		176.54 1.07 176.24	3	50 DO	47								0					:
	POWER.	SOLID	Compact brown fine to medium sand, occ. gravel (FILL)	\bowtie	1.37 175.93	4	50 DO	14	176				<u> </u>			0	<u> </u>		<u> </u>		
2	PC		Firm brown sitty clay, some sand and gravel with pockets of topsoil, pieces of wood, metal and clay brick (FILL)		1.68	5	50 DO	6								0					
3			Compact brown SILTY SAND, and	₩	174.71 2.90	7	50 DO	ĺ	175								0				- <u>₹</u> -
			gravel END OF BOREHOLE AT REFUSAL TO AUGER		174.41 3.20																Water seepage encountered into borehole at elevation 174.9 m. during drillin
5																					
9																					
DEF			CALE	ٺــا		l			(Go	lder	tos	<u>i </u>				<u> </u>].		LOGGED: R.W.V

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JANUARY 27, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

ای			SOIL PROFILE	1-	1	S/	AMP		z	NAMIC PENETRATION SISTANCE, BLOWS/0.3m HYDRAULIC COND k, cm/s	UCTIVITY, T 29 INSTALLATION
METRES	CONTAIN ONIGO	BORING ME	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	kPa rem V. ⊕ U - O Wp I	10 ⁴ 10 ³ 10 ⁵ ROUNDWATER ENT PERCENT GROUNDWATER DW W W V
0			PAVMENT SURFACE	Ë	100.16		T			20 40 60 80 10 20 (Golder Report No. 001-4014)	30 40
			ASPHALT Brown silty clay, some sand and gravel (FILL)		99.70 0.46	\vdash			100		0
1			Black mould sand, some grey silty clay (FILL)		98.64	2		42		0	
2			Black organic silty clay (FILL)		1.52 98.03	3	AS	10	98		0
3			Stiff mottled brown and grey SILTY CLAY, some sand, occ. gravel (TILL)		2.13	4		7	97	0	Borehole dry during drilling on January 27 2000
4	POWER AUGER	HOLLOW STEM			96.35 3.81	6	AS	25	96	0	
5			Very stiff to hard brown SILTY CLAY, some sand, occ. gravel (TILL)	4		7	AS	44	95	0	
6					94.06 6.10	8		18	94	0	
7			Very stiff to stiff grey SILTY CLAY, some sand, occ. gravel (TILL)			9	50 DO	9		⊕ +	
			Sanu, occ. gravel (TILL)	6		10	50 DO	8	93	⊕ + +	0
8	_1		END OF BOREHOLE		92.08 8.08	ı					
9											
10											
DEF 1:5		H S	CALE						(Golder Associates	LOGGED: P.N. CHECKED: (/4)

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JANUARY 27, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

္ဌ	THOD	SOIL PROFILE	h-	T	S/	MPI	T	Z.	DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, k, cm/s INSTALLATIO
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)		TYPE	BLOWS/0.3m	ELEVATION	20 40 60 80 10 ⁶ 10 ⁵ 10 ⁴ 10 ³ 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1
0		PAVMENT SURFACE	Ť	100.03				100	(Golder Report No. 001-4014)
ı		ASPHALT Granular base (FILL)		99.85 0.18	1	AS		100	
		Brown silty clay (FILL)	- 🗱	99.57 0.46	Г	50	60		
1		Black sand and gravel, some silt, pieces of wood (FILL)			3		21	99	
		Black organic clayey TOPSOIL	1, 2, 2, 4, 2, 2, 4, 2, 2, 4, 2, 2, 4, 2, 2, 4, 2, 2, 4, 2, 2, 2, 4, 2, 2, 4, 2, 2, 4, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,	98.66 1.37 98.20 1.83	4	50 DO	10		
3		Stiff mottled brown and grey SILTY CLAY, some sand, occ. gravel (TILL)		96.52	5	50 DO	8	98 97	O Backfill Material
4	Y 5	Very stiff brown SILTY CLAY, occ. sand and gravel (TILL)	4 6 6	3,51	7	50 DO	21	96	
5	POWER AUGER HOLLOW STEM			95.46 4.57	Г	50 DO	27	95	
6		Very stiff to stiff grey SILTY CLAY, some sand, occ. gravel (TILL)	10/0/0/		9	50 DO	15	94	○ Water level in borehole at elevation 93.9m during drilling on January 27, 2000
8				91.95 8.08	H	50 DO		92	O
		Grey medium to fine SILTY SAND		91.19	11	50 DO	PH		
9		Grey SANDY SILT, some gravel		8.84 90.43	12	50 DO	8	91	
10		END OF BOREHOLE		9.60					
DEP	TH S	SCALE					1		Golder LOGGED: P.N. CHECKED: G A.

RECORD OF BOREHOLE 3

BORING DATE: JANUARY 27, 2000

SHEET 1 OF 1

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

														zong,	DROF, 19303/1111
, ALE	HOD	SOIL PROFILE		,	SA	MPLE	s	z	DYNAMIC PENETR RESISTANCE, BLC	ATION WS/0.3m	1	HYDRAULIC (k, cm/	CONDUCTIVITY,	TI_	2 INSTALLATION
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGTH Cu, kPa	nat V. + rem V. ⊕		WATER (10 ⁻⁵ 10 ⁻⁴ 10 ⁻³ CONTENT PERCENT OW WI	T	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		PAVMENT SURFACE		99.89			7		(Golder I	60 8	Ma		20 30 40		
		ASPHALT Granular base (FILL)		99.64			1		Golder I	xepori 	/ v<i>o.</i> 	<i>001-4014</i> 	*/		
1				0.25	1 2		12	99				0			
		Brown to grey silty clay, pockets of organic material (FILL)			3	50	7								
2				97.45 2.44	4	50 DO	7	98					0		
3		Stiff mottled brown and grey SILTY CLAY, some sand, occ. gravel (TILL)			5	50 DO	15	97				0			Borehole dry during drilling on January 27, 2000
4	POWER AUGER HOLLOW STEM		8 0 0 0	96.23 3.66		50 DO	36	96				C			
5		Very stiff to hard brown SILTY CLAY, some sand, occ. gravel (TILL)	1/1/04	=	7	50 DO	26	95				0			
6				94.10 5.79	8	50 DO	17	94				0		_	
					9	50 DO	11					0			
7		Stiff to very stiff grey SILTY CLAY, some sand, occ. gravel (TILL)						93	Φ Φ	+					
8		END OF BOREHOLE		91.81 8.08	10	50 DO	9	92							
9															
10															

DEPTH SCALE

1:50

Golder Associates

LOGGED: P.N.
CHECKED: GAM

RECORD OF BOREHOLE 4

BORING DATE: JANUARY 28, 2000

SHEET 1 OF 1

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

щ	8	SOIL PROFILE			SAM	PLES		(NAMIC PENETRATION HYDRAULIC CONDUCTION RESISTANCE, BLOWS/0.3m Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Representation Rep	CTIVITY, T
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION		ELEV. DEPTH (m)	NUMBER	BLOWS/0.3m	ELEVATION	20 40 60 80 10° 10° 10° 14EAR STRENGTH nat V. + Q - WATER CONTEN U, kPa rem V. & U - O	
. 0		PAVMENT SURFACE	+ +	100.00	+	- "		20 40 60 80 10 20 (Golder Report No. 001-4014)	30 40
		ASPHALT Granular base (FILL)		0.08 99.69					
1		Brown to grey silty clay, some organic material and sand, occ. gravel (FILL)		0.30	1 5	0 15	99	0	
2		·		97.87 2.13	3 5	0 50	98	0	
		Grey fine SILTY SAND (ALLUVIAL)		97.49	4 5	0 7			
3		Grey to brown SILTY CLAY, some sand, oc. gravel (TILL)		2.51 96.80	_		97	0	Borehole dry during
4	POWER AUGER HOLLOW STEM	Very stiff to hard brown SILTY CLAY		3.20	5 5 5 5 5 6 5 D			0	drilling on Jánuary 28, 2000
5	POV	Very stiff to hard brown SILTY CLAY, some sand, occ. gravel (TILL)	100	94.82 5.18	7 5 D	23	95	0	
6				ŀ	8 5 D		94	0	
7		Stiff to very stiff grey SILTY CLAY, some sand, occ. gravel (TILL)			9 5 D	8	93	• +	
8				91.92	10 50		92	6 +	
9		END OF BOREHOLE		8.08					
10	, -	SCALE.							

DEPTH SCALE

1:50

LDN_BHS 001-4014.GPJ GLDR_CAN.GDT 2/8/00 DATA INPUT: Tony Mastroianni

Golder

LOGGED: P.N. CHECKED: GAM

RECORD OF BOREHOLE 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JANUARY 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

щ	QQ	SOIL PROFILE			SAI	MPLE	s		YNAMIC PENETRATION ESISTANCE, BLOWS/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s		
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/U.3m	ELEVATION	20 40 60 80 HEAR STRENGTH nat V. + Q. ● u, kPa rem V. ⊕ U - ○	10° 10° 10¹ 10³ WATER CONTENT PERCENT Wp I OW I WI	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
	- —	PAVMENT SURFACE	ST	100.00	Н	1	ň		20 40 60 80	10 20 30 40		<u>.</u>
- 0		ASPHALT Granular road base (FILL)		0.08 99.72	1				(Golder Report No. 0	01-4014)		
- - - 1		Brown silty clay with black mould sand layers (FiLL)		0.28	1		9	99		0 0		
- 2		Brown silty clay (FILL)		98.17 1.83 97.71 2.29	3	50 DO 3	3	98		0		
		Grey fine to medium SILTY SAND, some organic material (ALLUVIAL)		97.26 2.74	4	50 DO 4	ا			0		
- 3		Stiff mottled brown and grey SILTY CLAY, some sand, occ. gravel (TILL)		96.34	5	50 DO	1	97		0		Borehole dry during drilling on January 28, 2000
4	HOLLOW STEM	Very stiff to hard brown SILTY CLAY, some sand, occ. gravel (TILL)		3.66	6	50 DO 3	0	96		0		
5		some sand, occ. gravel (TILL)	8 8 70	94.82	7	50 DO 1	1	95		0		
6			2	5.18	8	50 DO 1				0		
		Stiff to very stiff grey SILTY CLAY, some sand, occ. gravel (TILL)	1 100		9	50 E	1	94		0	:	
7			10/07					93	⊕ + + +			
8		END OF BOREHOLE		91.92 8.08	10	50 8		92		0		
9												
10												

DEPTH SCALE

1:50

LDN_BHS 001-4014.GPJ GLDR_CAN.GDT 2/8/00 DATA INPUT: Tony Mastroianni

Golder

LOGGED: P.N. CHECKED: GAM

1:50

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 29, 2000

DATUM: LOCAL

CHECKE

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

																		L. 1, 2011	9, 5, 1	51 , 19305Mill
پ	오	SOIL PROFILE			SA	MPL	.ES	7	DYNAI RESIS	VIC PEN TANCE,	BLOWS	ION 5/0.3m	1	HYDR	AULIC C k, cm/s	ONDUCT	TIVITY,	Т	_ ပ	INICTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAF Cu, kP		<u> </u>		80 - Q - • U - O	1 W		0 ⁵ 1 ONTENT	PERCE	o ^{.3}	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
4	ă		STF	(m)	<u> </u>		E E		2	0 4	10	60	80		10 2			10 1		
٥	T	GROUND SURFACE Black clayey topsoil (FILL)	***	100.41	Γ			(Ga)	lder	Rep	ort i	No. (001-4	1067)]			Ì	
Ì			₩	100.18 0.23	1	50 DO	9								0					
		Stiff brown and grey silty clay, some organic topsoil pockets (FILL)		99.57				100		·										
1				0.84	2	50 DO	22							0						
İ		Compact medium to coarse brown SAND, trace silt			-	50 DO	12	99												
2			I I	98.43 1.98		DO	12									0				— ∑ Water level in boreho
		Firm grey SILTY CLAY, some sand			4	50 DO	5	98							0					at elevation 98.43m during drilling on Marc 29, 2000
3	GER			97.51 2.90																
	HOLLOW STEM		2		5	50 DO	17	97		-					0					
4			9/		6	50 DO	40						*		0					
		Hards for bound to				100		96												
5		Hard to firm brown becoming grey SILTY CLAY, some sand, occ. gravel and sand pockets (TILL)			7	50 DO	12								0					
					8	50 DO	9	95							0					
6			9		_	ВО														
				93.86				94		⊕		+								
	_	END OF BOREHOLE		6.55					:		6	Đ	 - 							
7																				
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EP	TH:	SCALE				L				Go	lda	•			L	I				LOGGED: A.F

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 29, 2000

DATUM: LOCAL

SAMPLER HAMMER, 29kg; DROP, 19305mm

PENETRATION TEST HAMMER, 29kg; DROP, 19305mm

וַנָּ			SOIL PROFILE			S/	AMPL	.ES	,	DYNAMIC PE RESISTANCE	NETRATI , BLOWS	ON /0.3m		HYDRA	ULIC C k, cm/s	ONDUCT	IVITY,	Τ	_, თ	1,10=111
METRES		BORING METHOD		ρ	i_	_C			ELEVATION	20	40	30 E	30	10)-6 1	0° 10	0-4 1	^{lò₃} ⊤	ADDITIONAL LAB. TESTING	INSTALLATION AND
ME	9	<u> </u>	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	ME	TYPE		LE 🕌	SHEAR STRE	NGTH	nat V. +	Q- •	w	ATER C	ONTENT		NT	ĮŽ.	GROUNDWATE OBSERVATION:
3		Š Š		TRA	(m)	₹	-		ū					νν¢		—о ^W		WI	₽ ₹	
-	H	-	CDOLING CHESTOR	ľ		⊢	+	\vdash	<u> </u>			80 8			0	20 3	10 4	40	—	
0	-	\vdash	GROUND SURFACE		100.41	⊢	\mathbf{I}		(Gol	der Rep	ort N	o. Ul)1-40	<i>1</i> 67)	0			İ	l	
			Black clayey topsoil (FILL)	****	100.23 0.18	1	50	6												
ı		П		₩	1]"		100		<u> </u>	ļ			0	ļ		ļ		
		Н		\bowtie	l												}		İ	
			Mottled brown and grey SILTY CLAY, some organic topsoil pockets (FILL)	\bowtie		-	1													
1		П	some organic topsoil pockets (FILL)	\bowtie	l	2	50 DO	16							C)				
				\bowtie		⊢	ł		1										l	
				₩	98.89				99		-	-		 		ļ		ļ		
					1.52	П	50													
		Ш		8.3		3	50 DO	25							()				
2						-					İ									_ <u>₹</u>
	3ER	₹	Compact to loose medium to coarse	\times		L								i i				İ		Water level in boreho at elevation 98.43m
	S AUC	S W	brown SAND, trace silt, some gravel			4	50 DO	4	98	 	+								ŀ	during drilling on Ma
	WEF	HOLLOW STM		્રે			DO	"							(1				29, 2000
	ď	┸		8,3			1													
3					97.29		-									0				
			Stiff grey SILTY CLAY, some sand trace	M	3.12	5	50 DO	13				ŀ			0					
			gravel	ľ⁄⁄I		L	-		97		 									
		 	****	1 1	96.75 3.66															
4				Y_{λ}		┢	1													
1			Hard to very stiff brown and grov			6	50 DO	39							0					
			Hard to very stiff brown and grey SILTY CLAY, some sand, occ. gravel,	اکرا		H	1					:								
			some sand (TILL)			L	ļ		96											
ı						7	50 DO	17												
5				K	95.38		DO	"								ľ				
		ı	END OF BOREHOLE		5.03														•	
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LOGGED:

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN
SAMPLER HAMMER, 140lb; DROP, 30in

BORING DATE: SEPTEMBER 27, 2000

DATUM: LOCAL

PENETRATION TEST HAMMER, 140lb; DROP, 30in

ا پِد	НОР		SOIL PROFILE			SA	MPL	.ES	z	DYNA RESIS	MIC PEN TANCE,	ETRATIO BLOWS/f	N t	1	HYDR.	AULIC C k, cm/s	ONDUCT	TIVITY,	Ţ	-1.5	INSTALLATION
FEET	BORING METHOD	0	ESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)		TYPE		ELEVATION	SHEAI Cu, ps		0 60 GTH na re	at V. + m V.⊕		W _I	ATER C	ONTENT OW	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		GROUND SUF			97.8	3		П	(Ge	,		ort N							10		
		Black clayey T	OPSOIL	2,27	0.0	7 1	2" DO	11	"No	ote: T	This I	Orawi is in	ing h	as be	een		0				
5		Stiff to very stiff SILTY CLAY, s fissured (TILL)	f, mottled brown and grey ome sand, occ. gravel,	9		2		22	95							0					
					90.8 7.0	3	2" DO		90							0	0				
10	VER AUGER	Hard to very st	iff, brown cc. gravel, fissured				2",							: :		0					Borehole remained of during drilling on September 27, 2000
	NOA			1	84.3	3 6	2" DO	23	85							0					
15		Stiff to very stif	f, grey			7	2" DO	18								0					
20		SILTY CLÁY, s (TILL)	f, grey ome sand, trace gravel						80												
		END OF BORE	HOLE		76.3 21.5	3	2" DO	13								0					
25																					
30																					
35																					
													•							,	

1 inch to 5 feet



LOGGED: P.N.

CHECKED: GN

RECORD OF BOREHOLE 4

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 27, 2000

DATUM: LOCAL

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

, J	THOD	SOIL PROFILE	T ⊢	Γ	SA	MPL	ES	Z.	R	YNAMIC PEI ESISTANCE				1		ONDUCT		T	AP NG	INSTALLATION
FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE		ELEVATION	Si	HEAR STRE u, psf	J NGTH	nat V rem V. 6		W _I	ATER C	ONTENT	PERCE	WI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
7		GROUND SURFACE	+"	97.4	H			(6	1 201	der Re		200 1				20 3	30 4	40	┢	
٥		Stiff, black clayey TOPSOIL	2,24	0.0 96.6	,	2"	11								"	0				
5		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, fissured, oxidized (TILL)		0.8	2	2° DO	16		voi edu	te: This uced an	d is i	n Im	perial	l Unii	ts"	0				
10	SER M	Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)		91.6 5.8			39	90							0					Borehole remained d
	SOLID STEM			85.4 12.0		2" ĐO	37	85							0					September 27, 2000
15					6	2" DO	22								0					
		Stiff to very stiff, grey SILTY CLAY, some sand, trace gravel (TILL)	4/0/4/		7	2" DO	14	80							0					
20		END OF BOREHOLE	0)	75.9 21.5	8	2** DO	12								0					
25																				
30																				
35							and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s													
																				- -
		SCALE 5 feet								JASS JASS	older	tos								LOGGED: P.N.

RECORD OF BOREHOLE 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 27, 2000

DATUM: LOCAL

	THOD	SOIL PROFILE	ļ.	T	Н	MPLE	S	NO	DYNAMIC F RESISTANO)		k, cm/s	ONDUCT		, <u> </u>	rat.	INSTALLATION
	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE		ELEVATION	20 SHEAR STF Cu, psf				10 WA Wp	TER CO	ONTENT	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE	K 27	96.9 0.0				(G	older R										·
		Stiff, black clayey TOPSOIL	0 /	0.7	1	2" DO	10	"N	ote: Thi	s Dra	wing	has b	een		0	Y			
-			10/						luced ar					"					
		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, tarce gravel, wet fissures, organic pockets (TILL)	9		2	2" DO	13								0				
5			8/ 9/	90.9	3	2" DO	27	00						0		0			
		Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)	0/			2" DO	42	90						0					
0	SOLID STEM			9.5	H	2" DO	25							0					Borehole remained of during drilling on September 27, 2000
	PO				6	2" DO	14	85						0					
15		Sliff to very sliff, grey SILTY CLAY, some sand, trace gravel	0		7	2" DO	15							0					
		(TILL)						80											
20			0																
		END OF BOREHOLE		75.4 21.5	1 1	2" DO	13							0					
5																			
30																			
35																			

1 inch to 5 feet

Golder Associates

CHECKED: GM

RECORD OF BOREHOLE 7

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 27, 2000

DATUM: LOCAL

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

	THOD	SOIL PROFILE	T -		SA	MPL	ES	Z.	DYNAMIC PEI RESISTANCE)		k, cm/s		/ITY.	1 4	NG	INSTALLATION
т П	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE		ELEVATION	SHEAR STRE Cu, psf	NGTH	60 80 L 1 nat V. + rem V. ⊕	Q - • U - O		TER C	0.5 10.5 CONTENT F	PERCENT	ADDITION	LAB. TESTING	AND GROUNDWATER OBSERVATIONS
5		GROUND SURFACE Stiff, black clayey TOPSOIL Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, fissured (TILL)	2,7	97.1 0.0 0.7				"No	Ider Rep te: This I uced and	ort N Orawi	No. 00 ing ha	01-4 is be	238) en		0				
POWER AUGER	SOLID STEM	Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, fissured, oxidized (TILL)	8 8 8 8	90.6 6.5	3	2" DO	39	90						0	D			- 1	Borehole remained c during drilling on September 27, 2000
0d 5	Sc	Stiff, grey SILTY CLAY, some sand, trace gravel, fissured, oxidized (TILL)		84.1 13.0	7			85 80						0					
:0		END OF BOREHOLE		7 <u>5.6</u> 21.5	8	2" DO	13							0					
30																			
35				A company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the comp			The second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second secon												

DEPTH SCALE

1 inch to 5 feet



LOGGED: P.N. CHECKED: \mathcal{CM}

RECORD OF BOREHOLE 10

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 27, 2000

DATUM: LOCAL

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

щ	ç	3	SOIL PROFILE			SA	MPL	ES		DYNAM RESIS	IIC PEN	ETRATIC BLOWS/)N ft	1	HYDRA	VULIC C	ONDUCT	IVITY,	Ţ	. (2)	
DEPTH SCALE FEET	CORTAM SMIACE	KING ME I	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/ft	ELEVATION	20	0 4	0 6	0 8	Q . •	w	of 1	0° 1° ONTENT	0.4 10 PERCEN) ⁻³	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
ă o			GROUND SURFACE Very stiff, black clayey TOPSOIL	STR.	97.8 0.0 97.0 0.8				(Go "No	lder I ote: Th	Repo	ort N Prawii	00 10 0. 0 ng ha	01-42 as be	<u>1</u> 238) en	02	0 3	1 V 30 40		₹5	
			Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt pockets, fissured (TILL)			2	2° DO		Red	uced d	and i	s in I	тре	rial U	Inits'	,	0		***		
5				9/10	90.8 7.0	3	2" DO		90							0	0				
10	POWER AUGER	SOLID STEM	Hard, brown SILTY CLAY, some sand, trace gravel, fissured, oxdized (TILL)	4		5	2" DO									0					Borehole remained d during drilling on September 27, 2000
15					85.3 12.5	6	2" DO				•					0					
			Stiff, grey SILTY CLAY, some sand, trace gravel (TILL)			7	2" DO	14	80							0					
20			END OF BOREHOLE		76.3 21.5	ı	2" DO	14								0					
25																					
30																					
35																					
			CALE 5 feet	<u> </u>	1	-	I	<u> </u>		7	Go	lder	tee	<u> </u>			<u> </u>	<u> </u>			LOGGED: P.N. CHECKED: G/



RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

	THOD		SOIL PROFILE	T ⊨	ı	SA	AMPL	E\$	×	DYNAMIC P RESISTANC		ON /ft		1		ONDUCTI		Ţ	βĀ	INSTALLATION
FEE	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	20 SHEAR STF Cu, psf 400	RENGTH	1		10 W/P	ATER CO	ONTENT ON 30	PERCEN		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
٥		GROUNE	SURFACE		574.4				(Go	lder Re	port N	o. 0	01-4	247)	<u>/</u>		Ĭ			
		Compact	black sandy TOPSOIL	1,2,2,4 1,2,2,4 1,2,2,4	0.0 572.4	1	2" DO	15	"No	te: This iced and	Drawi	ng ho	as be	en	,	>				
		Compact gravel, fe	, brown SAND, trace silt, occ. w grey silty fine sand seams		569.9	ட	2" DO	11	570						0					
5		Firm grey trace grav (TILL)	SILTY CLAY, some sand, vel	1	4.5	3	2" DO	7	370			all the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s			0					Borehole remained d during drilling on
		Hard boo	wn SILTY CLAY, some sand	?/ ?/	567.4 7.0	4	2" DO	44					>2000-	-	0					September 28, 2000
0	SOLID STEM	and grave	el, fissured			5	2" DO	52	565						0					
	8 "				562.4 12.0	6	2" DO	13		:						0			:	
5		Stiff to ve to some s (TILL)	ry stiff, grey SILTY CLAY, trace and and gravel			7	2** DO	11	560						0					
					556.4 18.0								>2000-					,		
20		Very stiff and grave	grey CLAYEY SILT, some sand			8	2** DO	18	555						0					
ŀ		END OF	BOREHOLE		552.9 21.5															
:5							3													
							3													
30																				
5																				

DEPTH SCALE 1 inch to 5 feet



LOGGED: C.C CHECKED:

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

ALE			SOIL PROFILE	l bu		SA	MPL	LES	z	DYNAM RESIST	IC PENE ANCE, E	TRATIONS	ON /ft	1	HYDRA	k, cm/s	ONDUCT	IVITY,	T	ڳ ڳاپ	INSTALLATION
DEPTH SCALE FEET	BORING METHOD	DOLLING INF	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION		STREN	STH 1	natV. + rem V. €	0 - 0 - 0	W	ATER C	ONTENT	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		\Box	GROUND SURFACE		576.8		Г		(G	lder	Pan	ort l	Ma 1	001							
			Compact, black sandy topsoil (FILL)	▩	0.0 575.3	1	2" DO	10		naer ote: T						,	þ				
			Stiff brown silty clay, some sand, trace gravel (FILL)		1.5	2	2" DO	13	Rea	uced	and i	s in	Impe	erial (Units 	" —	0				Minor water seepage into borehole encountered at 574.5
5			Stiff grey and black clayey silt, occ. sand seams, occ. peat inclusions (FILL) Black PEATY ORGANIC MATERIAL,	***	572.3 4.5 570.6 6.3	3	2" DO	13									0		165.7)	during drilling on September 28, 2000
			some clay Stiff, grey SILTY CLAY,trace to some sand and gravel		7.0	4	2" DO	12	570							0					
10	FR AUGER	LID STEM	(TILL)		567.3 9.5	5										0					
	MOA	Š	Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)			6	2".	38	565							•					
15					562.3 14.5											•					
			Very stiff to hard, grey SILTY CLAY, trace to some sand and gravel (TILL)			7	2" DO	16	560			<u> </u>				0					
20			Hard grey CLAYEY SILT, some sand and gravel (TILL) END OF BOREHOLE		555.6 21.3 21.5		2" DO	33							0	Ć					
25																					
30											T, In a second										
35																					
			CALE						(Gol Lsso	der	,								LOGGED: CC





RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN
SAMPLER HAMMER, 140lb; DROP, 30in

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

PENETRATION TEST HAMMER, 140lb; DROP, 30in

-		SOIL PROFILE		1	SA	MPL	ES.	ž	DYNAM RESIST	IC PENETI ANCE, BLO	RATIO DWS/f	N t		HYDR/	AULIC CO k, cm/s	ONDUCT	ivity,	T	ا کو پر	INSTALLATION
FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	SHEAR Cu, psf	STRENGT			Q - • U - O	W	ATER CO	ONTENT	PERCEI	NT NI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
ō		GROUND SURFACE		574.2				(Go.		Repor					_		,			
		Stiff, brown silty clay and black clayey topsoil (FILL)		0.0 572.2	1	2" DO	14	"No	te: Th	is Dra and is	win	ig ha	ıs bee	en -						
		Soft black clayey TOPSOIL, some peaty material	7	570.4 3.8	2	2" DO	4					•			0	0				_ <u>\$</u> _
5		Firm to stiff, grey SILTY CLAY, some sand, trace gravel (TILL)			3	2" DO	11	570							0	V				Minor water seepage into borehole encountered at about elevation 571.2 ft.
	SOLID STEM			567.2 7.0	4	2" DO	47	565					>2000-	-	0					during drilling on September 28, 2000
0		Hard to stiff brown SILTY CLAY, some sand and gravel, fissured (TILL)			5	2" DO	38							i	0					
		Stiff, grey SILTY CLAY, trace to some		561.2 13.0	6	2" DO	13	560							0					
5		sand and gravel (TILL)	6	557.7	7	2" DO	12								0					
20																				
30																				
:5														:						

DEPTH SCALE 1 inch to 5 feet



RECORD OF BOREHOLE 4

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

,		SOIL PROFILE	T 1-	1	SA	MPL	ES	z	DYNAMIC PENE RESISTANCE, E	BLOWS	on ft		HYDRAULIC C k, cm/s		T _P S	INSTALLATION
FEET		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	20 40 SHEAR STRENG Cu, psf 400 80	GTH r		Q - • U - O	WATER C	0.5 10.4 10.3 DNTENT PERCENT 0. W W 0. 30 40	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0 -		GROUND SURFACE	222	574.5 0.0				(Go	lder Repo							
		Loose, black sandy TOPSOIL	1, 2, 2, 3, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2, 4, 2,	572.5	1	2" DO	9	"No Redi	te: This Di uced and is	rawi s in l	ng ha Imper	is bee	en c Inits"			
		Loose, brown to grey SILTY SAND, trace gravel, occ. clayey zones		2.0 571.2 3.3	<u>. </u>	2" DO	4			, ,,,,			0			<u></u>
5		Soft to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL)		3.3 566.5	3	2" DO	12	570				>2000-		0		Minor water seepage into borehole encountered at about elevation 571.5 ft. during drilling on September 28, 2000
ower Auger	SOLID STEM	Hard, brown SILTY CLAY, some sand and gravel, fissured (TILL)		562.5	5	2" DO		565					0			
-		Very stiff, grey SILTY CLAY, trace to some sand and gravel, occ. sand partings/pokets (TILL)		12.0 560.0	6	2" DO	18	560					0			
15		Dense, grey fine to medium SAND, trace gravel		14.5 558.7 15.8	-	2" DO	38	l					0			
20		Dense to compact grey SAND, some gravel, occ. fine sand seam			8	2" DO	27	555					0			
		END OF BOREHOLE		553.0 21.5												
25																
30	5															
35																
DEP1		CALE							Gol	lder						LOGGED: C.C.



RECORD OF BOREHOLE 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

CALE	CHI		SOIL PROFILE	۱	Γ	┝	MPI	Т	ĕ	1		NETRA E, BLOV		_			k, cm/]	ING ING	INSTALLATION
DEPTH SCALE FEET	ODBING METHOD	DONING ME	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	SHEA Cu, p		40 ENGTH			Q- • U- O	v w	VATER (ONTEN	PERCE	WI	ADDITIONAL LAB. TESTING	AND GROUNDWATEF OBSERVATIONS
		7	GROUND SURFACE	+‴	576.6	H	+	\vdash	\vdash	(Go	1.1	800 -	1200	160 7A 7	00	11 1	10 2 4 7 \	20	30 -	40	\vdash	
			Compact, black sandy topsoil mixed with crushed gravel, some silt (FILL)		0.0 574.6	1	2"	13		"No Redi	te: T	his I	Drav	vin	g ha	s bee	en	0				
			Loose, brown fine to medium SAND, trace gravel		2.0	2	2".	6		Real					nper	0						
5	ER AUGER	SOLID STEM	Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, fissured, occ. silt pockets (TILL)		4.5	3	2" DO		570						>2000-			0				Borehole remained of during drilling on September 28, 2000
10	POW	os	Very stiff grey SILTY CLAY, trace to some sand and gravel (TILL)		567.1 9.5 564.6		2" DO	15	565								0					
15			Hard to very stiff, brown SILTY CLAY, some sand and gravel, fissured (TILL)		12.0	6		36									0					
_		-	END OF BOREHOLE		560.1 16.5	7	2" DO	21							:		0					
20																:						
25																						
30													:									
35																						
			CALE								G	olde ocia	r	_								LOGGED: C.C.



RECORD OF BOREHOLE 6

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

U .		ŀ	SOIL PROFILE	1 -	1	SA	MPI	LES	z	1	MIC PEN STANCE,			1		k, cm/s			Ţ	P _G	INSTALLATION
FEET			DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	SHEA Cu, p:	IR STREM	IGTH F			10 ^{-€} WA Wp I 10	TER C	TMBTNC WO	PERCE	O ³ T NT WI 40	ADDITIONAL LAB. TESTING	AND GROUNDWATEF OBSERVATIONS
0			GROUND SURFACE		574.5			<u> </u>	(G						4247)		0 3	2	10		
			Stiff black clayey TOPSOIL	1,2%	0.0	1	2" DO	8	"N	ote:	This.	Draw	ving l	has b	een		0				
			0.0	1, 7, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1	572.5 2.0				Re	duce •	d ana	l is in	Imp	erial	Units	,,					
			Soft grey and black ORGANIC CLAYEY SILT, some sand, occ. gravel and rootlets		570.8		2" DO	4									0				
			Firm to stiff, mottled brown and grey	1	3.8				570								0				
5			Firm to stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt pockets	1]	3	2"	11			⊕			+		0					Borehole remained of during drilling on
	er		(TILL)	8	567.5	_	150									Ŭ					September 28, 2000
	POWER AUGER	STEM			7.0	4	2" DO	41								^					
	POWER	SOLID	Hard, brown SILTY CLAY, some sand		1	Ľ	DO	"								0					
10			and gravel, fissured (TILL)		1	 	2"		565												
					562.5		ĎΟ	44)					
					12.0	ļ															
			Stiff, grey SILTY CLAY, trace to some	2]	6	ĎО	11									0				
15			sand and gravel (TILL)	6		_			560												
				1	558.0	7	DO	13								0					
			END OF BOREHOLE		16.5								·								
Ī																					
20																					
İ																					
25																					:
		İ																			
		-																			
30																					
					:																
35																					
																	j				
DEF			CALE								Go Asso	lder	4								LOGGED: C.C.



RECORD OF BOREHOLE 7

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DESCRIPTION UND SURFACE pact, black sandy TOPSOIL prown and grey CLAYEY SILT, sand to stiff, mottled brown and grey (* CLAY, some sand, trace gravel, sand seams/layers near surface .)	DEPTI (t) 575, 574, 574, 574, 574, 574, 574, 574,	7 0 6 1 7	2" DO	10	"N/	older	R STREM	ort N	at V. + em V. ⊕ 00 16	Q- • U- 0	ν _ε 1 247)	ATER CO	TNBTNC	PERCEN	LAB. TESTING	AND GROUNDWATER OBSERVATIONS
oact, black sandy TOPSOIL prown and grey CLAYEY SILT, sand to stiff, mottled brown and grey / CLAY, some sand, trace gravel, sand seams/layers near surface .)	2, ² / ₂ , 0. 2, ² / ₂ , 574. 1. 573.	0 6 1 7 0		10	"N/	older	Rep	ort N	Vo. 0	01-4	(247)				ヿ	·
orown and grey CLAYEY SILT, sand to stiff, mottled brown and grey (CLAY, some sand, trace gravel, sand seams/layers near surface	2 ² 2 574. 1 573.	6 1 7 0		10	"N/	oto T	hic I								 - 4	I
sand. to stiff, mottled brown and grey (CLAY, some sand, trace gravel, sand seams/layers near surface .)	573.	.7 .0			Red		nis L)rawi	ing h	as be	en	-0-				
sand seams/layers near surface .)			٦_		rica	luced	and	is in	Impe	rial l	Units	,, 0			İ	
stiff to hard, brown SILTY CLAY,			2" DO				Ф						0			Borehole remained d
stiff to hard, brown SILTY CLAY,	9	- 1	2" 00	11	570		w		Т							during drilling on September 28, 2000
stiff to hard, brown SILTY CLAY,	568	4	2" DO	28								0				
Sum to hard, brown SILTY CLAY,		-	- 00													
sand and gravel fissured .)		5	5	40	565							0			 ŀ	
	562. 13.	2 6 5	2" DO	22								0				
stiff to stiff, grey SILTY CLAY, trace ne sand and gravel .)	e P	7	2" DO	13	560							-				
OF BOREHOLE	559 16.	2	100													

DEPTH SCALE

1 inch to 5 feet



RECORD OF BOREHOLE 8

SHEET 1 OF 1

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

LOCATION: SEE LOCATION PLAN SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

<u> </u>			SOIL PROFILE			S/	AMP!	LES		DYN. RESI	AMIC PEN ISTANCE,	BLOWS	ON S/ft	(HYDR	AULIC C k, cm/s	ONDUC	TIVITY,	T	ي ر	INSTALLATION
DEPTH SCALE FEET				PLOT	ELEV.	Ë	ш		ELEVATION	L	20 4	40	60	30		L		1	10-3	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER
유			DESCRIPTION	STRATA PLOT	DEPTH	NUMBER	TYPE		ELEV	SHE, Cu, p	AR STREM	NGTH	nat V. + rem V. ⊕	Q - 0	۷۸	ATER C	ONTENT OW.	PERCE	NT Wi	ADDIT AB. TE	OBSERVATIONS
		4		STF	(ft)	۲	_		<u> </u>		400 8	00 1	200 16	500					40	, ,	
0	Т	+	GROUND SURFACE	222	575.9 0.0	-	-		(Gol	der	Repo	rt N	o. 00	1-42	<i>(47)</i>						
		ł	Loose, black silty TOPSOIL	13	574.9 1.0	1	2" DO	6	"Not	e: Ti	his Di	rawii	ıg ha	s bee	n	0			+	ł	
						Г			Redu	ced	and is	s in I	mper	ial U	nits"	Ŭ	!				
			Firm to year stiff, mottled brown and grey			2	2" DO	6													
	ļ	١	Firm to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. sand seams/zones near surface			H	-		ĺ						Ì						
5			(TILL)	1			}										ļ				Borehole remained d
						3	DO	16	570	-	-		-	>2000-	ļ	-		ļ	<u> </u>		during drilling on September 28, 2000
		\mathbf{I}		1	568.9 7.0												ļ				
		1				4	2" DO	24	1							0					
	~	-	Very stiff to hard, brown SILTY CLAY, some sand and gravel, fissured	\mathbb{K}_{k}		-							į								
10	AUGE	57 L	(TILL)			┝	ļ														
	POWER AUGER	SOLID				5	2" DO	49	565						<u> </u>	-			<u> </u>		
	ă	+			563.9 12.0	L															
						6	2" DO	15								0					
				10			1														
15						7	2" DO	17	500												
			Very stiff, grey SILTY CLAY, trace to some sand and gravel	8		Ĺ	Po	"	560											İ	
			(TILL)																		
								İ													
20																					
-~						8	2" DO	23	555	ļ	1										
-		+	END OF BOREHOLE	14	554.4 21.5																
25																					
İ																					
		-																	İ		
30																					
35																					
		L		Ш			l]			<u> </u>									
DEP	тн	sc	CALE								V G∩	lder	,								LOGGED: C.C.
1 inc	:h to	o 5	feet						- (J =	Go Asso	nucia	tes								CHECKED:



RECORD OF BOREHOLE 9

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: SEPTEMBER 28, 2000

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

YLE	2	2	SOIL PROFILE			SA	MPI	LES	z	DYN/ RESI	AMIC PEN STANCE,	NETRATI BLOWS	ON S/ft	1	HYDR	AULIC C	ONDUC	TIVITY,	T	ۇ ئ	INSTALLATION
DEPTH SCALE FEET	CONTON SNIGOR	BURING ME	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	SHE/ Cu, p	20 AR STREI	NGTH I	nat V. + rem V. ⊕		w w	/ATER C	ONTENT	F PERCE	lo³	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0			GROUND SURFACE		576.9			(Gold									<u> </u>	1		
			Loose, black sandy TOPSOIL	4, 26, 26, 24, 24, 26, 26, 26, 26, 26, 26, 26, 26, 26, 26	574.9 2.0	1	2* DO	"	Note. Reduc	: Th	is Dro	awing	g has	been		0					
			Very stiff brown CLAYEY SILT, some sand, occ. sandier zones/pockets		572.4 4.5	2	2" DO	16													
5	AUGER	SOLID STEM	Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL)	10/0/	z	3		12	570							0	0				Borehole remained of during drilling on September 28, 2000
10	POWER				567.4 9.5	<u> </u>	2" DO									0					
			Hard, brown SILTY CLAY, some sand and gravel, fissured (TILL)	8	562.4	6	2" DO	50	565							0					
15			Very stiff, grey SILTY CLAY, trace to some sand and gravel (TILL) END OF BOREHOLE		14.5 560.4 16.5	г	2" DO	21								0					
20													A STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STA								
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DEF			CALE	1]							Go	older ocia									LOGGED: C.C.



RECORD OF BOREHOLE 7

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: FEBRUARY 14, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

		SOIL PROFILE	<u> </u>	.	SA	MPLI	_	N.	1	MIC PEN TANCE.				1		ONDUCTI			NG NG	INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAI Cu, kP	R STREN	IGTH I	nat V. + rem V. ⊕	Q - • U - O	W	ATER C	OW	PERCEN	ADDITION	LAB. TESTING	AND GROUNDWATER OBSERVATIONS
		PAVEMENT SURFACE	S	188.45			а		2				30			009)			\dashv	
ľ		ASPHALT		0.00			İ			(00	luei	Kep)	10. U	/11-7 	1	'		İ	
		CONCRETE		188.12 0.33				188						İ				ĺ	l	
			₩	0.48				100												
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1 9	ž į	STEM	₩		1	50 DO	18								0					
2 2	N AU	≥1	₩											<u> </u>					ı	
2,410	HOLLOW STEM	Very stiff to stiff, mottled brown and grey silty clay mixed with some sand, gravel and pockets of topsoil	₩					187												Borehole dry during
		(FILL)	₩		2	50 DO	10								0					Borehole dry during drilling on February 1 2001
2			₩			1											-			
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			₩		3	50 DO	12	186							0					
f		END OF BOREHOLE	XXX	185.71 2.74																
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DEPTH SCALE

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Golder

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN
SAMPLER HAMMER, 140lb; DROP, 30in

BORING DATE: JUNE 6, 2001

DATUM: GEODETIC

PENETRATION TEST HAMMER, 140lb; DROP, 30in

- 1	호	SOIL PROFILE		Т.		MPL		z	DYNAMIC PENET RESISTANCE, BL	.OWS/ft		k, cm/	S		- 11	구일	INSTALLATION
FEEI	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	20 40 SHEAR STRENG Cu, psf 400 800			WATER (10° 10 CONTENT OW 20 30	PERCEN		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
٥	_	PAVEMENT SURFACE		581.5				(Go	lder Repor			128)					
		ASPHALT Granular base (FILL)	/門	0.1	1			"No	te: This Dr	awing l	as be	en					
		Very stiff mottled brown and grey SILTY CLAY, some sand, trace gravel			1	AS		Redi	iced and is	in Impe	erial U	Inits" O					
		(TILL)		577.0		2" DO	24					0					
5				577.0 4.5	3	2" DO	32					0					
	JGER							575									Borehole dry during drilling on June 6, 20
	SOUR STEM	Hard to very stiff brown SILTY CLAY, some sand and gravel, some to occ.			4	2" DO	28					0					
10		grey fissures (TILL)			5	2" DO	24					0					
								570									
			Ÿ	567.2 14.3		200	27					0					
15		Very stiff brown SILTY CLAY, some sand and gravel (TILL)) 	565.0	7	2" DO	26					0					
		END OF BOREHOLE		16.5				565									
20																	
25																	
30																	
35																	

DEPTH SCALE

1 inch to 5 feet

LOGGED: C.C.
CHECKED:

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JUNE 6, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

	욷	SOIL PROFILE	1 ₋	1	3	MPL		×	DYNAMIC PENETS RESISTANCE, BLO	WS/ft		HYDRAULIC CO k, cm/s		₽₽	INSTALLATION
FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	20 40 SHEAR STRENGT Cu, psf			vvp I	ONTENT PERCENT	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
<u> </u>		PAVEMENT SURFACE	05	580.5		_			Golder Re	1200 port [<u> 10 20</u> [1-4128]	30 40	+	
Ĭ		ASPHALT Granular base (FILL)	/	0.1				580	"Note: This	Draw	ino ha	is heen			
ı		Black clayey TOPSOIL	ት ኢ	1		AS	-		Reduced and	l is in	Impor	ial Units"			
			1:3	578.5 2.0	l				Neaucea and	ı ıs ın	ımper	iai Oniis	1 1		
		Stiff mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL)		576.0	١.	2" DO	14					0			
5			1	4.5	L	2" DO	28	575				0			Borehole dry during
	POWER AUGER				4	2" DO	30								drilling on June 6, 20
10	POWER	Very stiff to hard brown SILTY CLAY,			Ė	DO									
		some sand and gravel, some to occ. grey fissures (TILL)			5	2" DO	21	570				0			
					6	2" DO	20					0			
15					7	2" DO	17	565				0			
ł		END OF BOREHOLE	Y	564.0 16.5	\vdash										
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DEPTH SCALE

1 inch to 5 feet

Golder Associates LOGGED: C.C.
CHECKED:

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JUNE 6, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

į	줮	SOIL PROFILE	-T		Ş/	MPL	ES.	z	DYNAMIC PENETRATION RESISTANCE, BLOWS/ft HYDRAULIC CONDUCTIVITY, K, cm/s INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATION INSTALLATI	ON
FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	20 40 60 80 10° 10° 10° 10° 10° 10° 10° 10° 10° 10	TER
o		PAVEMENT SURFACE	Ľ	581.4		Γ			400 800 1200 1600 10 20 30 40 (Golder Report No. 011-4128)	
		ASPHALT Granular base (FILL)		0.1	•				"Note: This Drawing has been	
		Black to brown clayey topsoil and brown silty clay (FILL)		0.8	1	AS	-	580	Reduced and is in Imperial Units"	
			 	578.9 2.5		2"				
		Firm mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL)	10/	577.1		2" DO	5			
5	TEM			4.3	L	-			>2000+	
	POWER AUGER SOLID STEM				3	2" DO	15	575	O Borehole dry durir drilling on June 6,	ng
	۳ °	Very stiff brown SILTY CLAY, some sand and gravel, some to occ. grey			L				drilling on June 6,	. 20
ı		sand and gravel, some to occ. grey fissures (TILL)		}	4	2" DO	26			
		()		1	r					
10					5	2° 00	24			
		END OF BOREHOLE	Till	569.9 11.5		1		570		
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		SCALE 5 feet							Golder CHECKED.	h



RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: 106m. W. centreline of Belleview and 5m. S. centerline of Riverside Dr.BORING DATE: June 6, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

Щ.	원	SOIL PROFILE	1:		S	AMPI	+	z	DYNAMIC PENETRAT RESISTANCE, BLOW	IUN S/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s	و پـ	INSTALLATION
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	ТҮРЕ	BLOWS/0.3m	ELEVATION	SHEAR STRENGTH Cu, kPa	60 80 nat V. + Q. ● rem V. ⊕ U - ○	10 ⁴ 10 ⁵ 10 ⁴ 10 ³ WATER CONTENT PERCENT WP	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		PAVEMENT SURFACE		179.30 0.00	Γ						No. 011-4136)	\top	
		ASPHALT Broken CONCRETE		0.18	1			179					
- 1		Very sliff mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt and sand pockets, fissured (TILL)		177.77	1	50 DO	17	178			0		
2				1.52	2	50 DO	31				0		
		Very stiff to hard brown SILTY CLAY, some sand, trace gravel, fissured (TILL)	4		3	50 DO	24	177			0	_	
3	POWER AUGER SOLID STEM		0		4	50 DO	22	176			0	_	Borehole dry during drilling on June 6, 20
4				175.49 3.81	5	50 DO	12	175			0		
5		Stiff grey SILTY CLAY, some sand, trace gravel (TILL)	10/		6	50 DO	10	174			0		
6			01010	172.75	7	58 DO	8	173			0		
7		END OF BOREHOLE		6.55									
8													
9													
10									Golder				

DEPTH SCALE 1:50



RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: AUGUST 29, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

HOD I	SOIL PROFILE	<u> </u>	<u> </u>	┢	MPL		N N	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m 20 40 60 80 HYDRAULIC CONDUCTIVITY, k, cm/s 10 ⁸ 10 ⁵ 10 ⁴ 10 ³ INSTALLATION AND
BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m
0	PAVEMENT SURFACE ASPHALT CONCRETE Mottled brown and grey silty clay, some sand, trace gravel, occ. sand and topsoil		177.15 0.00 0.18 176.74 0.41		50 DO	12	177	(Golder Report No. 011-4205)
1	pockets (FILL)		176.24 0.91	2	50 DO		176	
2	Hard to very stiff, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)	9		3		42	175	
3	(NEC)	10/0/		5			174	
POWER AUGER	HOLLOW STEM		173.49 3.66	6			173	Borehole dry during drilling on August 29 2001
				7	50 DO	13	172	O O
	Very stiff to stiff, grey SILTY CLAY, some sand, trace gravel (TILL)	0 0		8	50 DO	9	171	
,							170	Φ +Φ +
8	END OF BOREHOLE		169.07 8.08	9	50 DO	5		
9								
0								

DEPTH SCALE

1:50



RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: AUGUST 28, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

ETHOD		SOIL PROFILE	TO.	<u> </u>	┢	MPLI	-1	NOIT	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s T Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y
RORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m
L	1	PAVEMENT SURFACE		178.45 0.00					(Golder Report No. 011-4205)
	ŀ	ASPHALT CONCRETE with steel wire mesh at base		0.18 178.07					
		Firm, black clayey TOPSOIL	1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,	0.38 177.61 0.84	1	50 DO	7	178	0
		Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, fissured, occ. silt pockets, intrusions (TILL)		0.84	2	50 DO	11	177	
			9	176.47 1.98		50 DO	16		Backfill Material
					4	50 DO	53	176	O □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □
		Hard to very stiff, brown SILTY CLAY, some sand, trace gravel (TILL)	0		5	50 DO	37	175	September 13, 2001
POWER AUGER	HOLLOW STEM			174.06	6	50 DO	18	474	
5				4.39	7	50 DO	14	174	
6		Stiff, grey SILTY CLAY, trace gravel (TILL)	100					173	Bentonite Seal
		Compact, grey SILTY FINE SAND, trace gravel		172.13 6.32	8	50 DO	12	172	August 28, 2001 Backfill Material
7		Stiff, grey SILTY CLAY, some sand, trace gravel		171.35 7.10				171	
8		(TILL) END OF BOREHOLE		170.37 8.08	9 7 8	50 DO	9		O Water seemes into
9		·						: :	Water seepage into borehole encounters at about elevation in during drilling on August 28, 2001 Water level in stand
ō									at elevation 175.7 m September 13, 2001
		SCALE			1_				Golder LOGGED: CC.

1:50

Golder Associates CHECKED: CC.

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 10, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

	THOD	2	SOIL PROFILE		1	SA	MPL	ES	N	\ 1	C CONDUCTIVITY,	AL ING	INSTALLATION
FEET	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION		10 ⁵ 10 ⁴ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³ 10 ³	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0			GROUND SURFACE	2 27	606.3 0.0				(Gol	ler Report No. 011-4226)			-
			Black clayey TOPSOIL	2,20	604.9	l	AS		"Not	: This Drawing has been			
			Loose brown, SILTY SAND, some clay, trace gravel		601.8	2	2" DO	6	Redu	red and is in Imperial Units"	1 1 1 1		□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □
5			Very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, some silt pockets and fissures (TILL)		4.5 598.3	3	2" DO	23	600	0			Backfill Material
10	POWER AUGER	SOLID STEM	Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, some oxidation and fissures (TILL)		8.0	4	2" DO	42	595	-	0		Bentonite Seal Backfill Material
			•		589.3 17.0		ВО		590				
20			Stiff, grey SILTY CLAY, some sand, trace gravel (TILL)		584.8	6	2" DO	9	,		0		
			END OF BOREHOLE	1	21.5				585				Borehole dry during drilling on October 10, 2001
25												- 1	Water level in standpip at elevation 603.7 ft. o October 12, 2001
30						:						2	
35													
												:	
 DE	PTI	нѕ	CALE		<u>L</u>					Golder			LOGGED: A.S.

1 inch to 5 feet

LOGGED: (1.S.

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 10, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

	HO HO	SOIL PROFILE			SA	MPL	ES	Z	DYNAMIC PENET RESISTANCE, BI	RATION OWS/ft		HYDRAULIC k, cm	CONDUCT /s	IVITY,	T	NG AL	INSTALLATION
FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	20 40 SHEAR STRENG Cu, psf 400 800		l	WATER	10 ⁵ 10 CONTENT ——————————————————————————————————	PERCEN	√i Vi	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE		606.2				(Gol	der Repoi				20 0				
U	-	Black clayey TOPSOIL	200	605.0				"Not	e: This Dr	awing h	as bee	n					
				605.0	1	AS	-	Redu	ced and is	in Impe	erial U	nits"	10				
			%	1									0				
		Very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel,		1	2	2" DO	18			:		0					
5		occ. silt seams (TILL)		1	_												
				1	3	2" DO	18	600				0					
ĺ		-		599.2				000									
				7.0	4	2" DO	27					0					Borehole dry during
					Ľ	DO	2'										drilling on October 10, 2001
10	UGER	Very stiff to hard, brown and grey			L												
	VER AI	Very stiff to hard, brown and grey SILTY CLAY, some sand, occ. gravel, occ. fissures (TILL)			5	2" DO	45	595				0					
	o g	3 ()															
			0		6	2" DO	31					0					
	l			592.2 14.0													
15			10/		7	2" DO	15					0					
				1	Ľ	DO	15	590				0				1	
		Very stiff to stiff, grey SILTY CLAY,		4													
		some sand, trace gravel (TILL)															
		ų		1													
20					8	2" DO	11						,			ļ	
	H	END OF BOREHOLE		584.7 21.5				585								1	
																l	
25																	
					1												
					l												
30																	
35																	
															ļ		
_				<u> </u>					Go							<u> </u>	<u> </u>

DEPTH SCALE

1 inch to 5 feet



RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 10, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

_	НОБ	SOIL PROFILE			SA	MPL	ES	z	DYNAMIC PENETRA RESISTANCE, BLOV	TION VS/ft	HYDRAULIC C	ONDUCTIVITY,	NG PL	INSTALLATION
FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	20 40 SHEAR STRENGTH Cu, psf 400 800	nat V. + Q - (rem V. ⊕ U - 0	WATER C	10 ⁵ 10 ⁴ 10 ³ 1000 1000 1000 1000 1000 1000 1000 10	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE	222	606.9				(Gol	der Report			30 40		
		Black clayey TOPSOIL	ر مر در مرمر در مرمر	605.3	1	AS	_	"No	e: This Drav	ving has b	een	þ		
5		Hard, mottled brown and grey, SILTY CLAY, some sand, trace gravel, occ. silt pockets (TILL)		1.6	2	2" DO	42	Redi	ced and is in	a Imperial	Units"			
	2	Very stiff to hard, brown SILTY CLAY,		600.4	4	2" DO 2" DO		600			0			Borehole dry during drilling on October 10, 2001
10	SOLID STEM	some sand, frace gravel, occ. silt pockets and sand partings, fissured (TILL)			5	2" DO	49	595			0			
15				592.9 14.0	L	2" DO	23				0			
		Very stiff, grey SILTY CLAY, some sand, trace gravel, occ. silt or sand layer (TILL)			7	2" DO	17	590			0			
20		END OF BOREHOLE		585.4 21.5		2" DO	15				0			
25														-
30														
35														

DEPTH SCALE

1 inch to 5 feet

LOGGED: J.S.

RECORD OF BOREHOLE 4

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 11, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

_	6	3 1	SOIL PROFILE			SA	AMPL	ES		DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, RESISTANCE, BLOWS/ft k, cm/s	
FEET	NETTH ONIGO	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	RESISTANCE, BLOWS/ft	TER
0			GROUND SURFACE	1	607.0				(Go	der Report No. 011-4226)	
ا			Black clayey TOPSOIL	7 27 2 27	0.0 606.0	ı			"No	e: This Drawing has been	
					1.0	L	AS		Redi	ceed and is in Imperial Units"	
5			Very stiff, mottled brown and grey SILTY CLAY to CLAYEY SILT, some sand, trace gravel, occ. silt seams or pockets (TILL)	6		3	2" DO AS				
				8	600.0	┢	2" DO	18	600		
	œ									Borehole dry during drilling on October 2001	าg r 11
10	POWER AUGE	SOLID STEM	Hard, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)			5	2" DO	58	595		
				1/2 1/2	593.0 14.0				J 95		
15						L	2" DO	27			
			Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)	2					590		
20					585.5	7	2" DO	16		0	
			END OF BOREHOLE		21.5						
25											
				:							
30								and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s			
35											
			<u> </u>		<u> </u>					Coldon LOGGED: J.S	

DEPTH SCALE

1 inch to 5 feet

Golder Associates LOGGED: J.S.

CHECKED: /

RECORD OF BOREHOLE

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 10, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in PENETRATION TEST HAMMER, 140lb; DROP, 30in DYNAMIC PENETRATION RESISTANCE, BLOWS/ft HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE FEET ADDITIONAL LAB. TESTING INSTALLATION ELEVATION 10⁻⁶ 10⁻⁵ 10⁻⁴ 80 40 60 AND BLOWS/ft NUMBER GROUNDWATER ELEV SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION OBSERVATIONS DEPTH Wp I ─ ○ W WI (ft) 800 1200 1600 20 (Golder Report No. 011-4226) GROUND SURFACE 606. "Note: This Drawing has been Black clayey TOPSOIL 605.2 AS Reduced and is in Imperial Units" 2" DO 2 0 Stiff to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt or sand pockets (TILL) 2" DO 3 26 0 600 2" DO Borehole dry during 37 0 drilling on October 10, 2001 AUGER STEM 5 2" DO 0 Hard, brown SILTY CLAY, some sand, trace gravel, fissures, some silt pockets (TILL) 595 2" DO 6 30 0 15 15.0 2" DO 7 13 0 590 Stiff, grey SILTY CLAY, some sand, trace gravel (TILL) 20 2" DO 0 8 11 585.1 END OF BOREHOLE 25 BHS 011-4226.GPJ GLDR_CAN.GDT 10-17-01 DATA INPUT: Tony Mastrolanni 30

DEPTH SCALE 1 inch to 5 feet



LOGGED: J.S.

CHECKED:

RECORD OF BOREHOLE 6

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: October 11, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

ш	9	SOIL PROFILE			SA	MPLI	ES		DYNAN	IIC PENI	ETRATIONS	ON (ft)	HYDRA	AULIC CO	ONDUCT	IVITY,	Ţ	(2)	
DEPTH SCALE FEET	BORING METHOD		POJ		œ		¥	ELEVATION	2				30	10	0° 10) ⁻⁴ 10). I	ADDITIONAL LAB. TESTING	INSTALLATION AND
PTH	ING I	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	MBE	ТҮРЕ	OWS	LEVA	SHEAR Cu. psf	STREN	GTH r	nat V. + em V. +	Q - • U - O	W	ATER CO				DDITI B. TE	GROUNDWATER OBSERVATIONS
ద	BOR		STRA	(ft)	ž	-	B	ш	4C			00 16		VV	0 2	0 3		ν ι 0	₹≾	
- 0		GROUND SURFACE		607.2				(Go	lder l											_
		Black clayey TOPSOIL	222	0.0 606.1					te: Tl							b l				
L			3	1.1	1	AS	-		iced (,					
			2/	1	H	-		000				1		I						-
		Chiff to year of iff monthlad beauty and area	6	1	2	2" DO	14								0					-
		Stiff to very stiff mottled brown and grey SILTY CLAY, some sand, trace gravel, some silt and sand pockets, fissures		1																-
- 5		(TILL)	9	1	3	2" DO	20							İ	0					_
<u> </u>				1	Ľ	DO														-
				,				600						-						~
-				599.2 8.0																Borehole dry during drilling on October 11,
ŀ	œ		2/	1	ļ															2001
- 10	AUGE	Hard brown SILTY CLAY, some sand,		1		2"														_
-	SOLID STEM	trace gravel, fissures (TILL)		1	4	2" DO	43								0					-
ŀ		(1166)		1	١.			595				-	ļ							-
<u> </u>				1															:	-
-			10	593.2 14.0	1															-
- 15			1	1	-	_								İ						-
}				1	5	2" DO	17								0					-
ŀ				1				590					ļ							-
-		Stiff to very stiff, grey SILTY CLAY, some sand, trace gravel (TILL)	1	1											!					-
-				1																-
- 20					L															-
Ŀ				585.7	6	2" DO	12								0					-
ŀ		END OF BOREHOLE	Γ	21.5																-
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- 25																				-
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DE	PTH:	SCALE						4			1.1									LOGGED: J.S.

DEPTH SCALE

1 inch to 5 feet

Golder Associates LOGGED: J.S.
CHECKED:

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: NOVEMBER 21, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

Ş	3	SOIL PROFILE			SA	MPL	ES	z	DYNAMIC PENE RESISTANCE, E	TRATIONS	ON fft		HYDRA	AULIC CC k, cm/s	NDUCTIV	/ITY,	Ţ	ا و پ	INSTALLATION
CONTENT ON GOOD	BORING ME	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)		TYPE	BLOWS/ft	ELEVATION	20 40 SHEAR STRENG Cu, psf 400 80	GTH r	<u> </u>		Mt M		NTENT F	PERCENT		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
, L		GROUND SURFACE	2	575.2 0.0		Г		(Gol	der Repo				276)						
		Black clayey TOPSOIL	**************************************	573.2 2.0	1	AS		"No	te: This Druced and is	awii	ng ha	s bee	n		0				
5		Stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt pockets and fissures (TILL)		568.7	3	2" DO	8	570						O					
		Very stiff, brown SILTY CLAY, some sand, trace gravel, fissured (TILL)		6.5	4	2" DO	26							0					
0 2		Sand, date graver, dissured (TILL)	9/		5	2" DO	15	565						0					Borehole dry during
POWER AUGER	SOLID STEM		2/	562.7 12.5	6	2" DO	8							0					drilling on November 21, 2001
5			6		7	2" DO	8	560		Ф		+		0					
0		Stiff, grey SILTY CLAY, some sand, trace gravel (TILL)			8	2" DO	6	555	Φ	•	+			0					
5								550	⊕	+									
		END OF BOREHOLE		548.7 26.5	9	2" DO	9							0					
0																			
5																			
									Go										

DEPTH SCALE

1 inch to 5 feet



RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: NOVEMBER 22, 2001

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

]	호	Ļ	SOIL PROFILE		,	SA	MPL	ES	<u>z</u>	DYNAMIC I RESISTAN	CE, BL	OWS/f	N ŧ	1	HYDRA	k, cm/s	NDUCTI	VIIY,	T	ا ڳوڻ	INSTALLATION
	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	20 SHEAR ST Cu, psf			at V. + m V. ⊕	Q - • U - O	W _p	·	ONTENT I	PERCEI	NT WI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
\dagger	ш	+	GROUND SURFACE	S.	575.1	┝		-	(Ca	400	800		00 16			0 2	30) 4	0		
` -			Black clayey TOPSOIL	2, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20 X, 20	573.1 2.0	1	AS	•	"No	lder Re te: This uced an	Dro	awir	ig ho	ıs bee	en		0				
			Firm to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt and sand pockets, topsoil intrusions (TILL)			2		6	570							(
					568.6 6.5	4	2" DO	26								0					
,			Very stiff, brown SILTY CLAY, some sand, trace gravel, occ. fissures, silt pockets (TILL)	9		5	2" DO	21	565							0					
	POWER AUGER	SOLID STEM			562.6 12.5	6	2" DO	10								0					Borehole dry during drilling on November 22, 2001
5				8		7	2" DO	8	560					>2000-	-	0		•			
,			Very stiff to stiff, grey SILTY CLAY, some sand, trace gravel (TILL)						555		0	Ф	+	+							
						8	2" DO	6			₽	+	-			0					
			END OF BOREHOLE		548.6 26.5	9	2" DO	10	550							0					

DEPTH SCALE

1 inch to 5 feet



RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 140lb; DROP, 30in

BORING DATE: NOVEMBER 22, 2001

DATUM: GEODETIC

PENETRATION TEST HAMMER, 140lb; DROP, 30in

	皇	SOIL PROFILE			SA	MPL	ES	z	DYNAMIC PEN RESISTANCE,	BLOWS	ON /ft		HYDRA	k, cm/s	ONDUCTIV	VITY,	T	INSTALLATION
	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	20 4 SHEAR STREI Cu, psf 400 8	NGTH r		Q - • U - O	Wr Wr		ONTENT F	PERCENT WI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
,		GROUND SURFACE		575.1				(Gol	der Repo						30			17711
		Black clayey TOPSOIL	2, 22, a	0.0 574.1 1.0	ı	AS		"Not	e: This D ced and i	rawii	ng ha	s bee	n		0			Backfill Material
		Soft to very stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. silt and sand pockets, fissured (TILL)			2	2" DO	4					>2000-	-	(Bentonite Seal
5		,		568.6 6.5	3	2" DO	6	570				>2000-	_	0				
		Stiff to very stiff, brown SILTY CLAY, some sand, trace gravel, fissured			4	2" DO	18						,	0				
0		(TILL)	9/	563.1	5	2" DO	14	565						0				Backfill Material
POWER ALIGER	SOLID STEM			12.0	6	2" DO	11							0				SSAIII (HSCHEI
5			9/		7	2" DO	7	560						0				
		Stiff, grey SILTY CLAY, some sand, trace gravel (TILL)									 	+						
0		, , ,			8	2" DO	8	555						C				
									0		Φ .							
5		END OF BOREHOLE		548.6 26.5	•	2" DO	8	550						0				Rorahola day during
																		Borehole dry during drilling on November 22, 2001
0																		
5																		
<u></u>		SCALE		<u> </u>	<u>.</u>				G									LOGGED: C.C.

DEPTH SCALE

1 inch to 5 feet



RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 9, 2002

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

щ	4OD		SOIL PROFILE			SA	MPL	.ES	7	DYNAMIC PENET RESISTANCE, BI	RATION .OWS/0.3	n \	HY	YDRAULIC Co k, cm/s	ONDUCTIVITY,	TLo	INICTALL ATION
DEPTH SCALE METRES	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENG Cu, kPa	60	80	•	WATER C	0°5 10°4 10°3 L 1 1 ONTENT PERCENT	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
3	BOR			STRA	(m)	N	-	BLO	ш	20 40		ν. σ . υ. 80		Wp ├ ───	0	143	
0			GROUND SURFACE	XXXX	183.96								No.	021-40			1//1
			Black clayey topsoil, mixed with gravel (FILL)		0.00 183.65							_	1	q		1	
1			Stiff, brown silty clay, some sand, trace gravel, occ. topsoil pockets (FILL)		183.65 0.30 182.89				183					0			
·		ĺ	Stiff, black clayey TOPSOIL	**************************************	1.07 182.43		DO							0			
2			Stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL)		1.52 181.98 1.98	3	50 DO	9	182					 			
	POWER AUGER	HOLLOW STEM	Very stiff, brown SILTY CLAY, some sand, trace gravel, numerous silt/ sand pockets (TILL)		1.98	4	50 DO	26	181					p			Backfill Material
					180.30 3.66	5	50 DO	26					ļ	q			₹
4			Very stiff, grey SILTY CLAY, some sand, trace gravel (TILL)					22	180					0			
5		-	END OF BOREHOLE		178.93 5.03	7	50 DO	16	179					•			
6																	Water level in boreho at about elevation 18t m. approximately 2 h after completion of drilling on April 9, 200
7																	Water level in standp at about elevation 18 m. on April 23, 2002
8																	
9																i	
10																	
DEI		H S	CALE							Gol	der	_					LOGGED: C.C.



RECORD OF BOREHOLE

REHOLE 2

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 9, 2002

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

SHEET 1 OF 1

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION ELEVATION AND GROUNDWATER BLOWS/0.3m 10.4 TYPE ELEV. SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ WATER CONTENT PERCENT STRATA DESCRIPTION **OBSERVATIONS** DEPTH -ОW Wp ⊩ (m) 20 GROUND SURFACE (Golder Report No. 021-4035) 184.0 Granulated recycled asphalt and 184 0.00 183.87 concrete (FILL) 0.20 AS 0 Very stiff, brown, silty clay, some sand, trace gravel, occ. topsoil pockets (FILL) 50 DO 20 2 0 183 182.85 1.22 Black clayey TOPSOIL 182.54 1.52 Stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occ. sand pockets (TILL) 50 DO 3 9 0 _<u></u>___ Water 182.09 1.98 182 Seepage Water seepage into POWER AUGER borehole encountered at about elevation 182.3 50 DO 34 0 m. during drilling on April 9, 2002 Hard, brown SILTY CLAY, some sand, trace gravel (TILL) 181 50 DO 42 5 0 180.56 3.51 50 DO 28 180 Very stiff, grey SILTY CLAY, some sand, trace gravel (TILL) 50 DO 23 0 END OF BOREHOLE

DEPTH SCALE

1:50

8

GolderAssociates

LOGGED: C.C.

RECORD OF BOREHOLE 9

SHEET 1 OF 1

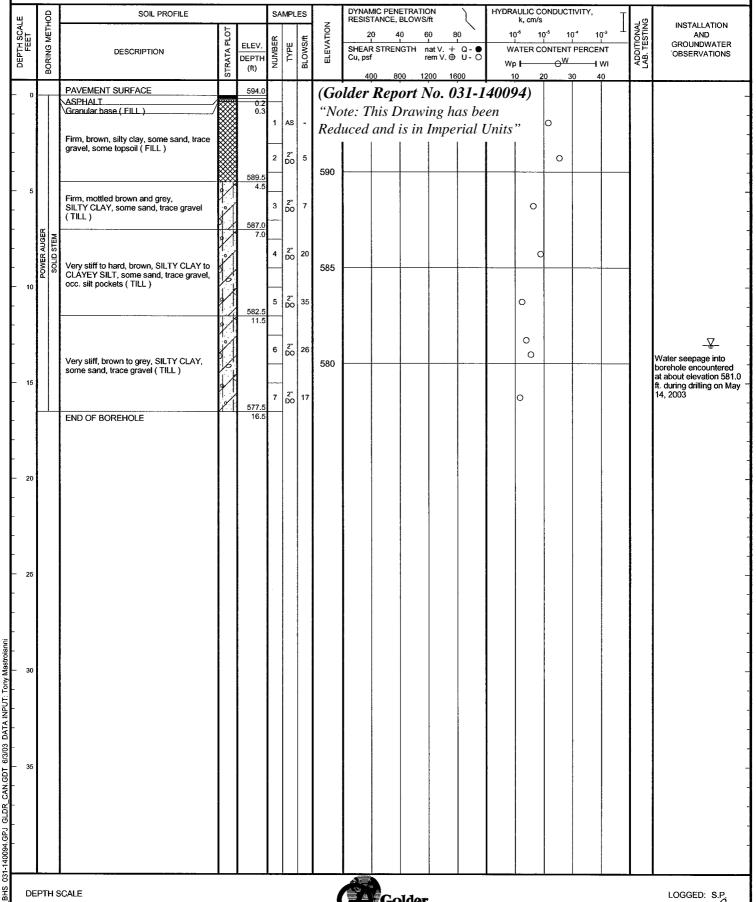
LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 140lb; DROP, 30in

BORING DATE: MAY 14, 2003

DATUM: GEODETIC

PENETRATION TEST HAMMER, 140lb; DROP, 30in



1 inch to 5 feet



CHECKED:

RECORD OF BOREHOLE 10

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 14, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DESCRIPTION PAVEMENT SURFACE ASPHALT Granular base (FILL) Firm, mottled brown and grey, silty clay nixed with topsoi, some sand, trace gravel (FILL) Firm, mottled brown and grey, SILTY CLAY, some sand, trace gravel TILL) Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt bockets (TILL) Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)	STR	ELEV. DEPTH (ft) 594.0 0.2 0.6 589.0 7.0 581.5 12.5	Win 2 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	AS 2" DC 2" DC	- 6	"No Rea 590	SHEAR S'Cu, psf 400 Alder Ro Luced and	800 1 eport 1 s Draw	nat V. + rem V. ⊕ 200 16 Vo. 0. ing ha	31-14 as bee	w ₁ 4009 en	0 2 4)	NTENT P	ERCENT WI 40		LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
ASPHALT Granular base (FILL) Firm, mottled brown and grey, silty clay nixed with topsoi, some sand, trace gravel (FILL) Firm, mottled brown and grey, SILTY CLAY, some sand, trace gravel TILL) Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt bockets (TILL)		589.0 5.0 5.0 7.0 7.0	2 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	2" DC	6	"No Rea 590	lder R ote: This	eport l Draw	No. 0 . ing ha	31-14 as bee	4009 en	, o	o				
Firm, mottled brown and grey, silty clay nixed with topsoi, some sand, trace gravel (FILL) Firm, mottled brown and grey, SILTY CLAY, some sand, trace gravel TILL) Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt bockets (TILL)		589.0 5.0 587.0 7.0 581.5 12.5	1 2 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	2" DC	6	"No Rea 590	ote: This		ing ho	ıs bee	en	, 0					
mixed with topsoi, some sand, trace gravel (FILL) Firm, mottled brown and grey, SILTY CLAY, some sand, trace gravel TILL) Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt bockets (TILL)		587.0 7.0 7.0 581.5	2 3 3 5 5 5 5	2" DC	6	590 585											
mixed with topsoi, some sand, trace gravel (FILL) Firm, mottled brown and grey, SILTY CLAY, some sand, trace gravel TILL) Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt bockets (TILL)		587.0 7.0 7.0 581.5	3 5 5 5 5	2" DCC	6 22	585											
Firm, mottled brown and grey, SILTY CLAY, some sand, trace gravel TILL) Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt bockets (TILL) Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)		587.0 7.0 7.0 581.5	3 5 5 5 5	2" DCC	6 22	585											
Very stiff, grey, SILTY CLAY, some sand, trace gravel Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt sockets (TILL)		587.0 7.0 7.0 581.5	3 4 5 5 5 5	2" DC	22	585									: :: ::		
Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt sockets (TILL)		587.0 7.0 581.5	3 4 5	2" DC	22												
Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt bockets (TILL) Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)		581.5 12.5	5	2" DC	22							0					i
very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)		581.5 12.5	5	2" DC									i				
very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)		12.5	5	2" DC						1			- 1	i i			_ <u>₹</u>
very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)		12.5	5		30							0					Water seepage into borehole encountere at about elevation 58
Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)		12.5	5		30											ļ	ft. during drilling on M 14, 2003
sand, trace gravel (TILL)		12.5	5									o					14, 2000
sand, trace gravel (TILL)		12.5	5	2" DC													
sand, trace gravel (TILL)			6	ĎC													
sand, trace gravel (TILL)				⊢ .	22	580						0					
END OF BOREHOLE		┨	₽														
END OF BOREHOLE	7 1		7	2" DC	, 18							0					
		577.5 16.5		1													
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		l															
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	ı																
		4				<u> </u>				i							1

1 inch to 5 feet

CHECKED: 4

RECORD OF BOREHOLE 113

BORING DATE: DECEMBER 1, 2003

SHEET 1 OF 1

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

S	THOD	SOIL PROFILE	T =		S/	MPI	_	z	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s S INSTALLATION
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 60 80 10 ⁶ 10 ⁵ 10 ⁴ 10 ³ 1 10 ³
0		GROUND SURFACE	***	175.83 0.00					(Golder Report No. 031-140318)
		Black, clayey topsoil (FILL)		175.22		AS	-		
1		Stiff dark brown silty clay, occasional pockets of topsoil (FILL)		0.61 174.69 1.14	2	50 DO	13	175	
2		Stiff to very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel, fissured (TILL)			3	50 DO	17	174	0
				173.09 2.74	4	50 DO	30	173	0
3		Hard to very stiff, brown, SILTY CLAY , some sand, trace gravel, fissured			5	50 DO	45		0
4	POWER AUGER HOLLOW STEM	(TILL)			6	50 DO	30	172	Borehole dry during drilling on December 2003
5				171.26 4.57	7	50 DO	13	171	
6			10					170	
7		Stiff to very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)			8	50 DO	11	169	0
7			(a) (a)						>96+ >96+
8		END OF BOREHOLE		167.75 8.08	9	50 DO	9	168	
9									
10					:				
DEI		CALE	نـــا		<u> </u>	<u>. </u>			Golder LOGGED: C.C Associates CHECKED: GM

RECORD OF BOREHOLE 114

BORING DATE: DECEMBER 1, 2003

SHEET 1 OF 1

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

ļ.,	운	SOIL PROFILE			SA	MPL		z	DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, k, cm/s
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 60 80 10° 10° 10° 10° 10° 15° 10° 10° 10° 10° 10° 10° 10° 10° 10° 10
0		GROUND SURFACE		175.37					(Golder Report No. 031-140318)
		Black, clayey TOPSOIL	**************************************	0.00 174.61	1	AS	-	175	
1		Stiff to very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		0.76	2	50 DO		174	0
3		Hard to very stiff, brown, SILTY CLAY, some sand, trace gravel, fissured (TILL)		173.27 2.10	4	50 DO	39	173	
				172.09 3.28	5	50 DO	20	172	O Borehole dry during
4	POWER AUGER HOLLOW STEM		4		6		11	171	O O O O O O O O O O O O O O O O O O O
5		Very stiff to firm, grey, SILTY CLAY, some sand, trace gravel (TILL)	0		7	50 DO	8	170	Φ +
6					8	50 DO	11	169	
8		Compact, grey, SILTY FINE SAND, trace gravel, occ. clay pockets		168.27 7.10 167.29 8.08		50 DO	21	168	0
9		END OF BOREHOLE		6.08					
10									

1:50

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 16, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

((9		SOIL PROFILE	I 1		SA	MPL	_	z	DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, K, cm/s INSTALLA	
METRES	COLTENA CIVICO	BORING ME	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 60 80 10° 10° 10° 10° 10° 10° 10° 10° 10° 10) VATE
0		⇉	GROUND SURFACE	Ĭ	175.11			П		20 40 60 80 10 20 30 40 (Golder Report No. 031-140333)	
Ĭ		╽╏	Grey/ brown, granular base (FILL)	<u> </u>	0.00 0.18				175		
			Black, clayey TOPSOIL	1, 2021 1, 2021 1, 2021	174.35	1	AS	-			
1			Stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		0.76	3	50 DO	10			
3	POWER AUGER	HOLLOW STEM	Hard to very stiff, brown, SILTY CLAY, some sand and gravel, fissured		172.97 2.13		50 DO	31	173	O Borehole dry du drilling on Dece 16, 2003	uring embe
			(TILL)		171.45	⊦	50 DO	26	172	0	
4			Stiff, grey, SILTY CLAY, trace to some sand and gravel		3.66	<u> </u>	50 DO	13	171	0	
5			(TILL) END OF BOREHOLE		170.08 5.03	l	50 DO	11			
6											
7											
8											
9											
10										Golder LOGGED:	

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 16, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

ES	ETHOD	SOIL PROFILE	Ь	I	H	AMPL	_	NOI	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m 20 40 60 80 SHEAR STRENGTH nat V. + Q. ● Cu, kPa WATER CONTENT PERCENT Wp — WH WH WH WH WH WH WH WH WH WH
0	_	GROUND SURFACE		176.43					(Golder Report No. 031-140333)
		Black, clayey topsoil (FILL)	₩	0.00 176.18					
				0.25	1	AS	-	176	
1					2	50 DO	12		
2		Stiff to firm, brown, silty clay, some sand, trace gravel, with some topsoil intermixing/ pockets and layers (FILL)			3	50 DO	11	175	0
				173.53	4	50 DO	6	174	0
3		Very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)	1/ 1/ 1/	2.90 173.08 3.35	-	50 DO	15	173	0
4		Very stiff, brown, SILTY CLAY, some sand and gravel, fissured (TILL)			6	50 DO	27		
5	POWER AUGER			171.40		50 DO	20	172	0
	NOY CH			5.03				171	
6					8	50 DO	15	470	
7		Very stiff to firm, grev. SILTY CLAY						170	
		Very stiff to firm, grey, SILTY CLAY, trace to some sand and gravel, occ. silty sand and sandy silt pockets/ seams (TILL)				50		169	
8					9	50 DO	9	168	Water seepage into borehole encountere
9									es + at about 166,98m during drilling on Deember 16, 2003
		Compact, grey, SANDY SILT (TILL) END OF BOREHOLE		166.98 9.45 166.68 9.75	L	50 DO	16	167	0 0
10									

DEPTH SCALE

1:50

Golder

RECORD OF BOREHOLE 3

SHEET 1 OF 4

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 16-17, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

1 HOD		SOIL PROFILE	ΙĘ		H	AMPL		N O	DYNAMIC PENETF RESISTANCE, BLO	WS/0.3m	80	k, cm		₀₋₃]	ING	INSTALLATION
BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGT Cu, kPa 20 40	H nat VI rem V. 6		WATER Wp I—	CONTENT PERCEI	NT WI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
, 	7	GROUND SURFACE	×××	177.06 0.00				177			-	o. 031-1		Ì		
					1 2	AS 50 DO		176				0	Φ			
		Stiff to very stiff, brown, silty clay, some sand, trace gravel, with black topsoil, intermixing, pockets and layers (FILL)			3	50 DO	21	175				o				
					4	50 DO	20					0				
JGER	STEM				5	50 DO	21	174				0				
POWER AUGER	HOLLOWS	Very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel, occ. fine sand partings (TILL)		173.25 3.81 172.64	6	50 DO	26	173				0				
		Very stiff, brown, SILTY CLAY, some sand and gravel, fissured (TILL)		4.42 171.88	7	50 DO	27	172				0				Borehole dry during drilling on December 16, 2003 prior to commencing wash boring
			\$/ \$/ \$	5.18	8	50 DO	13				:	0				
3			1		9	50 DO	9	171				C				
,		Stiff, grey, SILTY CLAY, trace to some sand and gravel, occ. silty sand and sandy silt till pockets/ seams (TILL)						170		⊕	+					
WASH BORING	HQ CASING				10	50 DO	9	169				0				
	±	Dense, grey, SANDY SILT, trace to		168.53 8.53	_						>96+ >96+					
WASH BORING	UNCASED	some clay and gravel (TILL) Firm to stiff, grey, SILTY CLAY, trace sand and gravel, occ. silt and fine sand partings/ pockets (TILL)	6 9/ 9/	167.76 9.30 167.31	11	50 DO	35	168								
	\dashv	— CONTINUED NEXT PAGE —		9.75	_						_				 	

DEPTH SCALE

1:50





RECORD OF BOREHOLE 3

BORING DATE: DECEMBER 16-17, 2003

SHEET 2 OF 4

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	НОБ	SOIL PROFILE	<u>.</u>		SAMP		z	DYNAMIC PENETRA RESISTANCE, BLOV	TION VS/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s	T _je	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGTH Cu, kPa 20 40	nat V. + Q - ● rem V. ⊕ U - ○	10 ⁴ 10 ⁵ 10 ⁴ 10 ³ WATER CONTENT PERCENT Wp I — — — W — I WI 10 20 30 40	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
10		— CONTINUED FROM PREVIOUS PAGE	1 7			I	167			0. 031-140333)		
11					12 50 DC		166			0		
13					13 DC	5	165			0		
14					14 50	5 5	164			0		
115	WASH BORING UNCASED	Stiff to very stiff, grey, SILTY CLAY, trace to some sand and gravel, occ. silty sand and sandy silt till partings/ layers (TILL)			15 50 DC	4	162			0		·
16					16 50	4	161			0		
17							160	⊕	+ +			
18					17 DC	7	159					
			100		18 50	10	158			0		
20		— CONTINUED NEXT PAGE	1					 			+	

DEPTH SCALE

1:50



LOGGED: C.C.

CHECKED:

RECORD OF BOREHOLE 3

SHEET 3 OF 4

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 16-17, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

6	맫	SOIL PROFILE	Ι⊨		SA	MPL	-	Z.	1	MIC PEN TANCE,			1			ONDUCT		NG ING	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAF Cu, kP	R STREM	IGTH	nat V. + rem V. ⊕	Q - • U - O	W	ATER C	0 ^{.5} 10 ONTENT ——————————————————————————————————	PERCE	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
20		CONTINUED FROM PREVIOUS PAGE						157			,	Rep	,	-	•				
21 22 23 23 24 25 26 27	WASH BORING	Stiff to very stiff, grey, SILTY CLAY, trace to some sand and gravel, occ. silty sand and sandy silt till partings/ layers (TILL)		150.09 26.97	20	50 50 50 50 50 50 50 50 50 50 50 50 50 5	17	156 155 154 153		€9 €		+				0			
		Loose, grey, SILTY FINE SAND	1	149.48 27.58	23	50 DO	7	150								0			
29		Very stiff, grey, SILTY CLAY, trace to some sand and gravel (TILL)			24	50 DO	17	149									0		
30	H	CONTINUED NEXT PAGE	$-\mathbf{H}^{2}$	1	\vdash	-			 	<u> </u>	 			\vdash		 	 	\vdash	



RECORD OF BOREHOLE

BORING DATE: DECEMBER 16-17, 2003

SHEET 4 OF 4

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES DEPTH SCALE METRES INSTALLATION STRATA PLOT AND GROUNDWATER OBSERVATIONS BLOWS/0.3m 40 TYPE ELEV. SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH -0W (m) - CONTINUED FROM PREVIOUS PAGE -(Golder Report No. 031-140333) Very stiff, grey, SILTY CLAY, trace to some sand and gravel (TILL) 25 50 DO 25 146.58 30.48 END OF BOREHOLE 33 35 37 BHS 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastrolanni

DEPTH SCALE

1:50



RECORD OF BOREHOLE 4

BORING DATE: DECEMBER 8-11, 2003

SHEET 1 OF 4

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

ТНОБ	SOIL PROFILE	Ŀ	<u> </u>	SA	MPLI	-	N O	DYNAMIC PENE RESISTANCE, B			١,		k, cm/s	NDUCTIV		. I	ING ING	INSTALLATION
BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENG Cu, kPa 20 40	STH n	at V. + em V. ⊕ 0 80	Q - • U - O	Wp	TER CC	ONTENT P	ERCEN		ADDITIONAL LAB. TESTING	AND GROUNDWATE OBSERVATION:
_	GROUND SURFACE		177.16 0.00					(Gold	ler I	Repoi	rt No	o. 03	1-14	0333 ,)			
	Black, clayey topsoil, occ. gravel and brick fragments (FILL)		176.40	1	AS	-	177					É	,					
	Very stiff, brown to brown and grey, silty clay, some sand, trace gravel,		0.76		50 DO	19	176						0					
	some black topsoil intermixing (FILL)		175.03 2.13		50 DO	15	175						0					
	Stiff dark brown to black, clayey TOPSOIL	1, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21, 20 21,	174.26	4	50 DO	14												
GER	Sliff to very stiff, mottled brown and grey,		2.90	5	50 DO	10	174						0					
POWER AUGER HOLLOW STEM	(TILL)	1	172.74		50 DO	19	173						0					
	Very stiff, brown, SILTY CLAY, some		4.42	7	50 DO	28	172						o I—		l		МН	Borehole dry during drilling on December 2003 prior to commencing washboring
	sand and gravel, fissured (TILL)		171.22	8	50 DO	28	112						0					
	Very stiff to stiff, grey, SILTY CLAY,		5.94		50 DO	9	171						0					
	trace to some sand and gravel (TILL)	1	170.00 7.16	10	50 DO	14	170				>9 6+	0	0					
	Compact, grey, SILTY FINE SAND		169.69 7.47		1											!		
WASH BORING HO CASING	o Nicky) 			50 DO	9	169				:		0					
RING	Stiff to very stiff, grey, SILTY CLAY, trace to some sand and gravel, occ. silty sand and sandy silt till pockets/ seams										>96+ >96+							
WASH BORING	Λ.			12	50 DO	8	168	•		+			C					
		М		l						ľ								

DEPTH SCALE

1:5



RECORD OF BOREHOLE 4

BORING DATE: DECEMBER 8-11, 2003

SHEET 2 OF 4

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

» ALE	HOD	SOIL PROFILE	- -	- 1	S/	AMPL	_	ž	DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, K, cm/s 42 INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 60 80 10° 10° 10° 10° 10° 10° 10° 10° 10° 10
10	_	— CONTINUED FROM PREVIOUS PAGE	=		L	I			(Golder Report No. 031-140333)
		Compact, grey, SANDY SILT (TILL	19:1	196.64 166.64	13	50 DO	20	167	
11								166	Φ +Φ +
12				*	14	50 DO	8	165	
13								404	⊕ + + + + + + + + + + + + + + + + + + +
					15	50 DO	11	164	0
14								163	Φ+Φ
15	WASH BORING	Firm to stiff, grey, SILTY CLAY, trace to some sand and gravel, with occ. sill sand and sandy silt till pockets/ seams (TILL)	y 12		16	50 DO	10	162	0
16	-	sand and sandy silt till pockets/ seams (TILL)	7						Φ+Φ
			* *		17	50 DO	6	161	0
17								160	⊕ +
18					18	50 DO	8	159	0
19									Φ++ <
					19	50 DO	9	158	D D
20		— CONTINUED NEXT PAGE —							
DEF		SCALE						(Golder LOGGED: C.C. Associates CHECKED:

RECORD OF BOREHOLE 4

BORING DATE: DECEMBER 8-11, 2003

SHEET 3 OF 4

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

І	0	SOIL PROFILE			SA	MPLE	s		DYNAM RESIST	IC PEN	ETRATIO	ON	`	HYDR	AULIC Ç	ONDUCT	IVITY,	Т		
METRES	BORING METHOD		ا ا	Π			-	NO NO	RESIST 20				30					^{6.3}	ADDITIONAL LAB. TESTING	INSTALLATION AND
METR	NG	DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	YPE	BLOWS/0.3m	ELEVATION	SHEAR Cu, kPa		L		Q - • U - O	w	ATER C	ONTENT	PERCE		DITIC	GROUNDWATER OBSERVATIONS
-	BORII		TRA	DEPTH (m)	Ž	۲	BLOW BLOW	ద						١٧٧				WI	PB B	OBOLIVATION
20		CONTINUED FROM PREVIOUS PAGE	9	f	H		+		20) 4	υ (G_{0}			20 3		10 21_1	103	33)
20			1/		П		┪	157			Ф	+	GO	mer i	κ <i>ep</i> α)	<i>0. 0</i> .)1 - 1'	+UJ.)
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				1			1													
				1		50														
21				1	20	DO	8	156								0				
				1			1						ļ							
							1				⊕	+								
				1			1				•	_								
22							1	155												
			10		21	50	8													
						DO	$^{\circ}$									0				
23				1			1													
20			9	1				154			0	+				 				
				1			1				⊕	+								
	-			1																
24				1	22	50 DO	10									0				
	ı			1				153						<u> </u>						
				1								ľ								
ı	ے ع	Firm to atiff areas CII TV CI AV tone		1																ı.
25	WASH BORING	Firm to stiff, grey, SILTY CLAY, trace to some sand and gravel, with occ. silty sand and sandy silt till pockets/ seams	1]																
	WAS	(TILL)			Ц			152					-							•
					23	50 DO	9									0			ŀ	
					\vdash															
26			\mathbb{M}					151												
			/ol			-	ł	151												
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27			1 / 1 or		24	50 DO	7	150					<u> </u>	<u> </u>			C			
					Н			.55												
			K																	
28								149												
			//		$\vdash \vdash$															
		}			25	50 DO 1	2									0				
29					Н															
20								148												
			10																	
30			1		26	1	4									<u> </u>				
		— CONTINUED NEXT PAGE —	I '	1 1	ı		- 1					1			1	1		1	ıl	

DEPTH SCALE

1:50

RECORD OF BOREHOLE 4

SHEET 4 OF 4

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 8-11, 2003

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	뒫	H	SOIL PROFILE	I ⊢	ı	SA	MPLES	-	N.	DYNAMIC PENETRA RESISTANCE, BLOW	٠,	HYDRAULIC CON k, cm/s		ING ING	INSTALLATION
	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3M	ELEVATION	20 40 SHEAR STRENGTH Cu, kPa		Wp I—	NTENT PERCENT	ADDITIONAL LAB. TESTING	AND GROUNDWATE OBSERVATION
,		┿	- CONTINUED FROM PREVIOUS PAGE	l s	 	Н	Н,	\dagger		20 40	60 80	10 20	30 40		
1		S	irm to stiff, grey, SILTY CLAY, trace o some sand and gravel, with occ. silty and and sandy silt till pockets/ seams TILL)			26	50 DO 1		147	(Golder	Report N	o. 031-140	333)		
3	WASH BORING	Sc pa	'ery stiff to hard grey, SILTY CLAY , ome sand, occ. gravel, with some silt artings TILL)		144.85 32.31	28	50 DO 2	21	145 144 143						
5	>	H	lard, grey, SILTY CLAY, occ. siltier/ andier zones (TILL)		142.26 34.90 141.19 35.97	29	50 3	86	142			0			
7		H aı (lard, grey, CLAYEY SILT, some sand nd gravel, occ. cobbles/ boulders TILL)				50 DO 10		141			c			
8	ROTARY DRILL	G L	Grey, highly fractured dolomitic,		139.09 38.07	32			139			D			
9	ROTA	G	Grey, WEATHERED SHALE		137.87 39.29 137.44 39.72	33	NX RC	Н	138						
0															

DEPTH SCALE

1:50

Golder Logged: c.c.

RECORD OF BOREHOLE 5

BORING DATE: DECEMBER 15, 2003

SHEET 1 OF 1

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT 10-5 AND GROUNDWATER BLOWS/0.3m 40 60 80 NUMBER TYPE ELEV. SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION OBSERVATIONS DEPTH 급 -ОW-(m) **GROUND SURFACE** (Golder Report No. 031-140333) AS 175 50 DO Very stiff to stiff, brown, silty clay, some sand, trace gravel, with black topsoil intermixing pockets (FILL) 50 DO 0 173.37 2.29 Hard mottled, brown and grey, SILTY CLAY, some sand, trace gravel (TILL) 50 DO 0 30 173 172.76 2.90 Hard to very stiff, brown, SILTY CLAY, some sand and gravel, fissured (TILL) 50 DO 32 5 O 172 171.69 3.96 6 50 DO 0 Borehole dry during 171 50 DO drilling on December 15, 2003 7 0 >96-1 170 8 0 169 Very stiff to stiff, grey, SILTY CLAY, trace to some sand and grave! (TILL) >96+ 031-140333.GPJ GLDR_CAN.GDT 16/2/04 DATA INPUT: Tony Mastrolanni >96-1 168 50 DO 7 0 167 50 DO 10 5 166 165.90 9.75 END OF BOREHOLE

DEPTH SCALE

1:50

Golder LOGGED: C.C.
ASSOCIATES CHECKED: M

RECORD OF BOREHOLE 6

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: DECEMBER 15, 2003

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

_							_													_
ړ	HOD	SOIL PROFILE	T	1	SA	MPL	-	z	DYNAI RESIS	/IC PEN TANCE,	BLOWS	ON /0.3m		HYDR.	AULIC Co k, cm/s	ONDUCT	IVITY,	Τ	일두	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAF Cu, kP	R STREN	IGTH I	nat V. + rem V. ⊕	30	w w _i	ATER C	OW OW		NT	ADDITIONAL LAB. TESTING	AND GROUNDWATE OBSERVATION
o		GROUND SURFACE		175.45						Γ (G	olde	r Re	port			1403	333) ¹	, J		
		Brown, silty clay, some sand, trace gravel, occ. topsoil pockets (FILL)		0.00 174.84 0.61		AS	-	175							0					
1		Stiff, black, clayey topsoil, with brown silty clay pockets (FILL)		0.61 174.08		50 DO	9								c	D				
2		Very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		1.37		50 DO	15	174							0					
	POWER AUGER	LLOW STEM		173.32 2.13		50 DO	27	173							0					Borehole dry during drilling on Decembe 15, 2003
3	PO	Very stiff, brown, SILTY CLAY, some sand and gravel, fissured (TILL)	8		5	50 DO	17	172							0					
4		:		171.79 3.66	Н	50 DO	9				•				0					
		Stiff to firm, grey, SILTY CLAY, trace to some sand and gravel (TILL)	8		7	50 DO	7	171		••					0					
5		END OF BOREHOLE		170.42 5.03	\vdash															
6 7																				
10																	·			

DEPTH SCALE

1:50

Golder

RECORD OF TEST PIT 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

] پ			SOIL PROFILE			SA	MPL	.ES			LIC CONDU , cm/s	ICTIVITY,		Т	ی ر	
METRES	METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)		TYPE		ELEVATION	1	0° 16 WATER (Wp	ONTENT	—- ! ₩I	l	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0			GROUND SURFACE					П	(6	folder	Renor	t No	031-1	4507	2)	
			Dark brown to black, silty topsoil, some clay, asphalt, concrete and brick fragments, cinders, some roots (FILL)		0.00		cs		(0			1110.		13072		
1	BACKHOE		Mottled brown and grey, silty clay, some concrete and brick fragments (FILL)				cs									
2	BAC		Black, fine sand and cinders (FILL)		1.73		cs								Chem	<u>\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ </u>
			Black, clayey silt, some sand, some galss fragments, trace gravel some organics (Fil.L) Grey, SILTY CLAY, some sand, trace		2.23 2.51										Criem	—≚ Water seepage into Test pit encountered at about 2.2m depth,
3			gravel (TILL) END OF TEST PIT		3.05		cs								i	during digging on May 22, 2003
5																
8																
10																
DEF		180	CALE		L			<u>L.</u>			Golde ssoci	r	<u> </u>		<u> </u>	LOGGED: K.B. CHECKED: K.B



LOCATION: SEE LOCATION PLAN

RECORD OF TEST PIT 2

EXCAVATION DATE: MAY 22, 2003

SHEET 1 OF 1

DATUM:

»E	0	SOIL PROFILE	- L		SA	MPL	ES.	ž	DYNAMIC RESISTAI	NCE, BLO	VS/0.3m	1	k	LIC CONDUC , cm/s	SHVITY,	و [[INSTALLATION
DEPTH SCALE METRES	METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION	l		nat V. + rem V. ⊕		WpF	ER CONTEN	/——I wi	ADDITIONAL	AND GROUNDWATE OBSERVATION
. 0		GROUND SURFACE	0,				\forall		20	(Cal	60 :	80	No 0	20	30 40		
۲		Dark brown, clayey TOPSOIL, some roots, some sand, occ. gravel (FILL)		0.00	1	cs				(Gold	ier Ke	port	1 VO. 0.	31-145	0/2)		
		roots, some sand, occ. gravel (FILL)	₩	0.30													
. 1		Mottled brown and grey, clayey silt, pieces of wood, concrete and brick, some slag, and roots (FILL)				cs											
2	BACKHOE 0.60m x 2.13m	Mottled brown and grey, silty clay, pieces of concrete and brick (FiLL)		1.22	3	cs											
		Dark brown to black, fine to medium sand, some oxidation staining, occ. gravel, some clay and silt (FILL)		1.98	4	cs										Che	m <u>Ţ</u>
		Grey to black, ORGANIC SILT, some	M	2.44	5	cs											Water seepage into Test pit encountered
		Grey, SILTY CLAY, some sand, trace			6	cs											about 2.2m depth, during digging on M
3		gravel (TILL) END OF TEST PIT		3.05	_												22, 2003
- 4 - 5																	
8																	
9																	
DEF		CALE								Golde ssoci	r	·	<u> </u>	L	<u> </u>		LOGGED: K.B.

RECORD OF TEST PIT 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

ij,			SOIL PROFILE			SA	MPL	.ES	z	HYDRAL I	ILIC CONDI	JCTIVITY,		T	ت آت	INSTALLATION
METRES		METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION		WATER Wp I	CONTENT	PERCENT WI	0 ⁻³	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		\Box	GROUND SURFACE						11	Toldor	Rono	rt No	031-1	14507	2)	
J			Dark brown, clayey silt topsoil, some roots, sand, occ. gravel (FILL)	₩	0.00	i i			((sviaer	керо	1	, ,	L 43U /.	<i>4)</i>	
			,		0.25	1	cs									
		Н	Mottled brown and grey, silty clay, some	\bowtie		L									Ī	
			Mottled brown and grey, silty clay, some concrete and brick pieces, trace roots, trace gravel (FILL)	\bowtie	1		_		ŀ							
1			(LLL)	\bowtie	3	2	cs								1	
		13m		₩	1.22	-	-									
	BACKHOE	×2.1	Mottled brown and grey, silty clay, some sand, trace gravel, fissured, oxidized	\otimes	1]
	BAC	0.60m	sand, trace gravel, fissured, oxidized (FILL)	\otimes		3	cs									
2						L										
-			Black, sandy silt, some clay, trace gravel (FILL)	\bowtie	1.98	4	cs								Chem	
			Grey to black, silty clay, some organics, trace gravel (FILL)		2.29	5	cs									<u></u>
					2.51		1									Water seepage into Test pit at about 2.29m
			Mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)	9/	1											during digging on May 22, 2003
3	\vdash		END OF TEST PIT	K	3.05										1	
			LIND OF TEST FIT		0.00	1			1						Ĭ	
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DE	PT	'H S	CALE						1		Golde ssoci	·r				LOGGED: K.B.
1:	50								•		CCOC	otos				CHECKED:

LOCATION: SEE LOCATION PLAN

RECORD OF TEST PIT 4

EXCAVATION DATE: May 22, 2003

SHEET 1 OF 1

DATUM:

щ		SOIL PROFILE			SA	MPL	ES		k.	IC CONDU cm/s	CIIVIII,		T	.0	
DEPITH SCALE METRES	METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION	10	⁶ 1 WATER (Wp ⊢	CONTENT P	ERCENT		ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE Dark brown, clayey silt topsoil, some sand and gravel, occ. roots (FILL) Mottled brown and grey, silty clay, some concrete and brick pieces, trace gravel (FILL)		0.00 0.15	1	cs		(G			ort No	. 031-		72)	
1	IOE 2.44m	Mottled brown and grey, clayey silt, occ. sand and gravel (FILL)		0.61	2	cs									
2	BACKHOE 0.60m x 2.44m	occ. gravel, pieces of brick (FILL)		2.13	3	cs								Chem	
		Mottled grey and black, silty clay, some sand, some organics (FILL) Mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		2.44		cs								ı	Water seepage into Test pit encoundered at about 2.3m depth, during digging on May 22, 2003
3		END OF TEST PIT		3.05											
4															
5											-				
6															
7															
8									The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s						
9															
10															
	OTU 6	SCALE	1. 1							Golde ssoci				<u> </u>	LOGGED: K.B.

RECORD OF TEST PIT 5

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

ا پِد	_	SOIL PROFILE			SA	MPL	ES	z	HYDRAU	LIC COND , cm/s	UCTIVITY,		T	و بـ	INSTALLATION
METRES	METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION		WATER Wp	CONTENT F	PERCENT		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE						(Co	ldor I	enort	No. 0	31.11	5072)	-	
		Dark brown, clayey topsoil, some sand, trace gravel, roots (FILL)		0.00	l			(UU)	uei I	tepori □	110.0)1-14.	<i>3072)</i> !		
1		Mottled brown and grey, clayey silt, some sand, trace gravel, some wood, concrete and brick fragments (FILL)		0.33	. 2	cs									
	3m	Dark brown, fine to medium sand, some silt, some gravel, trace clay, glass fragments (FILL)		1.22	3	cs				·				Chem	
3	BACKHOE 0.60m x 2.13m	Dark grey, silty clay, some sand, trace gravel, some organics (FILL)		1.83	5	cs cs									
		Grey, SILTY CLAY, some sand, trace gravel (TILL)		3.33		cs			,						
4	·	END OF TEST PIT	1	3.96											
6															
8															
9															
10							_								
DEI		CALE	•	-			•	-		Gold ssoc	er		<u>.</u>	•	Logged: K.B. Checked: (

LOCATION: SEE LOCATION PLAN

RECORD OF TEST PIT 6

EXCAVATION DATE: May 22, 2003

SHEET 1 OF 1

DATUM:

; I		SOIL PROFILE			SA	MPL	ES	_	HYDRA	JLIC COND	UCTIVITY,		T	, ຕ	
METRES	METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION		WATER	10 ⁻⁵ 10 CONTENT P	ERCENT	03	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE Dark brown, clayey topsoil, some sand, silt and roots (FILL) Mottled brown and grey, silty clay, some concrete and brick fragments, trace gravel (FILL)		0.00 0.15	i	cs			(Golde	er Rep	ort No	. 031-	-14502	72)	
1		Dark brown, fine to coarse sand, some pieces of concrete, brick and glass fragments, some slag and gravel, trace silt and clay (FILL)		0.81		cs								Chem	
2	0.60m x 2.7	Brown, medium to coarse sand and gravel, some shell fragments, trace silt, clay (FILL)		1.83	4	cs									 Water seepage into Test pit at about 2.13m during digging on May
3		Dark grey, silty clay, some sand, trace organics (FILL)		2.59	5	cs									22, 2003
		Grey, SILTY CLAY, some sand, trace gravel (TILL)		3.35		cs									
5															
8															
9			i de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de l												

RECORD OF TEST PIT 7

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

۳. ا	^	SOIL PROFILE	T		SA	MPL	ES	z	HYDRAUI k,	LIC CONDI cm/s	JCTIVITY,		T	وِدِ	INSTALLATION
DEPIH SCALE METRES	METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION	10	WATER	CONTENT F		1	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE Dark brown, clayey topsoil, some sand, some silt, trace to some roots, brick \text{\text{fragments}} (Fil.L.)	/	0.00 0.08	1	cs		(1 Golde	r Rep	ort No	o. 031-	1450	72)	
1		Mottled brown and grey, silty clay, some concrete and brick pieces, some sand (FILL)				cs									
2	BACKHOE 0.60m x 2.74m	Grey, silty clay, some organics, trace sand, pieces of wire (FILL)	-	1.98		cs									<u>-</u> <u>√</u>
		Black, fine to coarse sand, some gravel, some wood, steel and glass fragments.		2.59		cs									Water seepage into Test pit encountered at about 2.0m depth, during digging on May 22, 2003
3		Grey, SILTY CLAY, some sand, trace gravel (TILL)		3.05	6	cs									
4		END OF TEST PIT		4.11											
5															·
6															
7															
8															
													* :		
9															
10															
DEF	TH S	SCALE						1		Golde ssoci	r				LOGGED: K.B. CHECKED: 戊戌

RECORD OF TEST PIT 8

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

SHEET 1 OF 1

	_	ļ	SOIL PROFILE			SA	MPL	ES		HYDRAU k	LIC CONDI , cm/s	JCTIVITY,		Ţ	으느	INSTALLATION
METRES	METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)		TYPE		ELEVATION		WATER	CONTENT OW	0 ⁻⁴ 16 PERCENT ————————————————————————————————————	o	ADDITIONAL LAB. TESTING	INSTALLATION A DI GROUNDWATER OBSERVATIONS
0		_[GROUND SURFACE	XXXX	0.00				((ľ		o. 031	3	<i>72</i>)	
			Dark brown, clayey topsoil, some sand, \some silt and roots, trace gravel (Fil.L)./		0.00 0.10		cs			joine	/ Kep					
1			Mottled brown and grey, silty clay, some concrete, brick pieces and wood fragments (FILL)			3	cs									
2	ВАСКНОЕ	0.60m x 2.74m			2.44		cs								Chem	Water seepage into
3			Grey, silty clay, some sand, some organics, trace brick fragments (FILL)				cs									about 2.1m depth, during digging on May 22, 2003
4			Grey, SILTY CLAY, some sand, trace gravel (TILL)		3.66		cs									
		Ī	END OF TEST PIT		4.27											
5																
7										į						
8																
10																
 DEF	тн	L	CALE								Golde SSOCi					LOGGED: K.B.

RECORD OF TEST PIT 9

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

į [_	_ ا	SOIL PROFILE	1.		SA	MPL	.ES	z	HYDRAULIC CONDUCTIVITY, k, cm/s INSTALLATION
METRES	COFFIN	METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION	WATER CONTENT PERCENT WP I OBSERVATIONS AND GROUNDWATER OBSERVATIONS
0			GROUND SURFACE							(Golder Report No. 031-145072)
			Dark brown, clayey topsoil, some sand, .silt and roots, trace gravel (FII L)		0.00 0.25	1	cs		•	
1			Mottled brown and grey, silty clay, some concrete and brick fragments, trace gravel (FILL)			2	cs			
	ш	£	Concrete and brick debris (FILL)	₩	1.37					
	BACKHOE	×2.4	Black, fine to medium sand, some silt, trace clay (FILL)	燚	1.52	3	cs		ĺ	Chem
ı	BAC	0.60m	Brown PEAT	(1) 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5	1.68	4	cs			
2		ľ	BIOWIT PEAT	333	2.13	7	0.5			<u> </u>
			Dark grey, ORGANIC SILT, some clay, some sand			5	cs			Water seepage into Test pit at about 2.13m during digging on May 22, 2003
3			Grey, SILTY CLAY, some sand, trace gravel (TILL)		2.74	6	cs			
Ī		٦	END OF TEST PIT	TX	3.35					
5										
8										
9										
DEF 1:5			CALE							Golder LOGGED: K.E. CHECKED: R.

RECORD OF TEST PIT 10

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

GROUND SURFACE Dark brown, clayey topsoil, some sand, trace gravel(FILL) Mottled brown and grey, silty clay, some topsoil, some sand, trace gravel (FILL) Brown, fine to coarse sand, some glass and steel fragments (FILL) Mottled brown and grey, silty clay, some organics, some sand (FILL) Grey, silty clay, some sand, some organics (FILL) Grey, SILTY CLAY, some sand, trace gravel (TILL)	e	0.00 0.30 0.76 1.83	3	cs		(G	Wp -	ONTENT	PERCENT WI 30 4	45072	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
Dark brown, clayey topsoil, some sand, trace gravel(FILL) Mottled brown and grey, silty clay, some topsoil, some sand, trace gravel (FILL) Brown, fine to coarse sand, some glass and steel fragments (FILL) Mottled brown and grey, silty clay, some organics, some sand (FILL) Grey, silty clay, some sand, some organics (FILL) Grey, SILTY CLAY, some sand, trace gravel (TILL)	e e e e e e e e e e e e e e e e e e e	0.30 0.76 1.83	3	cs cs		(G	 Repor	t No.	031-1	45072		
Mottled brown and grey, silty clay, some topsoil, some sand, trace gravel (FILL) Brown, fine to coarse sand, some glass and steel fragments (FILL) Mottled brown and grey, silty clay, some organics, some sand (FILL) Grey, silty clay, some sand, some organics (FILL) Grey, SILTY CLAY, some sand, trace gravel (TILL)	e e e e e e e e e e e e e e e e e e e	0.30 0.76 1.83	3	cs cs						-3072		
Brown, fine to coarse sand, some glass and steel fragments (FILL) Mottled brown and grey, silty clay, some organics, some sand (FILL) Grey, silty clay, some sand, some organics (FILL) Grey, SILTY CLAY, some sand, trace gravel (TILL)	9	1.22 1.83	3	cs cs							Chem	
Mottled brown and grey, silty clay, some organics, some sand (FILL) Grey, silty clay, some sand, some organics (FILL) Grey, SILTY CLAY, some sand, trace gravel (TILL)	9	1.22	3	cs							Chem	
Grey, silty clay, some sand, some organics (FILL) Grey, SILTY CLAY, some sand, trace gravel (TILL)		1.83 3.05	3	cs								<u> </u>
Grey, silty clay, some sand, some organics (FILL) Grey, SILTY CLAY, some sand, trace gravel (TILL)		3.05	5	cs								=
Grey, SILTY CLAY, some sand, trace gravel (TILL)												Water seepage into Test pit encountered at about 1.8m depth, during digging on May 22, 2003
gravel (TILL)				Ce								22, 2000
END OF TEST PIT		3.66		53								
	1 1											
						_						······································
			CALE	SALE	CALE							

RECORD OF TEST PIT 11

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

L C			SOIL PROFILE	,		SA	MPL	.ES	7	HYDRAU	JLIC COND c, cm/s	JCTIVITY,		T	٥٦	INIGTALL ATION
METRES	METHOD	O DE LINI	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION		WATER Wp I	CONTENT F	I WI		ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0			GROUND SURFACE Granular base (FILL) Mottled brown and grey, silty clay, some sand, occ. gravel (FILL) Brown, medium to coarse sand, some concrete, brick and glass fragments, some silt (FILL)		0.00 0.15 0.41	1	cs		((Golde	r Repo	203 ort No	031-	14507	(2)	
1	ВАСКНОЕ	0.60m x 2.13m	Mottled brown and grey, clayey silt, some sand, trace gravel (FiLL)			3	cs									Water seepage into Test pit at about 1.22m
2			Grey, silty clay, some sand, trace organics (FILL)		1.83		cs									during digging on May 22, 2003
3			Grey, SILTY CLAY, some sand, trace gravel (TILL) END OF TEST PIT		2.59 3.20	5	cs									
5																
8																
9																
DEP	тн	1 80	CALE	<u> </u>							G old¢ ssoci					LOGGED: K.B.

LOCATION: SEE LOCATION PLAN

RECORD OF TEST PIT 12

EXCAVATION DATE: May 22, 2003

SHEET 1 OF 1

DATUM:

	_	SOIL PROFILE			SA	MPL	.ES	z	HYDRAU!	LIC CONDI cm/s	JCTIVITY,	.,	T	5 آٿ	INSTALLATION
DEPTH SCALE METRES	METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)		TYPE		ELEVATION		WATER	CONTENT	0°4 1 PERCENT ——— I WI 30 4	0 ⁻³	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE Mottled brown and grey, silty clay, some sand, trace gravel, trace rootlets (FILL). Brown, medium to coarse silty sand, some gravel (FILL)		0.00		cs		((. 031-		(2)	
1		Mottled brown and grey, silty clay, some sand, trace gravel, concrete and brick fragments (Fil.L.) Gravel (FILL)		0.56 0.91	,	cs									
	HOE	Black, silty clay, some black and white fine sand (FILL) Solvent odour		1.22		cs								Chem	
2	BACK	Grey, SILTY CLAY, some organics, some sand		1.83	4	cs									<u></u>
3		Grey, SiLTY CLAY, some sand, trace gravel (TILL)	9/	3.05		cs									Water seepage into Test pit at about 2.74m during digging on May 22, 2003
4		END OF TEST PIT	Pi j	3.66											
5															
6															
7															
8															
9									T TOTAL AND AND AND AND AND AND AND AND AND AND						
10															
DEP	TH	H SCALE	1_							Golde ssoci	·r				LOGGED: K.B.

RECORD OF TEST PIT 13

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

EXCAVATION DATE: May 22, 2003

DATUM:

ا پرا	_	, I	SOIL PROFILE	1		SA	MPL	.ES	z	HYDRAU	ILIC CONDI			T	일두	INSTALLATION
METRES	COHLAN		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE		ELEVATION		WATER	OS 10 CONTENT F	PERCENT	0° ±	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		_	GROUND SURFACE						(1	- Golde	r Rond	ort No.	031-	14507	! '2)	
			Dark brown to black, clayey topsoil, some sand, occ. gravel (FILL)		0.00		İ		(•	joine I	ı Kepe	1	031-	14307	<i>2)</i> I	
			Mottled brown and grey, clayey silt, some medium to coarse silty sand, occ.		0.33	1	cs									
1			gravel, topsoil (FILL)		1.22		cs									
2	70€	2.44m	Mottled brown and grey, silty clay, some sand, occ. gravel, concrete and brick fragments (FILL)		1.22	3	cs									
2	BACK	.60m x	Black, fine to medium sand, some		2.13	4	cs								Chem	<u> </u>
İ		0.	gravel, some clay (FILL)	₩	2.44											Water seepage into
3			Brown and grey, clayey silt and sand, concrete, glass, steel and clay tile fragments (FiLL)			5	cs									Test pit at about 2.3m during digging on May 22, 2003
4			Grey, SILTY CLAY, some sand, trace		3.96	7	cs									
ı	1	\dashv	gravel (TILL) END OF TEST PIT	1	4.27	<u> </u>										
6		A														
8																
9															:	
DEF	PΤ	- I	CALE				L				Golde Ssoci	r				LOGGED: K.B.

RECORD OF BOREHOLE 4

BORING DATE: MAY 14, 2004

SHEET 1 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	걸	SOIL PROFILE			SA	MPL	_	Ž	DYNAMIC PENETRAT RESISTANCE, BLOW	S/0.3m	HYDRAULIC CON k, cm/s	· ·	무일	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	1BER	TYPE	BLOWS/0.3m	ELEVATION	20 40 I SHEAR STRENGTH Cu, kPa	60 80 nat V. + Q - ●	10 ⁻⁶ 10 ⁻⁵ WATER CON	ITENT PERCENT	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
2	BORIN	5255 W 1157	TRAT	DEPTH (m)	Ž	}	BLOW	日	1		VVp I	-⊖W wi	AD	OBOLIVATION
ᅥ		PAVEMENT SURFACE	0,	188.21	H				Golder R	enort No	10 20 041-14004			
°		ASPHALT		0.00				188	(Gotael Ri	<i>port</i> 110.	U71-17UU7 I	.0)		-
		CONCRETE	0 0 A	0.18 187.78	1	AS		100			0			
1		017		0.43	2	50 DO	8				0			
		Stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)	9 9		3	50 DO	11	187			0			
2				186,08 2.13	<u> </u>	50 DO	34	186			p			
3		Hard, brown, SILTY CLAY, some sand, trace gravel, occ. sand and silt partings, oxidized, fissured (TILL)	1		5	50 DO	33	185			0			
4				184.40	6									
	~	Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)	6	183.59 4.62			28	184			0			<u>-</u> ¥-
5	HOLLOW STEM	Compact, grey, SILTY FINE SAND, trace gravel		183.03 5.18	7	50 DO	27	183			D .			Water seepage into borehole encountere at about elevation 183.59m during drilli
6														on May 12, 2004
7					8	50 DO	11	182			0			
í		Very stiff, grey, SILTY CLAY, some sand, trace gravel, sand pockets						181		>96+				
8		(TILL)			9	50 DO	15	180			I O	→	МН	
9								179						
					10	50 DO	12				0			
10		CONTINUED NEXT PAGE			Γ	Γ								

1:50

LOGGED: S.P. CHECKED:

RECORD OF BOREHOLE 4

BORING DATE: MAY 14, 2004

SHEET 2 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	8	SOIL PROFILE			SAI	MPLES	1	DYNAMIC PENE RESISTANCE, BI	TRATION	`	HYDRAULIC k, cm	CONDUCT	IVITY, -	_	<u> </u>
METRES	BORING METHOD		ρ		α	E.	ELEVATION	20 40		80		ı/s 10 ⁻⁵ 10		ADDITIONAL LAB. TESTING	INSTALLATION AND
MET	SING	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE BLOWS/0.3m	LEVA	SHEAR STRENG Cu, kPa	TH nat V	+ Q - ● Đ U - O		CONTENT		DDITIC	GROUNDWATER OBSERVATIONS
	ğ		STR/	(m)	ž	_ 9	"	20 40		80	Wp } 10	W _20 30		83	
10	_	CONTINUED FROM PREVIOUS PAGE													
	İ						178		D	>96+		(00.40)			
-			P					(Golde	r Kepoi	rt No	041-14	10048))		
					H										
11					11	50 DO 15	;				0				
ı			8/	1	H		177								
				1											
				1											
12				1											
1				1	Ш		176								
١				1	12	50 DO 15	1					,			
				1	_										
13				1											
١			9	1			175								
۱	ļ			1											
١		·		1	H		İ								
. ا	~ _			1	13	50 DO 13					С	.		1 1	
ľ	HOLLOW STEM			1	H		174			<u> </u>				_	
	WER.	Very stiff, grey, SILTY CLAY, some sand, trace gravel, sand pockets	10/	1											
í	외	(TILL)		1									į.	1 1	
5			1	1										1 1	
ļ		ļ	10/	1			173		-	-		-		- 1	
۱					14	50 DO 15	1				0				
١					H										
6			K											1 1	
١			Vol.				172			1				-	
١							l								
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LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT. Tony Mastrolanni



LOGGED: SAP. CHECKED:

RECORD OF BOREHOLE 5

BORING DATE: MAY 18, 2004

SHEET 1 OF 1

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

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Canalist road basin (Fill.)			十	十	40					_		,	_			T		0	187.20				,	
Said, some gravel, frace silt (FilLL)				-	-		10)			1,0.					187	s -	1 As	8	0.18					Ė E
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Stiff, motited brown and grey, silty clay, some sand, frace gravel, frace gravel filt.) Stiff, motited brown and grey, silty CLAY, some sand, trace gravel filt.) Stiff, motited brown and grey, silty CLAY, some sand, trace gravel filt.) Stiff, motited brown and grey, silty CLAY, some sand, trace gravel filt.) Stiff, motited brown and grey, silty CLAY, some sand, trace gravel filt.) Stiff, motited brown and grey, silty CLAY, some sand, trace gravel filt.) Stiff, grey, silty CLAY, some sand, trace gravel filt.) Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt. Stiff, grey, silty CLAY, some sand, trace gravel filt.								(12	3 50	7 0	1,37 185,50		ack, clayey topsoil, some sand avel (FILL)	Si		<u> </u>
Stiff, disck, clayey topsoil, some sand, trace gravel (FILL) Stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL) Borehole dry drilling on Ma 183.54 183.66 6 50 00 11 184 183.171 184 183 183 183 183 183 181 182 END OF BOREHOLE Stiff, grey, SILTY CLAY, some sand, trace gravel (TILL) 181.71 184 184 184 184 184 185 184 185 181 181								0									Do	\mid			ottled brown and grey, silty clay, and, trace gravel, trace topsoil	Si sc (I		- - -
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Hard, brown, SiLTY CLAY, some sand, trace gravel, occ. silt partings, oxidized (TILL) Stiff, grey, SiLTY CLAY, some sand, trace gravel (TILL) END OF BOREHOLE O 181.71 182 181 O 181.71 Stiff, grey, SiLTY CLAY, some sand, trace gravel (TILL) O 181.71 Stiff, grey, SiLTY CLAY, some sand, trace gravel (TILL) O 181.71 Stiff, grey, SiLTY CLAY, some sand, trace gravel (TILL) O END OF BOREHOLE	ry during Vlay 18, 2004	Borehole di drilling on N	E	_				0							184	11	50 DC	5			ottled brown and grey, CLAY, some sand, trace gravel	St St St St St St St St St St St St St S	POWER AUGER	- : - :
Stiff, grey, SILTY CLAY, some sand, trace gravel (TILL) 180.64 6.55 12 181 O O O O O O O O O								0							183	34	50 DO	-	183.54 3.66					Ė
181.71 5.49 Stiff, grey, SILTY CLAY, some sand, trace gravel (TILL) END OF BOREHOLE 180.64 6.55								0								41	50 DO	7			own, SILTY CLAY, some sand, avel, occ. silt partings, oxidized	Ha tra (T		- - - - - -
END OF BOREHOLE 8 50 DO 12 181 O															182							C4:		
END OF BOREHOLE 6.55					-			0		-					181	12	50 DO	1			y, SILTY CLAY, some sand, avel (TILL)	tra		- 6 - -
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DEPTH SCALE

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LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastroi



LOGGED: \$:19 CHECKED:

RECORD OF BOREHOLE 8

BORING DATE: MAY 18, 2004

SHEET 1 OF 1

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

٦ <u>.</u>	OOH.	SOIL PROFILE	1.		SA	MPL		z	YNAMIC PENETRATION ESISTANCE, BLOWS/0.3m	I	HYDRA	ULIC CONDU k, cm/s	ICTIVITY,	ي ٍ ∐	INSTALLATION
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 60 HEAR STRENGTH nat V u, kPa rem V. (80 + Q - ● ⊕ U - ○	VVp	TER CONTE	10 ⁴ 10 ³ NT PERCENT W	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		PAVEMENT SURFACE		188.60 0.00					(Golder Repor						
		CONCRETE	9 4	0.19 188.18 0.42	1	AS		188				0			
1		Very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel, occ. sift partings (TILL)		187.23	2	50 DO	16					0			
2				1.37	3	50 DO	28	187				0			
		Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, oxidized (TILL)	100		4	50 DO	41	186				0			
3	POWER AUGER HOLLOW STEM			184.94	L	50 DO	39	185			(0			Borehole dry during drilling on May 18, 20
4				3.66	┞	50 DO	18				C				
5		Stiff to very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)			7	50 DO	17	184			C)			
				-				183							
6		END OF BOREHOLE		182.04 6.55	8	50 DO	14					0			
7															
8															
9															
10															
DEF 1 : 5		CALE						(Golder Associates						LOGGED: S.P.

RECORD OF BOREHOLE

SHEET 1 OF 1

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 18, 2004

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

Щ.		НО	SOIL PROFILE		,	SA	MPL		z	DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, K, cm/s INSTALLATION
DEPTH SCALE METRES		BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m
0			PAVEMENT SURFACE		188.67					(Golder Report No. 041-140048)
			ASPHALT	p. 6.	0.00					
			CONCRETE	ρ à 3 Δ	188.26					
			Black, topsoil, some sand, trace gravel	₩	0.41 188.06 0.61	ł			188	
1			Brown, silty fine to medium sand, trace gravel, trace clay (FILL)			┢	AS	7		0
			Compact, greyish brown, fine to coarse silty sand, trace gravel, trace silt		187.30 1.37 186.94 1.73	\vdash	50 DO	14	187	Water seepage into borehole encounters at about elevation 187 45m during delib
2			Stiff, brown to grey, SILTY CLAY, some sand, trace gravel, fissured, silt partings							on May 18, 2004
			Compact, grey, fine to medium SAND, trace gravel		186.23 2.44 185.77	3	50 DO	29	186	
3					2.90	一	50 DO	26		
	~								185	
4	POWER AUGE	HOLLOW STEM		9		5	50 DO	28	• •	
5						6	50 DO	30	184	0
			Very stiff to hard, grey, SILTY CLAY, some sand, trace gravel (TILL)						183	
6						7	50 DO	14		
7									182	
•						8	50 DO	15	181	
8			END OF BOREHOLE	<i>A</i>	180.59 8.08					
9										
10										
DEI			SCALE	-	<u> </u>		<u> </u>	1		Golder LOGGED: & P. Associates CHECKED:



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DEPTH SCALE

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RECORD OF BOREHOLE 15

BORING DATE: MAY 18, 2004

SHEET 1 OF 1

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DATUM: GEODETIC

LOGGED: S.P.

CHECKED:

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

E. WAT 10, 2004

DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES RESISTANCE, BLOWS/0.3m ADDITIONAL LAB. TESTING INSTALLATION ELEVATION 60 80 10⁻⁵ 10⁻⁵ 10 ⁴ AND STRATA PLOT BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - ○ WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp **⊢** (m) 60 10 20 (Golder Report No. 041-140048) PAVEMENT SURFACE 186.49 0.00 ASPHALT 0.14 1 AS Granular road base (FILL) 186.09 0.4 186 2 AS 0 Stiff, brown, silty clay, some sand, trace gravel, pockets of topsoil and silty sand 50 DO 3 8 0 185 184.92 50 DO 4 Firm, black, topsoil, some sand, roots, organics (FILL) 184.36 2.13 Stiff, brown and grey, SILTY CLAY, 50 DO 184 14 some sand, trace gravel (TILL) 183.75 2.74 0 POWER AUGER HOLLOW STEM Borehole dry during drilling on May 18, 2004 50 DO 6 36 0 183 50 DO 7 41 Hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt pockets, fissured (TILL) 182 50 DO 8 0 181 180.3 6.15 50 DO Very stiff, grey, SILTY CLAY, some sand, trace gravel, silt pockets (TILL) 9 19 0 179.94 180 END OF BOREHOLE 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastrolanni 10

> Golder Ssociates

RECORD OF BOREHOLE 16

BORING DATE: MAY 18, 2004

SHEET 1 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

														oo.ong, i	DROP, 760mm
J F	원	SOIL PROFILE			S/	AMPL	.ES	7	DYNAMIC PENETI RESISTANCE, BLO	ATION WS/0.3m	1	HYDRAULIC CC k, cm/s	ONDUCTIVITY,	ΤΙ	
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGT Cu, kPa 20 40	nat V. + rem V. €			ONTENT PERCENT	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		PAVEMENT SURFACE		187.30					(Golder	Ronor	t No	041-140	048)	╅┈	
		ASPHALT	33333	0.00 187.09 0.20		ļ			Oomer	керог	. 140.	. U41-1400	740)	ļ	1
- [Granular road base (FILL)		186.84 0.46	1	AS	-	187				0			1
1		Very stiff, mottled brown and grey, silty clay, some sand, trace gravel, trace topsoil (FILL)			2	50 DO	15	186				0			
2		Firm, mottled brown and grey, sitty clay, some sand, trace gravel, topsoil pockets (FILL)		185.77 1.52 185.16 2.13	3	50 DO	7					0			
3					4	50 DO	24	185				0			
		Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, silt partings, fissured (TILL)	101		5	50 DO	30	184				0			
4		-		183.05 4.24	6	50 DO	22	183				0			
5	HOLLOW STEM				7	50 DO	10	182				0			Borehole dry during drilling on May 18, 200
6					8	50 DO	8	181			>96+	0			
,		Very stiff to stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)						180	⊕	+					
			0		9	50 DO	6	179				0			
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DEPTH SCALE

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LOGGED: CHECKED:

BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastrolanni

RECORD OF BOREHOLE 16

BORING DATE: MAY 18, 2004

SHEET 2 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

ALE.	Ş		SOIL PROFILE	_		SA	MPLE	s		DYNAMIC RESISTA	C PEN	ETRAT	ION S/0.3m	7	HYDF	RAULIC (CONDUC's	TIVITY,	т		
DEPTH SCALE METRES	BORING METHOD		DESCRIPTION	\ PLOT	ELEV.	3ER	<u>т</u>	3/0.3m	ELEVATION	20		40	60	80		10-6	10 ⁻⁵ 1	Q ⁻⁴	103 1	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER
DEP	NACA		DESCRIPTION	STRATA PLOT	DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELE	SHEAR S Cu, kPa					V1	/p 	CONTENT		1 \A/I	ADDIT	GROUNDWATER OBSERVATIONS
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	POWER AUGER	Ve	ry stiff to stiff, grey, SILTY CLAY.		Ī				173		_									Ì	
	POWE	soi	ry stiff to stiff, grey, SILTY CLAY, me sand, trace gravel (TILL)		l						⊕	+								I	
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RECORD OF BOREHOLE 19

BORING DATE: MAY 25, 2004

SHEET 1 OF 2

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

	HOD	SOIL PROFILE			SA	MPL	.ES	7	DYNAMIC PENETRA RESISTANCE, BLOV	TION VS/0.3m	1	HYDRAU	JLIC Co k, cm/s	ONDUCTIV	VITY,	T	٥٦	INSTALLATIO
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)		TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGTH Cu, kPa	1	80 - Q - • - U - O	10⁴ WA Wp	TER C	0 ⁻⁵ 10 ⁻¹ ONTENT F	PERCEN	۱T	ADDITIONAL LAB. TESTING	AND GROUNDWAT OBSERVATIO
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1		Stiff to hard, brown and grey, silty clay, some sand, trace gravel (FILL)			2	50 DO	9	186					0					
2		Hard to stiff, brown and black, silty clay, some slag, some sand, trace gravel, trace organics (FILL)		185.13 1.68	3			185						1000				
3		Cliff mottled brown and every		183.91 2.90				184						0				
		Stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		183.15 3.66		50 DO	12						0					
4					6	50 DO	31	183					0					
5	HOLLOW STEM	Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, silt pockets (TILL)			7	50 DO	29	182					0					
6						50	47	181										
7				179.80		50 DO	17	180					0					
				7.01		E^		470						3				
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RECORD OF BOREHOLE 19

BORING DATE: MAY 25, 2004

SHEET 2 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DESCRIPTION 2																				
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END OF BOREHOLE Total				10				172			'									
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END OF BOREHOLE 14 50 WH 15 70 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-			10/						ļ										lat about elevation
END OF BOREHOLE 15.70 15.70						1,1 5	50 14/1							ĺ						on May 25, 2004
	L				171.11	'	۰۰''''			[(1				
	1		END OF BOREHOLE		15.70					ľ										
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1:50

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastrolanni



LOGGED: S.P. CHECKED:

RECORD OF BOREHOLE 20

SHEET 1 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 26, 2004

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	윤	SOIL PROFILE	_		SA	MPLE	s		DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, K, cm/s
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m
0		PAVEMENT SURFACE ASPHALT		187,93 0,00					(Golder Report No. 041-140048)
		CONCRETE	7 4 4 V	0.13 187.42					
1		Very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel, silty pockets (TILL)		0.51 186.55	1	50 DO 2	25	187	
2				1.37	2	50 DO	31	186	0
		Hard, brown, SILTY CLAY, some sand, trace gravel, fissured, silt pockets and sand layers (TILL)	9		3	50 DO 3	30		0
3		sand layers (TILL) -70mm sand seam @ 4.0m			4	50 DO 3	34	185	0
4				183.51	5	50 DO 3	36	184	
5	POWER AUGER HOLLOW STEM			4.42	6	50 DO 1	18	183	
6			10					182	
7					7	50 DO 1	13	181	I O ···········I
		Hard to very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)							>96+
8		<u> </u>			8	50 DO 1	2	180	
9								179	>96+
					9	50 DO 1		178	0
٩ţ		CONTINUED NEXT PAGE				1	T		

DEPTH SCALE

1:50

BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastrolanni



LOGGED: /S.P. CHECKED:

RECORD OF BOREHOLE 20

SHEET 2 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

BORING DATE: MAY 26, 2004

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

8 원	SOIL PROFILE	I = I	SA	MPLES	- z	DYNAMIC PENETRA RESISTANCE, BLOV	TION VS/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s	āُادَ	INSTALLATION
METRES BORING METHOD	DESCRIPTION	STRATA PLOT (9) H1dag	NUMBER	TYPE	ELEVATION	20 40 SHEAR STRENGTH Cu, kPa 20 40	nat V. + Q - ● rem V. ⊕ U - ○	10 ⁸ 10 ⁸ 10 ⁴ 10 ³ WATER CONTENT PERCENT Wp ———————————————————————————————————	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
10	CONTINUED FROM PREVIOUS PAGE							. 041-140048)		
11 12 13	Hard to very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL) Compact to loose, SANDY SILT, some clay, occ. sand seams and clayey layer END OF BOREHOLE	171.77 16.15	11 12 13 14 14 15 1		176 177 177 177 170					₩ater seepage into borehole encountered at about elevation 171.48m on May 26, 2004

LDN_BHS 041-140048.GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastrolanni

DEPTH SCALE

1:50



LOGGED: R.P. CHECKED:

RECORD OF BOREHOLE 21

BORING DATE: MAY 26, 2004

SHEET 1 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DESCRIPTION Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Com	ę	SOIL PROFILE		SA	MPL	ES	7	DYNAMIC PENETRAT RESISTANCE, BLOWS	ION S/0.3m	HYDRAULI k,	IC CONDUCTIVITY, cm/s	Ţ	higtal Atton
PANEMENT SURFACE 1970 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 1980 19	METRES BORING MET	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAR STRENGTH Cu, kPa	nat V. + Q - ● rem V. ⊕ U - O	WATE	ER CONTENT PERCEN		INSTALLATION AND GROUNDWATER OBSERVATIONS
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Very stiff to very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL) 9 50 11 180 9 50 11 179	POWER AUGER HOLLOW STEM			7		17	183			0			Borehole dry during drilling on May 26, 20
Very stiff to very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL) 9 50 11 180 >96+				8	50	14	182				0		
9 11 179 >96+	7	Very stiff to very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)			ВО		181						
179	В			9	50 DO	11	180				0		
10 50 8	9						179		>96+				
178	,			10	50 DO	8	178				0		

DEPTH SCALE

1:50



LOGGED: S.P. CHECKED: (

RECORD OF BOREHOLE 21

BORING DATE: MAY 26, 2004

SHEET 2 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

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, ALE	현	SOIL PROFILE			s	AMP		J -	DYNA RESIS	MIC PEN STANCE,	NETRAT	ION S/0.3m	1	HYDRA	ULIC (k, cm/	ONDUC	TIVITY,	T	.0)	
DEPTH SCALE METRES	BORING METHOD		STRATA PLOT	ELEV	æ		BLOWS/0.3m	ELEVATION		20	40	60	80	10				103	ADDITIONAL LAB. TESTING	INSTALLATION AND
Ā	RING	DESCRIPTION	ATA	DEPTI		TYPE)/S/\(C	ELEV	SHEA Cu, kF	R STREI Pa	NGTH	nat V. + rem V. ⊕	Q- • U- O	W			T PERCI		100 111 111 111 111 111 111 111 111 111	GROUNDWATER OBSERVATIONS
	В			(m)	Z		BLC		1				80	Wp		— → V\ 20	30	1 WI 40	₹₹	
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i i	HOLLOW STEM	Very stiff to very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)								į	'		İ							
ľ	I	(TILL)	6					173					>96+							
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LDN_BHS 041-140048 GPJ GLDR_CAN.GDT 8/26/04 DATA INPUT: Tony Mastrolanni



LOGGED: S CHECKED:

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

RECORD OF BOREHOLE 31

BORING DATE: JUNE 7, 2004

SHEET 1 OF 1

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m SOIL PROFILE HYDRAULIC CONDUCTIVITY, DEPTH SCALE METRES BORING METHOD SAMPLES ADDITIONAL LAB. TESTING INSTALLATION BLOWS/0.3m 60 80 10⁻⁵ 10.4 AND NUMBER TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - ○ DESCRIPTION GROUNDWATER WATER CONTENT PERCENT DEPTH **OBSERVATIONS** Wp **I**────────────── (m) 10 20 (Golder Report No. 041-140048) GROUND SURFACE 187.30 0.00 187 AS 0 Brown, silty clay, some sand, trace gravel (FILL) 186 10 0 2 185 184.86 2.44 Stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel, fissured (TILL) Borehole dry during driling on June 7, 2004 50 DO 8 184 183.64 3.66 183 Hard, brown, SILTY CLAY, some sand, trace gravel (TILL) 50 DO 33 0 182 50 DO 32 181 Stiff to hard, grey, SILTY CLAY, some sand, trace gravel (TILL) 180 6 50 DO 10 179.22 8.08 END OF BOREHOLE DEPTH SCALE

041-140048.GPJ GLDR_CAN.GDT 10/12/04 DATA INPUT. Tony Mastrolanni

1:50



LOGGED: S.P CHECKED:

RECORD OF BOREHOLE 3

BORING DATE: JUNE 6, 2006

SHEET 1 OF 1

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	HOD	L	SOIL PROFILE	1 , 1		SA	MPL		Z.	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s INSTALLATION
METRES	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m
0		1	PAVEMENT SURFACE	<i>",</i>	181.04	T			181	(Golder Report No. 06-1140-006)
			ASPHALT CONCRETE	7 5 XXXX	0.00 0.09 0.28					
			Stiff, brown, silty clay, some sand and gravel, trace organics (FILL)		180.28 0.76	1	SS	10		
1		1	Very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		179.52	ı	SS	17	180	
2					1.52	1	ss	24	179	0
				8		4	ss	28	173	
3			Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel (TILL)			5	ss	33	178	Borehole dry during drilling on June 6, 2
	3ER	M		0,		Ľ		55		
4	POWER AUGER	SOLID STE			176.62 4.42		ss	25	177	
5					4.42	┢	ss	13	176	0
6								THE RESERVE THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF THE PROPERTY OF TH	175	
			Very stiff to stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)	0		8	ss	9		
7									174	>96+
8			END OF BOREHOLE	9	172.9	6	ss	7	173	0
			LIND OF BUNEFIOLE		3.3					
9										
10										
	EPT : 50		SCALE						-	Golder LOGGED: BASSOCIATES CHECKED: [3

LOCATION: SEE LOCATION PLAN

RECORD OF BOREHOLE 7

BORING DATE: JUNE 7, 2006

SHEET 1 OF 1

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm SAMPLER HAMMER, 63.5kg; DROP, 760mm

,	НОР	SOIL PROFILE	T ==		SA	MPLI	\dashv	z	DYNAMIC PENE RESISTANCE, B			1		RAULIC C k, cm/s			ING ING	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENG Cu, kPa	STH I	60 80 nat V. + rem V. ⊕	Q - •	٧	VATER C	<u> </u>	0 ⁻¹ 10 ⁻³ PERCENT	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
\dashv	8	PAVEMENT SURFACE	STR	(m)			BL(20 40 (Gold	der .	n 80 Repo	rt N		10 2	20 3	30 40		
٥		ASPHALT Grey, sand and gravel (FILL)		181.55 0.00 181.35 0.20	1	AS	-						0					
		Brown to black, silty clay, some organics, clay tile fragments (FILL)		0.30	2	ss	4	181					******		-			<u> </u>
1		organics, only the magnitude (* 122)		180.48 1.07	3	ss	2							AAAAAAAAA AAAAAAAAAAAAAAAAAAAAAAAAAAAA	0			Water seepage into borehole encountered at about a depth of 0.76m during drilling
		Firm to very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		179.57	4	ss	23	180						0				10.70m darang drining
2			0	1.98		SS	26	179						0				
3			6				-	179										
		Very stiff, brown, SILTY CLAY, some sand, trace gravel (TILL)	0		6	ss	27	178						0				
4	SOLID STEM				7	ss	26							0				
	2		•	177.13 4.42	\vdash	ss	13	177						0				
5			6													The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s		
6								176										
		Very stiff to stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)			9	ss	9	175						0				
7			0									>9 6+						
			9		10	ss	7	174										—————————————————————————————————————
8		END OF BOREHOLE	10	173.47 8.08	·		,				e de mandre de mandre de de mandre de de mandre de de mandre de de mandre de de mandre de de mandre de de mandr							7.32m upon completion of drilling on June 7, 2006
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10																		
DE	PTH	SCALE	L	1	1	1	1	I	Go	Ide	<u> </u>		L	1			I	LOGGED: B.G.

RECORD OF BOREHOLE 9

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: FEBRUARY 20, 2006

DATUM:

J	Ω	SOIL PROFILE			84	MPL	FS		DYNAN	/IC PENE TANCE, B	TRATIO	ON	\	HYDRA		NDUCT	IVITY,	T		
3	ETHO	SOIL I NOTILE	15		H		-	NO	RESIS ⁻				, ` ,	10	k, cm/s			, 	NAL	INSTALLATION AND
METITES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAF Cu, kPa	R STRENC	TH r	1	Q - • U - O	W _z	ATER CO	NTENT	PERCEN		ADDITIONAL LAB. TESTING	GROUNDWATER OBSERVATIONS
o		PAVEMENT SHOULDER SURFACE		0.00					(Go	lder i	Rep	ort N	<i>lo.</i> 0	6-11	40-0	20)				
ı		Granular road base (FILL)		0.00		AS	-				_	1		0						
		Stiff, mottled brown and grey, silty clay, some sand, trace gravel (FILL)		0.30	2	ss	10									• 0				
1				0.76		ss	10									0				
		Stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)			4	ss	9								0					
2		_	9/	2.13																
١		Lloyd brown Cli TV Cl AV come cond	0		5	SS	40								0					
3	SOLID STEM	Hard, brown, SILTY CLAY, some sand, trace gravel (TILL)			6	ss	38								0					Borehole dry during drilling on February 2 2006
4	ος ος			3.66																
					7	ss	29								0					
5		Variable was CH TV OLAY			8	SS	22								0					
		Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)						c.												
6		٠			9	ss	15		, ,						0					
ŀ		END OF BOREHOLE		6.55	_											1				
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8			1																	
9																				
10																				

DEPTH SCALE

1:50

LOGGED: A.A.

CHECKED: NI

RECORD OF BOREHOLE 17

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: FEBRUARY 20, 2006

DATUM:

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	웃		٠.	_	SA	_		z	DYNAMIC PEN RESISTANCE,	BLOWS	5/U.3M	Α.	ı	k, cm/s				널	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAR STREM	IGTH	nat V. + rem V. ⊕		W	·	ONTENT F	PERCEN	NT NI	ADDITIONAL LAB. TESTING	AND GROUNDWATE OBSERVATION
7		PAVEMENT SURFACE	100	†	H		Ť		(Gold		Rono				0 30		U		
٥	Т	ASPHALT		0.00		1			Gou	ier 1	керо	ri 140). UU	-114	0-02	<i>(</i>)			
- 1		CONCRETE	D. A.	0.15 0.28	L	AS	١.						0		l				
- 1		Granular road base (FILL)	/ ₩	0.28 0.30									ľ			1			
		Compact, brown, medium to coarse sand, some clay and silt, trace gravel (FILL)		0.76		SS	14							0					
1		Stiff, mottled brown, silty clay, some sand, trace gravel, sand pockets (Possible FILL)		0.76		ss	12							0					
2				1.22	4	ss	29		и					0					
		Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel (TILL)			5	ss	50							0					
3	SOLID STEM				6	ss	47							0					Borehole dry during drilling on February 2006
4				3.66	7		30							0					
6		Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)	0 0																
						ss	15							0					
7		END OF BOREHOLE		6.55															
8																			
9																			
10																			

DEPTH SCALE

1:50

LOGGED: A.A.

CHECKED: NP

LOCATION: SEE LOCATION PLAN

RECORD OF BOREHOLE 1

BORING DATE: JULY 13, 2006

SHEET 1 OF 1

DATUM: GEODETIC

PENETRATION TEST HAMMER, 140lb; DROP, 30in SAMPLER HAMMER, 140lb; DROP, 30in HYDRAULIC CONDUCTIVITY, k, cm/s DYNAMIC PENETRATION RESISTANCE, BLOWS/ft SAMPLES SOIL PROFILE BORING METHOD DEPTH SCALE FEET INSTALLATION 10" 10" 10-4 10⁻³ 60 80 40 BLOWS/ft NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH Wp I──────I WI (ft) 20 1200 1600 10 800 614.7 0.0 0.4 (Golder Report No. 06-1140-142) **GROUND SURFACE** Black, clayey TOPSOIL, rootlets AS Stiff to very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL) 2 SS 11 0 610 0 609.0 5.8 3 SS 22 0 Borehole dry durring drilling on July 13, 2006 SS 37 0 Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. oxidized, fissured (TILL) 605 5 SS 34 601.5 13.3 SS 22 6 Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL) 600 SS 16 0 END OF BOREHOLE 25

06-1140-142.GPJ GLDR_CAN.GDT DEPTH SCALE 1 inch to 5 feet

DATA INPUT: Tony Mastrolann

8/31/06

30



LOGGED: N.R. CHECKED:

06-1140-142.GPJ GLDR_CAN.GDT 8/31/06 DATA INPUT: Tony Mastrolann

DEPTH SCALE

1 inch to 5 feet

RECORD OF BOREHOLE 2

SHEET 1 OF 1

PENETRATION TEST HAMMER, 140lb; DROP, 30in

DATUM: GEODETIC

LOGGED: N.R.

CHECKED!

LOCATION: SEE LOCATION PLAN SAMPLER HAMMER, 140lb; DROP, 30in BORING DATE: JULY 13, 2006

DYNAMIC PENETRATION RESISTANCE, BLOWS/ft HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE FEET ADDITIONAL LAB. TESTING k, cm/s INSTALLATION 10-5 STRATA PLOT 60 80 10" 10-3 AND **BLOWS/ft** GROUNDWATER ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION OBSERVATIONS -0W DEPTH (ft) 800 1200 1600 10 PAVEMENT SURFACE 614.2 (Golder Report No. 06-1140-142) 0 Brown, granular road base (FILL) AS Firm to very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL) SS 0 610 608.5 5.7 SS | 17 0 Borehole dry durring drilling on July 13, 2006 ss | 38 0 5 Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. oxidized, 605 fissured (TILL) SS 35 0 0 600.7 13.5 SS 21 0 600 Very stiff to stiff, grey, SILTY CLAY, some sand, trace gravel (TILL) 13 0 SS 597.7 16.5 END OF BOREHOLE 20 25 30

Golder

RECORD OF BOREHOLE 3

BORING DATE: JULY 13, 2006

SHEET 1 OF 1

DATUM: GEODETIC

LOCATION: SEE LOCATION PLAN SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

J.	HOD	SOIL PROFILE	T.		SA	MPL	ES	z	DYNA! RESIS	MC PENI TANCE,	ETRAT BLOW	ION S/ft	`\	HYDR		ONDUC	TIVITY,	T	A'F NG	INSTALLATION
DEPTH SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	SHEAF Cu, psi	RSTREN	IGTH	60 8 nat V. + rem V. ⊕	Q - ● U - ○	w	ATER C	ONTENT	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0	_	PAVEMENT SURFACE ASPHALT		613.8 0.0		((50	lder				6-11					1			
		Brown, granular road base (FILL)		611.3		AS	-							0						
		Stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		2.5 609.3	2	ss	9	610						-	C	<u> </u>				
5	GER		0)	4.5		ss	16								0					Borehole dry durring drilling on July 13, 200
	SCLID STEM	Very stiff to hard, brown, SILTY CLAY, some sand, trace gravel, occ. silt seams, occ. fissures (TILL)	9		4	ss	35	605							0					
10				601.8	\vdash	ss	30								0					
		Very stiff, grey, SILTY CLAY, some sand, trace gravel, occ. fissures (TILL)	0/	12.0		ss	24	600							0					
15		sand, trace gravel, occ. fissures (TILL)	9	597.3	7	ss	17													
		END OF BOREHOLE		16.5																
20																				
26																				
25																				
30																				
35																				
DEF	тн	SCALE		L						Go Asso	13-									LOGGED: N.R.



RECORD OF BOREHOLE 4

BORING DATE: JULY 13, 2006

SHEET 1 OF 1

DATUM: GEODETIC

LOCATION: SEE LOCATION PLAN SAMPLER HAMMER, 140lb; DROP, 30in

PENETRATION TEST HAMMER, 140lb; DROP, 30in

	ETHOD	SOIL PROFILE	Τь		H	MPL		NOL	DYNAM RESIS	MIC PENE TANCE, E	BLOWS	/ft	,	HYDRAULI k, o 10°	C CONDU cm/s 10 ⁻⁵		o.3 I	ONAL	INSTALLATION AND
FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	SHEAF Cu, psi	STREN	GTH r	nat V. + rem V. ⊕	Q- ● U- O	WATE	R CONTE	NT PERCE	NT	ADDITIONAL LAB. TESTING	GROUNDWATER OBSERVATIONS
0	_	GROUND SURFACE	22	613.8 0.0		(G	older				06-11	,	,					
		Black, clayey TOPSOIL	1,3	0.8		AS	1	l	l -										
5		Stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		606.0	2		13	610							0				Borehole dry durring drilling on July 13, 20
	POWER AUGER	SOLID STEM		606.8	4	ss	34	605						0					
10	P	Hard, brown, SILTY CLAY, some sand, trace gravel (TILL)	9/		5	ss	39							0					
			6	599.8 14.0		ss	30	600						0					
15		Very stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)		597.3 16.5	7	ss	20							C					
20																			
25																			
30																			
35																			

DEPTH SCALE 1 inch to 5 feet

LOGGED: N.R. CHECKED: Q

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 140lb; DROP, 30in

RECORD OF BOREHOLE 5

BORING DATE: JULY 13, 2006

SHEET 1 OF 1

DATUM: GEODETIC

PENETRATION TEST HAMMER, 140lb; DROP, 30in

ALE	THOD	SOIL PROFILE	F		┢	MPL	1	N O	l	IC PENI FANCE,			χ'	l	k, cm/s			_ I	VAL ING	INSTALLATION
FEET	BORING METHOD	DESCRIPTION		ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/ft	ELEVATION	Cu, psf	STREN	GTH r	60 8 L nat V. + rem V. ⊕	U- O	Wp	ATER CO	ONTENT	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0	_	PAVEMENT SURFACE ASPHALT		614.4		I	((Golde						-142)						
		Brown, granular road base (FILL)		611.9	1	AS								0						
5		Stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel (TILL)		2.5	2	ss		610							0					Deschole de durine
	POWER AUGER	SOLID STEM		6.3		ss	33	605							0					Borehole dry durring drilling on July 13, 20
10		Stiff to hard, brown, SILTY CLAY, some sand, trace gravel (TILL)	9		5	ss	34								0					
				600.6 13.8		ss	28	600							0					- - - - -
15		Very stiff to stiff, grey, SILTY CLAY, some sand, trace gravel (TILL) END OF BOREHOLE	0	597.9 16.5		ss	13								0					
20																				·
25																				
30																				
35																				

DEPTH SCALE 1 inch to 5 feet

LOGGED: N.R. CHECKED:

RECORD OF BOREHOLE 1

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: MARCH 7, 2007

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	8	SOIL PROFILE			SA	MPL	ES	_	DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, INSTALLATION	
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	-	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m 20 40 60 80 SHEAR STRENGTH nat V. + Q - ● U-O Cu, kPa rem V. ⊕ U-O 20 40 60 80 10 20 30 40 WATER CONTENT PERCENT WP WP WP WI 20 40 60 80 10 20 30 40 INSTALLATION AND GROUNDWATER OBSERVATIONS	
1 1 2	POWER AUGER SOLID STEM	GROUND SURFACE Compact, black, sandy topsoil, trace gravel and rootlets (FILL) Compact, brown, sand and gravel (FILL) Compact, black, silty sand, some clay, trace gravel, cinders (FILL) Hard, black, silty clay, some sand, trace gravel, mixed with topsoil (FILL) Dense, black, sand, trace gravel, some cinders (FILL) END OF BOREHOLE		175.79 0.00 0.15 0.25 175.18 0.61 174.72 1.07	1	ss	18	175	(Golder Report No. 07-1140-0027) Borehole dry during drilling on March 7, 2007	

PROJECT: 07-1140-0027

RECORD OF BOREHOLE 2

LOCATION: SEE LOCATION PLAN

BORING DATE: MARCH 7, 2007

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	\neg	۵	SOIL PROFILE			SA	MPL	ES		DYNAM	IC PENE	TRATIC	N 0.3m)	HYDRA	k, cm/s	ONDUCT	IVITY,	T		
DEPTH SCALE	TRES	METHOD		PLOT	ELEV.	3ER	щ	,70.3m	ELEVATION					0. •	10 W) ⁶ 10) ⁻⁵ 1(PERCEN		ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
DEPT	ME	BORING	DESCRIPTION	STRATA PLOT	DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	313	Cu, kPa	STRENG				Wr	-	OW 0 3	I \	MΙ	API	OBSERVATIONS
07-1140-0027.GPJ GLDR_LDN.GDT 20/3/07 DATA INPUT: Tony Mastrolanni	0 1 2 3	POWER AUGER SOLID STEM	GROUND SURFACE Stiff, black, sandy topsoil, trace gravel and rootlets (FILL) Compact, brown, sand and gravel (FILL) Stiff, black, silty clay, some sand, and gravel, mixed with topsoil (FILL) END OF BOREHOLE		176.11 0.00 175.63 0.48 0.61 174.89	2	S		175							0			О		Borehole dry during drilling on March 7, 2007
-07-																					LOGGED: N.G.

DEPTH SCALE 1:50



LOGGED: N.G.

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: MARCH 7, 2007

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

щ	8	SOIL PROFILE			SA	MPLI	ES	~	DYNAMIC F RESISTANO				1	HYDRA	ULIC CC k, cm/s	NDUCT	IVITY,	T	SF	INSTALLATION
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 SHEAR STE Cu, kPa	40 RENGTH	H na rei	nt V. + m V. ⊕	Q - • U - O	10 W/ Wp	ATER CO	NTENT	PERCEN	NI MI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
1 2	POWER AUGER SOLID STEM	PAVEMENT SURFACE ASPHALT Compact, brown, granular road base (FILL) Hard, black, silly topsoil, some sand, trace gravel and clay (FILL) Firm, brown, silty clay, some sand, trace gravel, mixed with black topsoil (FILL) END OF BOREHOLE		175.91 0.03 175.43 0.48 0.63 174.67 1.24	1 2	SS	7	175	,	-	er R	Repor	nt No	o. 07	-114	c	27)			Borehole dry during drilling on March 7, 2007

RECORD OF BOREHOLE 4

LOCATION: SEE LOCATION PLAN

PROJECT: 07-1140-0027

BORING DATE: MARCH 7, 2007

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DATUM: GEODETIC

Ì	щ	00	SOIL PROFILE			SA	MPL	ES	7	DYNAM RESIS	IIC PEN TANCE,	BLOW	10N S/0.3m	1	HYDR	AULIC C k, cm/s	ONDUC	rivity,	T	무일	INSTALLATION
	DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	Cu, kP	а		nat V. rem V.	+ Q - • ⊕ U - O	W	ATER C	ONTENT		NT	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
1140-0027.GPJ GLDR_LDN.GDT 23/3/07 DATA INPUT: Tony Mastrolanni		POWER AUGER. SOLID STEM	PAVEMENT SURFACE ASPHALT Compact, brown, granular road base (FILL) Very stiff to stiff, black to brown, silty clay, some sand, trace gravel mixed with topsoil (FILL) END OF BOREHOLE		175.87 0.03 175.62 0.25 174.63 1.24	2	SS		175						C		0				Borehole dry during drilling on March 7, 2007
LDN_DBL 07-	DE 1 :		CALE							B	G Ass	olde oci:	r ates	,							LOGGED: NG.



RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: JUNE 22, 2007

DATUM: LOCAL

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

ES	ETHOD	SOIL PROFILE	Тb	T		MPL	_	NOI	DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, k, cm/s 10 ⁴ 10 ³ 10 ⁴ 10 ³	
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m	
0		PAVEMENT SURFACE		98.75					(Golder Report No. 07-1140-0098)	
		ASPHALT CONCRETE	84.5	0.00					((((((((((((((((((((
1		Very stiff, mottled brown and grey, SILTY CLAY, some sand, trace gravel, occ. roots (TILL)		97.37	2	SS		98		
2	POWER AUGER	Very stiff, brown, SILTY CLAY, some sand, trace gravel (TILL)		1.37	_		28	97	Borehole dry duri	ing 22,
3	ď		0	95.09 3.66		ss	19	95		
4		Stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)			6	ss	11	94		
5		END OF BOREHOLE		93.72 5.03						
6										
7										
8										
9			Market and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s							
		TH SCALE							Golder LOGGED: B CHECKED:	В.G.

RECORD OF BOREHOLE 2

BORING DATE: JUNE 22, 2007

SHEET 1 OF 1

DATUM: LOCAL

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	5 2	SOIL PROFILE	T.		SA	MPL	\dashv	z	DYNAMIC RESISTAN	ICE, BLO	VS/0.3m)	ı		NDUCTIV		IA NO	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 SHEAR ST Cu, kPa	40 RENGTH	nat V. + rem V. ⊕		10 WA Wp	TER CO	NTENT F	PERCENT WI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		PAVEMENT SURFACE		98.21							Report				i			
		ASPHALT CONCRETE	0.5	0.00				98	<u> </u>	-	-		 				_	
1		Firm. mottled brown and grey, SILTY CLAY, some sand, trace gravel, numerous to occ. organic pockets (TILL)	2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/	96.84 1.37	2	AS SS		97						0)			
2	POWER AUGER SOLID STEM			1.37	3	ss		96						0				Borehole dry during
3	POWER	Stiff to very stiff, brown, SILTY CLAY, some sand, trace gravel, occ. rootlets (TILL)	0			ss		95						0				drilling on June 22, 2007
4					6	ss	13	94						0				
5		Firm, grey, SILTY CLAY, some sand, trace gravel (TILL) END OF BOREHOLE		93.79 4.42 93.18 5.03	7	ss	6							0				
6						Telegraphic property of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control												
8																		
9																		
DE	PTH	SCALE					1	I	Â	Gold	er iates						L	LOGGED: B.G

RECORD OF BOREHOLE 3

BORING DATE: JUNE 22, 2007

SHEET 1 OF 1

DATUM: LOCAL

SAMPLER HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

,	HOD	T	SOIL PROFILE	Τμ		SA	MPL			DYNAMIC PENETE RESISTANCE, BLO	OWS/0.3m	ξ.	HYDRAULIC CC k, cm/s		I AAL	INSTALLATION
METRES	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGT Cu, kPa		- 0	Wp	ONTENT PERCENT	ADDITIONAL	GROUNDWATER OBSERVATIONS
\dashv	æ	-+	PAVEMENT SURFACE	ST	98.15			В		(Golden	r Report	$\frac{1}{No}$	07-1140			<u> </u>
٥		_	CONCRETE	9 4	0.00 97.94				98	(Gotaer	Report	1	0, 11,0			
			Mottled brown and grey, SiLTY CLAY, some sand, trace gravel (TILL)		0.20 97.39	1	AS						0			
1					0.76	2	ss	17	97				0			
2				9		3	ss	20					0			
	POWER AUGER	SOLID STEM	Very stiff to stiff, brown, SILTY CLAY, some sand, trace gravel (TILL)			4	ss	21	96				0			Borehole dry during drilling on June 22, 2007
3						5	ss	21	95				0			
				9												
4					93.97	6	ss	14	94				0		_	
			Stiff, grey, SILTY CLAY, some sand, trace gravel (TILL)	9/1		7	ss	9					0			
5			END OF BOREHOLE		93.12 5.03	3										
6																
7																
8																
9																
10																
	PT 50		SCALE							Gol	der ciates			<u></u>		LOGGED: B.G



PROJECT: 08-1132-033-0

RECORD OF BOREHOLE

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 11, 2008

1

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT 80 10¹ BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE WATER CONTENT PERCENT SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O DESCRIPTION DEPTH Wp \longrightarrow \longrightarrow \longrightarrow \longrightarrow (m) 20 (Golder Report No. 08-1132-033-0) PAVEMENT SURFACE ASPHALT 0.00 CONCRETE 181 Firm to stiff mottled brown and grey SILTY CLAY, some sand, trace gravel, with silt pockets and topsoil inclusions (TILL) SS 180 0 2 SS 10 179.46 1.83 0 179 3 SS 36 0 Stiff to hard brown CLAYEY SILT, some sand, trace gravel (TILL) SS 37 178 МН Borehole dry during drilling on April 11, 2008 177.63 3.66 5 SS 23 0 177 SS 12 0 Very stiff to firm grey **CLAYEY SILT**, some sand, trace gravel (TILL) 176 SS 8 0 GLDR_LDN.GDT 5/17/08 DATA INPUT: Jason Scott 175 8 SS 6 174.74 END OF BOREHOLE

Golder

DEPTH SCALE 1:50 LOGGED: S.M. CHECKED:

PROJECT: 08-1132-033-0

RECORD OF BOREHOLE 2

SHEET 1 OF 1

DATUM: GEODETIC

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 11, 2008

	SOIL PROFILE		,	SA	MPL	ES	z	DYNAMIC F RESISTANO	ENETRA E, BLOV	TION /S/0.3m		HYDF	RAULIC C k, cm/s	ONDUC	ΓΙVΙΤΥ,	T	٦Ş	INSTALLATION
METRES	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 SHEAR STI Cu, kPa	40 RENGTH		80 - Q - • - U - O	v	10 ⁰ 1 VATER C	ONTENT	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATE OBSERVATION
+		ST	(111)			B		20	40	Repo	80	. 09	10 2	20 3	30 4	10		
0	CONCRETE SURFACE CONCRETE		181.51 0.00 181.30 0.21	-														
1	Grey granular (FILL) Black fine to coarse slag and cinders (FILL) (Hydrocarbon Odour)		180.81 0.70 180.14	1	SS	6	181					0		0	0			
2	Firm mottled brown and grey SILTY CLAY, some sand, trace gravel, with rootlets (TILL)		1.37 179.38 2.13	2	SS	6	180						0					
ε ider	Very stiff to hard brown CLAYEY SILT , some sand, trace gravel (TILL)			3	SS	22	179						0					
POWER AUGER	SOLID ST		177.85 3.66		SS	35	178						0					
4					SS		177						0-		1		МН	
5	Very stiff to stiff grey CLAYEY SILT , some sand, trace gravel (TILL)			7	SS	10	176						0					<u>-</u> _
6		70,000		8	ss	9							0					Water seepage into borehole at about el 176.2m during drillin April 11, 2008
7	END OF BOREHOLE		174.96 6.55				175											Borehole dry upon completion of drilling April 11, 2008
8																		
9																		

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 2, 2008

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION ELEVATION STRATA PLOT 80 10⁻⁶ 10⁻⁵ BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. nat V. + Q - ● rem V. ⊕ U - O TYPE SHEAR STRENGTH nat V. WATER CONTENT PERCENT DESCRIPTION DEPTH Wp — (m) 10 20 30 (Golder Report No. 08-1140-W028) **GROUND SURFACE** 186.84 CS Loose, black, sand and gravel with slag (FILL) 186.44 0 0.41 2 SS 0 186 Loose, brown, fine sand, some gravel, 3 SS 4 0 trace silt, clay and organic material (FILL) 185.14 4 SS 4 1.70 185 Loose, black, fine sand, some organic material, occ. clay pockets (FILL) 0 184.33 2.51 5 SS 6 0 184 6 SS 6 0 Firm, black, clayey silt, some organic material, some sand (FILL) POWER AUGER HOLLOW STEM 183 SS 51.48 182.14 8 SS 0 8 182 Very stiff, grey, SILTY CLAY, some sand, silt seams/partings 181.28 5.56 >96+ 181 Water seepage into borehole at about SS 0 9 elevation 180.9m during drilling on April 2, 2008 Very stiff to stiff, grey, **SILTY CLAY**, some sand, trace gravel (**TILL**) 180 08-1140-W028.GPJ GLDR_CAN.GDT 5/12/08 DATA INPUT: Jason Scott >96+ Water level in borehole at about elevation 180.7m upon completion of drilling on April 2, 2008 10 SS 179 178.77 8.08 END OF BOREHOLE

FGolder

DEPTH SCALE 1:50 LOGGED: S.M. CHECKED:

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: APRIL 2, 2008

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

		НОП	SOIL PROFILE	1 ⊢		SA	MPL		Z.	DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, k, cm/s
METRES	COULT-TAN CIVID CO	BORING ME	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m 20 40 60 80 SHEAR STRENGTH nat V. + Q - ◆ Cu, kPa Cu, kPa Cu, depart = 10 department
0		\Box	GROUND SURFACE		184.97					(Golder Report No. 08-1140-W028)
			Black, clayey topsoil, rootlets (FILL)	\mathbb{R}	0.00 184.69	1	cs			
			Stiff to firm, brown, silty clay, mixed with sand and gravel (FILL)		0.28 184.00		ss		404	
1			Loose, black to brown, fine sand, trace gravel, occ. organics, trace clay (FILL)		0.96 183.60 1.37	3	SS	7	184	
2			Firm, brown, silty clay, some sand and gravel, trace organics (FILL)		182.83	4	ss	7	183	
			Loose, brown, MEDIUM TO COARSE SAND, trace silt		2.13 182.45 2.51	5	ss	7		O Water seepage into borehole at about
3			Firm, brown, CLAYEY SILT , numerous silt partings		181.31	6	ss	8	182	elevation 182.7m duri drilling on April 2, 200
4	POWER AUGER	HOLLOW STEM	Stiff, grey, CLAYEY SILT , numerous silt partings		3.66	7	SS	12	181	
5					179.94 5.03	8	SS	12	180	>96+
6						9	ss	12	179	>96+
7			Very stiff to firm, grey, SILTY CLAY, some sand, trace gravel (TILL)						178	>96+ Water level in boreho at about elevation 178.11m upon
8			END OF BOREHOLE	6	176.89 8.08	10	ss	7	177	completion of drilling April 2, 2008
9										
10										
DEF			CALE			<u></u>				LOGGED: S.M. CHECKED:

DEPTH SCALE

1:50

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: February 19, 2009

DATUM: GEODETIC

LOGGED: SM

CHECKED:

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT 80 10¹ 3LOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT BORING nat V. DESCRIPTION DEPTH -oW Wp -(m) 20 (Golder Report No. 09-1140-W011) Top of Pipe Elev. 185.76m GROUND SURFACE 185.30 0.00 Concrete rubble (FILL) 185 Compact, dark brown silty sand, some clay lumps, some gravel mixed with topsoil, cinders (FILL) SS 19 0 183.93 184 Firm, black clayey topsoil, some sand **(FILL)** 2 SS 0 Cuttings 183.17 2.13 183 Firm, greenish grey **CLAYEY SILT**, some sand, topsoil intrusions 3 SS 4 - faint petroleum odour 182.40 2.90 Stiff, grey **CLAYEY SILT**, some sand, numerous sand partings SS 10 182 181.64 0 SS Bentonite 181 Loose to compact, grey, medium to coarse **SAND**, trace gravel SS 22 180.12 5.18 180 SS 0 Sand >96 179 >96+ Very stiff to stiff, grey **SILTY CLAY**, some sand, trace gravel, sand partings **(TILL)** 8 SS 0 178 Ф + Screen >96+ 3/11/09 [177 GLDR_LON.GDT 9 SS 176.61 END OF BOREHOLE Water level in stand pipe at about elevation 182.48m on February 20, 140W011.GPJ Stand pipe removed on February 20, 2009.

1:50

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: February 20, 2009

DATUM: GEODETIC

CHECKED:

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES BORING METHOD ADDITIONAL LAB. TESTING DEPTH SCALE METRES INSTALLATION ELEVATION STRATA PLOT 80 10¹ BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. nat V. + Q - ● rem V. ⊕ U - O TYPE SHEAR STRENGTH nat V. Cu, kPa rem V WATER CONTENT PERCENT DESCRIPTION DEPTH -ow Wp 📙 (m) 60 20 (Golder Report No. 09-1140-W011) PAVEMENT SURFACE 185.12 ASPHALT 0.00 185 1 cs Brown, granular roadbase (FILL) 0.2 Compact, brown sandy silt, clay lumps, trace gravel, cinders **(FILL)** 2 SS 12 0 184.36 0.76 SS 3 0 184 Stiff, brown clayey silt, some sand, trace gravel, sand partings mixed with topsoil (FILL) SS 8 182.99 183 Very loose, grey **SILTY SAND**, trace gravel, numerous clay lumps SS 5 3 182.22 2.90 Seepage _______ 182 Compact, grey, medium to coarse **SAND**, trace silt and gravel 6 SS 12 0 Groundwater seepage 181.46 3.66 encountered at about POWER AUGER HOLLOW STEM elevation 182.07m during drilling on February 20, SS 0 2009. 181 8 SS 14 0 180 Stiff, grey SILTY CLAY, some sand, trace gravel, occasional silt partings (TILL) 179 9 SS 5 0 091140W011.GPJ GLDR_LON.GDT 3/11/09 DATAINPUT: SJL 178 Ф 10 SS 177.04 8.08 END OF BOREHOLE DEPTH SCALE LOGGED: SM

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: February 20, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

္တ	THOL	SOIL PROFILE	T ⊢		SA	AMPL	_	N _C	DYNAMI RESIST						AULIC C k, cm/s			_, T	ING	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 I SHEAR Cu, kPa	STREN	GTH r	ıat V. + em V. ⊕	Q - • U - O	v w	VATER C	ONTENT	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATEF OBSERVATIONS
															1140					
		PAVEMENT SURFACE		185.73																
٥		ASPHALT	***	0.00 0.11	1	cs								0						
		Compact, brown granular roadbase (FILL)		184.97	2	SS	17	185						0						
1				0.76		ss	10	100							0					
		Stiff to firm, brown clayey silt, some sand, trace gravel, numerous sand partings (FILL)			4	ss	6	184												
2		Firm, greenish grey CLAYEY SILT , some sand, topsoil intrusions, sand		183.60 2.13		33	0	104							0					
		some sand, topsoil intrusions, sand partings Loose, grey SILTY SAND, some clay	/	183.37 2.36	5	ss	7								0					
		lumps	1 1	182.99 2.74				183												
3		Compact, grey, fine to medium SAND , trace silt			6	SS	20									o				wr <u>¯</u>
	# W		1.7	182.07 3.66				182												Water level at about elevation 182.68m up completion of drilling
4	POWER AUGER HOLLOW STEM				7	ss	14								0					February 20, 2009.
					8	ss	17	181							0					
5																				
6		Stiff to very stiff, grey SILTY CLAY, some sand, trace gravel, sand partings (TILL)						180												
					9	ss	14								0					
7				<u>{</u>				179												
								178												
8		END OF BOREHOLE	4/1	177.65 8.08	10	ss	11								0					
9																				
DE	отн 9	CALE								Go Asso										LOGGED: SM

LOCATION: SEE LOCATION PLAN

RECORD OF BOREHOLE 1

BORING DATE: November 26, 2009

SHEET 1 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	THOD	SOIL PROFILE	1.		SA	MPL	_	z	DYNA RESIS	MIC PEI	NETRAT , BLOW	FION S/0.3m	1	HYDR	AULIC C	ONDUC	TIVITY,			2
2	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.3m	ELEVATION			40 NGTH	60 nat V. + rem V. €	80 - Q - •	w	ATER C	ONTEN	T PERCE		ADDITIONAL AB TESTING	INSTALLATIO AND GROUNDWATE
1	BOR		STRA	(m)	Ñ	۴	BLOV	П					80 80	W	p 				ADD	OBSERVATION
۰		PAVEMENT SURFACE		179.85					((Gold	er R	Pepor	t No.			- W0	25)			
		ASPHALT CONCRETE	9 1	0.05																Asphalt patch
		Brown granular roadbase, occ. clayey inclusions (FILL) Brown clayey silt, some sand, trace		0.30 179.29		AS									0					Bentonite
	3	gravel (FILL) Loose brown fine SAND, trace to some silt		0.56 179.09 0.76 178.89	2	SS	7	179				-	ļ			0	0			
		Loose brown SAND, some gravel, trace		0.96		33	,								0					
		silt		178.15											0					
		Stiff brown SILTY CLAY, some sand, with silt partings	V	1.70	3	SS	9	178										-0		May 27/09 77
				177.71 2.14																Nov. 27/09
			1		4	SS	4											C	,	Cuttings
		Soft to stiff grove SILTV CLAVE						177								-				
		Soft to stiff grey SILTY CLAY to CLAYEY SILT, some sand with silt and fine sand partings, few scattered fine			5	SS	3											27.68	•	
		gravel																		
					6	SS	3	176		•			+					29.08		
			H	175.43 4.42																
AUGER	V STEM			2	7	SS	2	175										45.45		
POWER AUGER	HOLLOW STEM				-			1/3												
									Φ	4										Screen
								174		+										
	П		H		-															
			H		8	SS	2											40.28) MH 39.7	Bentonite
		Firm to soft grow SILTY CLAY trace to						173												
		Firm to soft grey SILTY CLAY, trace to some sand, occ. silty fine sand partings, few scattered fine gravel	1						Φ	+										
										T										
					9	SS	2	172	-						-			35.25		
																				Cuttings
									⊕	+										
			1					171		•	+		\dashv				-			
			H		10 :	ss	3											25.27		
			1																	
		— CONTINUED NEXT PAGE —																-311,		

DEPTH SCALE 1:50

LOGGED: SM

CHECKED: NI

RECORD OF BOREHOLE 1

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: November 26, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	I	요	IL PROFILE	T :	т —	-	SAMP			RES	AMIC PEN STANCE	BLOWS	/0.3m		H I DRA	VULIC CC k, cm/s	INDUCT	IVIIY,	T	٥٦	INCTALL STICK
BORING METHOD	BORING METHOD	DESCRIPT	FION	STRATA PLOT	ELEV. DEPTH		TYPE	BLOWS/0.3m	ELEVATION	SHE, Cu, k	AR STRE	NGTH	nat V. + rem V. ⊕		Wp	ATER CC	OW OW	PERCE	WI	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		CONTINUED FROM P	REVIOUS PAGE —	0		+	-				-	_	_	et Na			0 1:				
POWER AUGER HOLLOW STEM	POWER AUGER HOLLOW STEM				167.05 12.80	12	11 SS	S 2	168	Ф	-	der I	_	-	p. 09-						Borehole dry during drilling on November 26 2009. Water level in standpip at about elev. 177.8m on November 27, 2009.

LDN_BHS_02 09-1140-W025.GPJ GLDR_LON.GDT 3/3/10 DATA INPUT: DMB

Golder Associates

CHECKED: NI-

RECORD OF BOREHOLE 2

BORING DATE: November 26, 2009

SHEET 1 OF 2

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN
SAMPLER HAMMER, 63.5kg; DROP, 760mm

BONNO DATE. November 26, 2

DYNAMIC PENETRATION SOIL PROFILE SAMPLES HYDRAULIC CONDUCTIVITY, BORING METHOD DEPTH SCALE METRES RESISTANCE, BLOWS/0.3m ADDITIONAL LAB. TESTING k, cm/s INSTALLATION ELEVATION STRATA PLOT BLOWS/0.3m 80 10° 10¹ 10² AND GROUNDWATER NUMBER TYPE SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - O DESCRIPTION WATER CONTENT PERCENT OBSERVATIONS DEPTH Wp - WI (m) 5 10 15 (Golder Report No. 09-1140-W025) PAVEMENT SURFACE 180.45 ASPHALT Grey-brown granular roadbase (FILL) 0 180.10 0.35 AS 180 Borehole dry during drilling on November 26, 2009. SS Loose brown SILTY SAND, trace to some gravel, occ. fine sand/silt seams/layers 179 3 SS 0 178.32 2.13 Soft brown SILTY CLAY, some sand with silt/fine sand partings 178 4 SS 3 27.75 SS 177 Soft grey SILTY CLAY to CLAYEY SILT, trace to some sand, with occ. silt/fine sand partings 176 POWER AUGER HOLLOW STEM 6 SS MH 35.3 175.42 5.03 175 0 \oplus 48.94 7 SS 174 \oplus Soft grey SILTY CLAY, trace sand, occ. \oplus silt/fine sand partings, few scattered fine 173 gravel 39.41 SS 8 172 32.09 SS 1 171 -- CONTINUED NEXT PAGE --

DEPTH SCALE

1:50

GLDR_LON.GDT 3/3/10 DATA INPUT:



LOGGED: SM

CHECKED: NI-

LOCATION: SEE LOCATION PLAN

RECORD OF BOREHOLE 2

BORING DATE: November 26, 2009

SHEET 2 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

ALE .	ТНОБ	SOIL PROFILE	T.	Ť	SA	AMPLE		z D'	YNAMIC PENETRAT RESISTANCE, BLOW	ION 5/0.3m	HYDRAULIC CONI	DUCTIVITY,	T _º	INICTALLATION
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV.		TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGTH Cu, kPa	nat V. + Q - ●	WATER CON	10 ² 10 ³ TENT PERCENT	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
DE	BOR		STRA	(m)	Š	- :	BLO		20 40		WP -	OW WI 15 20	AD	OBOLIVATIONS
- 10	Т	CONTINUED FROM PREVIOUS PAGE	+	170.55 9.90	i.		+				o. 09-1140)-W025) _		
- 11						SS		70	+ +			27.1		
- 12							16	69	⊕ + ⊕ +					
	POWER AUGER HOLLOW STEM	Firm to soft grey SILTY CLAY , trace sand, occ. silt/fine sand partings, few			11	SS W	/H 16	68				37.	9	
13	POW	scattered fine gravel					16	67	Φ +					
14					12	SS 1	16	36				35.7	⁷ φ	
15									Φ++					
16		END OF BOREHOLE		164.75 15.70		SS 2	16	55				29.54		
17														
18														
19														
														-
DEP		CALE						(Z	Golder Associa	tes			•	LOGGED: SM

LOCATION: SEE LOCATION PLAN

RECORD OF BOREHOLE 3

BORING DATE: November 25, 2009

SHEET 1 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

METRES	ETHOD	SOIL PROFILE	70		-	MPL	_	NO	RESIS	MIC PEN TANCE,	BLOW	S/0.3m	1			CONDUCT	9	2005	IAL ING	INSTALLAT
MEIR	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEA Cu, kP	R STREI			80 + Q - ● ⊕ U - O	V	VATER C	ONTENT	PERCI	WI	ADDITIONAL LAB. TESTING	AND GROUNDWA OBSERVATI
			S						2	Gol	der	Repo	ort N	o. 09	5 9-11 4	10 1 10-W	025	<u>20</u>		
0		PAVEMENT SURFACE ASPHALT CONCRETE		176.90 176.72 0.18	1															
		Grey-brown granular roadbase(FILL) Compact brown fine SAND, trace to		0.38	1	AS								0	0					
1		some silt		175.53 1.37	2	SS	17	176							C					=
2		Stiff brown and grey SILTY CLAY, trace to some sand, occ. silt partings, fissured			3	SS	11	175										28.79	þ	
		Stiff grey SILTY CLAY, trace to some sand and gravel		174.77 2.13	4	SS	9											30.15)	Bentonite
3				174.00 2.90	5	SS	6	174										38.81)	
4		*			6	SS	2	173										39.01)	
5	HOLLOW STEM				7	SS	2	172									F	43.54) MH 42.3	
	īĪ								Ф +											Screen
6		Firm soft grey SILTY CLAY, trace sand, few scattered fine gravel			8	SS	2	171	⊕ +									31.6		
7							۷	170												
										+				9						
8					9	ss	2	169										32.79		Cuttings
								105	⊕ + ⊕	+										×
9					10 5	ss	2	168										47,24		*
		CONTINUED NEXT PAGE	T				T											- #	+	

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LOCATION: SEE LOCATION PLAN

RECORD OF BOREHOLE 3

SHEET 2 OF 2

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

BORING DATE: November 25, 2009

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

щ	00	SOIL PROFILE			SA	MPLES		DYNA RESIS	MIC PEN STANCE,	ETRATI	ON 5/0.3m	1	HYDRA	ULIC C	ONDUCT	IVITY,		
DEPTH SCALE METRES	BORING METHOD		LOT		ü	3	ELEVATION	- 2	20 4	0	60 8	B0	10) ³ 1		0 ² 10 ³	ADDITIONAL LAB. TESTING	INSTALLATION AND
EPTH	SING	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE BLOWS/0.3m	SLEVA					Q- • U- O	WA	ATER CO	ONTENT	PERCENT	B. TE.	GROUNDWATER OBSERVATIONS
۵	BOF		STR	(m)	ž	. 2							VVp	1	0 1	──! WI	FA	
27		CONTINUED FROM PREVIOUS PAGE						-(0	Folde	r R	enori	+ No	09-1	140.	wo	25)		
	Ш	END OF PODELIOLE	И	167.15 9.75		SS 2		,,	 	/ /	 			170	1102			Cuttings
- - 10		END OF BOREHOLE		9.75			167										-	Borehole dry after drilling on November 25, 2009.
																		Standpipe dry on November 27, 2009.
																		13
- - 11																		2
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DEPTH SCALE

1:50

LDN_BHS_02_09-1140-W025.GPJ GLDR_LON.GDT 3/3/10_DATA INPUT: DMB

LOGGED: TA

CHECKED: NA

1:50

RECORD OF BOREHOLE 1

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 24, 2009

DATUM: GEODETIC

CHECKED:

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION ELEVATION STRATA PLOT 80 10¹ BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O TYPE WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp 🛏 (m) 60 20 (Golder Report No. 09-1140-W028) **GROUND SURFACE** 175.45 Black clayey topsoil, silty clay, occasional sand seams and gravel 175 SS 8 Borehole dry during drilling on March 24, 2009. 174.74 SS 2 0 Firm to stiff, mottled, brown and grey SILTY CLAY, some sand, trace gravel (TILL) 174 3 SS 14 OH МН 173.32 2.13 173 SS 28 0 Very stiff, brown SILTY CLAY, some sand, trace gravel (TILL) 0 5 SS 172.10 25 172 POWER AUGER SOLID STEM SS 20 0 171 0 SS 17 0 170 Stiff to very stiff, grey **SILTY CLAY**, some sand, trace gravel, some sand pockets/partings **(TILL)** 8 SS d 169 4/7/09 DATA INPUT: SJL 168 9 SS 22 0 167.37 8.08 END OF BOREHOLE 140W028.GPJ GLDR_LON.GDT 991 DEPTH SCALE LOGGED: TA

RECORD OF BOREHOLE 2

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 24, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES BORING METHOD ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT 80 10¹ BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. SHEAR STRENGTH nat V. Cu, kPa rem V. nat V. + Q - ● rem V. ⊕ U - O TYPE WATER CONTENT PERCENT DESCRIPTION DEPTH -oW Wp 📙 (m) 20 (Golder Report No. 09-1140-W028) **GROUND SURFACE** 174.61 Black clayey topsoil, some dark grey silty clay, occasional sand seams (FILL) SS 5 174 Borehole dry during drilling on March 24, 173.74 0 0.87 2 Firm, mottled, brown and grey SILTY CLAY, some sand, trace gravel, occasional topsoil pockets (TILL) SS 0 173.24 173 SS 23 0 Very stiff, brown SILTY CLAY, some SS 27 0 sand, trace gravel, some sand pockets (TILL) 172 5 SS 21 0 170.95 3.66 171 POWER AUGER SOLID STEM SS 12 0 170 SS 0 >96_ 169 >96 Stiff to very stiff, grey SILTY CLAY, some sand, trace gravel, some sand seams/pockets with depth (TILL) 8 SS 10 0 168 >96+ 4/7/09 DATAINPUT: SJL >96 167 9 SS 20 166.53 8.08 END OF BOREHOLE 140W028.GPJ GLDR_LON.GDT DEPTH SCALE LOGGED: TA

991

1:50

RECORD OF BOREHOLE 3

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 24, 2009

DATUM: GEODETIC

CHECKED:

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES BORING METHOD ADDITIONAL LAB. TESTING DEPTH SCALE METRES INSTALLATION ELEVATION STRATA PLOT 80 10¹ BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. SHEAR STRENGTH nat V. Cu, kPa rem V nat V. + Q - ● rem V. ⊕ U - O TYPE WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp -20 (Golder Report No. 09-1140-W028) **GROUND SURFACE** 175.10 0.00 175 Black CLAYEY TOPSOIL 174.82 0 SS Firm, mottled, brown and grey **SILTY CLAY**, some sand, trace gravel, Seepage _______ some topsoil pockets (TILL) 2 SS 0 174 173.73 1.37 Minor groundwater seepage into borehole at about elevation 174.2m. 3 SS 15 0 173 Very stiff to hard, brown SILTY CLAY, some sand, trace gravel (TILL) SS 32 O**I**-МН 172 0 5 SS 26 171.72 3.38 0 POWER AUGER SOLID STEM SS 12 0 171 SS 12 0 170 >96+ Stiff to very stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional sand seams/pockets **(TILL)** >96 Seepage _____ 169 8 SS Groundwater seepage observed at about elevation 169.0m during drilling on March 24, 2009. >96 4/7/09 DATAINPUT: SJL 168 >96 9 SS 9 0 167.02 8.08 END OF BOREHOLE GLDR_LON.GDT 140W028.GPJ DEPTH SCALE LOGGED: TA

RECORD OF BOREHOLE 1

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: April 8, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

ALE S		HOD	SOIL PROFILE			SA	MPLE		N _O	DYNAMIC PENETRA RESISTANCE, BLOV	VS/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s		INSTALLATION
DEPTH SCALE METRES	GOLTTIM OMIGOR	BORING ME	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGTH Cu, kPa 20 40	60 80 nat V. + Q - ● rem V. ⊕ U - ○	10 ⁰ 10 ¹ 10 ² 11 WATER CONTENT PERCEN Wp		AND GROUNDWATER OBSERVATIONS
0			PAVEMENT SURFACE		197.77							09-1140-W037)		
1									197				_	Borehole dry during drilling on April 8, 2009.
2									196					
3			Auger through approach fill material (No samples taken)						195					
4									194					
5	POWER AUGER	HOLLOW STEM			193.20 4.57	1	SS	12	193			0		
6						2	SS	12	192					
0			Stiff to firm grey silty clay, some sand, trace gravel (Approach Fill Material)			3	SS	13				0		
7						4	SS	5	191					
8			Black CLAYEY TOPSOIL , trace sand and gravel	27.7. 1 2.7.7. 1 2.7.7. 1	190.15 7.62 189.92 7.85	5	SS	14	190			0	_	
3			Stiff, mottled brown and grey SILTY CLAY, some sand, trace gravel, occasional sand pockets and organic pockets (TILL)			6	SS	9	189			0		
9			Very stiff to hard, brown SILTY CLAY , some sand, trace gravel, occasional sand partings, fissured (TILL)		188.78 8.99		SS	22			>96+	0		
			CONTINUED NEXT PAGE					1						

BHS_02 091140W037.GPJ GLDR_LON.GDT 7/2/09 DATA INPUT: SJL DEPTH SCALE 1:50

LOGGED: SM

RECORD OF BOREHOLE 1

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: April 8, 2009

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES BORING METHOD ADDITIONAL LAB. TESTING INSTALLATION AND GROUNDWATER OBSERVATIONS STRATA PLOT 10¹ BLOWS/0.3m NUMBER SHEAR STRENGTH nat V. rem V ELEV. TYPE nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH OW. Wp -60 20 (Golder Report No. 09-1140-W037) --- CONTINUED FROM PREVIOUS PAGE --188 10 0 SS 34 Very stiff to hard, brown SILTY CLAY, some sand, trace gravel, occasional sand partings, fissured (TILL) 187 9 SS 31 0 186.80 10.97 11 SS 10 12 0 186 12 >96+ SS 10 0 185 >96 Hard to very stiff, grey **SILTY CLAY**, some sand, trace gravel **(TILL)** >96 184 12 SS 0 >96 183 >96 15 SS 13 0 182.07 END OF BOREHOLE 16 17 7/2/09 DATA INPUT: SJL GLDR_LON.GDT 091140W037.GPJ LOGGED: SM

1:50

RECORD OF BOREHOLE 10

SHEET 1 OF 1

LOCATION: SEE LOCATION PLAN

BORING DATE: March 12, 2009

DATUM: GEODETIC

CHECKED:

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES BORING METHOD ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT 10⁰ 10¹ BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE nat V. + Q - ● rem V. ⊕ U - O SHEAR STRENGTH nat V. Cu, kPa rem V. WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp 📙 60 20 (Golder Report No. 09-1140-W037) GROUND SURFACE 189.69 Dark grey CLAYEY TOPSOIL 189.46 Borehole dry during drilling on March 12, 2009. Firm, mottled brown and grey **SILTY CLAY**, some sand, trace gravel, occasional fissures with oxidation (TILL) 189 SS 0 188.32 188 2 SS 37 0 Hard, brown **SILTY CLAY**, some sand, trace gravel, fissured **(TILL)** 3 SS 69 \circ МН 187 186.62 3.07 SS 0 35 186 SS 25 0 185 SS 17 184 Hard to very stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt SS 15 0 partings (TILL) 183 182 8 SS 10 0 >96_ GLDR_LON.GDT >96 181 091140W037.GPJ SS 12 0 180.09 END OF BOREHOLE 9.60 DEPTH SCALE LOGGED: NG

BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

1:50

RECORD OF BOREHOLE 9

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 1, 2009

DATUM: NOT SURVEYED

CHECKED:

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

L F	ДОН	SOIL PROFILE			SA	MPLE	-	z	DYNAMIC PE RESISTANCE	NETRAT , BLOWS	ON 5/0.3m	$\overline{\chi}$	HYDRAULIC k, cm/	CONDUCTIVI's	TY, T	NG AF	INSTALLATION
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	1 4 1.	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 I SHEAR STRE Cu, kPa		nat V. + rem V. ⊕		WATER Wp	10 ¹ 10 ² CONTENT PE	∎wı	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
	B		ST	(111)			酉			ler K	epor	t No	10 109-114	20 30 10-W09	1B)		
0		GROUND SURFACE Black clayey topsoil, trace rootlets (FILL)		0.00	1	cs											
		Firm, mottled brown and grey SILTY CLAY, some sand, trace gravel,		0.30	2	SS	6							0			Borehole dry during drilling on September 1 2009.
1		occasional sand pockets (TILL)			3	SS	6						0				
2				1.37	4	SS	15						0				
		Stiff to very stiff, brown SILTY CLAY, some sand, trace gravel, occasional silt seams/partings (TILL)			5	ss	18						0				
3				3.28	6	ss	13						0				
4					7	SS	2										
5	POWER AUGER	Stiff to very stiff, grey SILTY CLAY, some sand, trace gravel, occasional silt partings (TILL)			8	SS	4			Φ	+			0			
6				5.94								>96+					
		Compact, grey SILTY SAND, some clay, trace to some gravel		6.71		SS	16						0				
7																	
8		Stiff, grey SILTY CLAY , some sand, trace gravel, occasional silt partings	9		10	SS	3						0				
		(TILL)								€		+					
9					11	ss	3							0			
	Н	CONTINUED NEXT PAGE	1				+			+							

RECORD OF BOREHOLE 9

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

BORING DATE: September 1, 2009

DATUM: NOT SURVEYED

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

, L	된	SOIL PROFILE	T 1-		L SA	MPL	_	ž	DYNAMI RESISTA						ONDUCT			₽ _N	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAR S Cu, kPa	STREN	GTH i	nat V. + rem V. €	W	ATER C	—О ^W	PERCENT WI		ADDITIONAL LAB. TESTING	AND GROUNDWATEI OBSERVATIONS
_		CONTINUED FROM PREVIOUS PAGE	S				_					nort				$\frac{0}{1B}$ –	\dashv	\dashv	
10	POWER AUGER HOLLOW STEM	Stiff, grey SILTY CLAY , some sand, trace gravel, occasional silt partings (TILL)	2/	10.67							⊕ ⊕	+ +							
11		Soft, grey SILTY CLAY		1	12	SS	3							0	,				
		END OF BOREHOLE		11.13															
12																			
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	рты (SCALE								A _									LOGGED:

DEPTH SCALE
1:50

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

RECORD OF BOREHOLE 10

BORING DATE: September 2, 2009

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

SHEET 1 OF 2

DATUM: NOT SURVEYED

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES METHOD ADDITIONAL LAB. TESTING DEPTH SCALE METRES INSTALLATION STRATA PLOT NUMBER GROUNDWATER OBSERVATIONS ELEV. SLOWS/0. BORING nat V. + Q - ● rem V. ⊕ U - O TYPE SHEAR STRENGTH WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp | 20 (Golder Report No. 09-1140-W091B) GROUND SURFACE 0.00 Stiff, black clayey topsoil, trace rootlets **(FILL)** cs 0 0 Borehole dry during Stiff, brown silty clay, some sand, trace gravel, topsoil pockets **(FILL)** SS 13 0 drilling on September 2, 2009. 0.76 ss SS 0 Soft to firm, brown and grey silty clay, some sand, trace gravel, trace organics (FILL) SS 3 0 0 SS 6 0 3.40 Soft, brown SILTY CLAY, some sand, trace gravel, trace organics (TILL) SS 2 0 SS 0 Ф >96 Stiff to very stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silt partings (TILL) SS 3 Φ 10/26/09 DATA INPUT: 7.32 Compact, grey SANDY SILT, trace to SS 24 0 10 some clay, trace gravel (TILL) 8.23 140W091B.GPJ GLDR_LON.GDT Stiff, grey **SILTY CLAY**, some sand, occasional gravel **(TILL)** SS 8 9.1 SS 36 Dense, grey SANDY SILT, some clay (TILL) --- CONTINUED NEXT PAGE --991

DEPTH SCALE 1:50

RECORD OF BOREHOLE 10

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 2, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

п	l 8	SOIL PROFILE			SA	MPLE	ES		DYNAM	IIC PENE FANCE, E	TRATI	ON /0.3m)	HYDRAULI	C CONDUCT	TIVITY,	тΙ	(1)	
METRES	BORING METHOD		F		H		ᅱ	ELEVATION					_ \	10°			, ∐	ADDITIONAL LAB. TESTING	INSTALLATION
	B		STRATA PLOT	ELEV.	띪		BLOWS/0.3m	ΑŢ	2				30		1			ESI	AND GROUNDWATER
¥	<u>₽</u>	DESCRIPTION	Ĭ.	DEPTH		TYPE	NS/	Ē	SHEAF Cu, kPa	STREN	GTH	nat V. + rem V. ⊕	Q - •		R CONTENT		Т	.T.	OBSERVATIONS
7	, a		₹	(m)	N	-	O O	Ш	Cu, Ki a					vvp —	O ^W		/I	₹₹	
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	L	CONTINUED FROM PREVIOUS PAGE					\perp		\perp (G	olde	r Ra	nort	No	09-114	10-W0	91R)			
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10		D 04NDV 011 T																	
	띩	Dense, grey SANDY SILT , some clay (TILL)		1															
	Į Į	(P.J.																
	띩			‡															
	POWER AUGER		44	10.74	1														
		Firm, grey SILTY CLAY, some sand,		10.74	13	ss	6												
11		Firm, grey SILTY CLAY, some sand, trace gravel, occasional silt partings (TILL)		1															
		END OF BOREHOLE		11.13															
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BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

RECORD OF BOREHOLE 11

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN BORING DATE: September 2, 2009 DATUM: NOT SURVEYED SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES METHOD ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT NUMBER GROUNDWATER OBSERVATIONS ELEV. SLOWS/0.3 nat V. + Q - ● rem V. ⊕ U - O TYPE SHEAR STRENGTH WATER CONTENT PERCENT BORING DESCRIPTION DEPTH -OW Wp -20 (Golder Report No. 09-1140-W091B) **GROUND SURFACE** Black clayey topsoil, trace rootlets (FILL) 0.00 0 Cuttings 0.25 SS Firm, brown silty clay, some sand, trace gravel, trace rootlets, trace organics Bentonite SS 6 Soft, brown and grey SILTY CLAY, SS 3 0 some sand, trace gravel, trace to some organics (TILL) SS 29 0 Very stiff, brown SILTY CLAY, some sand, trace gravel, occasional silt seams/partings (TILL) Cuttings 6 SS 21 0 3.66 Firm, grey SILTY CLAY, some sand, SS 0 trace gravel, occasional silt partings (TILL) POWER AUGER 4.57 SS WL Sept. 3 _____ Compact, grey **SANDY SILT**, some clay, occasional silty clay layers **(TILL)** 5.49 Bentonite SS Cuttings 0 Firm to very stiff, grey SILTY CLAY to CLAYEY SILT, some 10/26/09 \oplus sand, occasional silt pockets and seams (TILL) GLDR_LON.GDT 10 SS 2 0 WL Sept. 2 _____ Screen >96_

DEPTH SCALE

--- CONTINUED NEXT PAGE --

1:50

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LOGGED: TA

RECORD OF BOREHOLE 11

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 2, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

. I	ООН	SOIL PROFILE			SA	MPL	.ES	_	DYNAMIC F RESISTAN	ENETRAT	TON S/0.3m	λ	HYDRAULIO k, cm	CONDUC	TIVITY,	Tl_	z installation
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 SHEAR STI Cu, kPa	40 RENGTH	nat V. + rem V. ⊕	Q - • U - O	VVP —	CONTENT	10 ² 10 ³ F PERCENT	15	AND GROUNDWATER OBSERVATIONS
\dashv	Δ	CONTINUED FROM PREVIOUS PAGE	ST	(,			B		20	40		30	10		30 40	-	
10	POWER AUGER HOLLOW STEM			10.67	12	ss				e	+	>96 ₊	09-114	<i>0-W0</i>	918)		Screen Water level in boreho a depth of about 8.4m
13																	upon completion of drilling on September 2009. Water level in standpi at a depth of about 5. on September 3, 2009
15																	
16																	
18																	

1:50

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 2, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES METHOD ADDITIONAL LAB. TESTING DEPTH SCALE METRES INSTALLATION STRATA PLOT NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SLOWS/0. nat V. + Q - ● rem V. ⊕ U - O SHEAR STRENGTH WATER CONTENT PERCENT BORING nat V. DESCRIPTION DEPTH -OW Wp | 20 (Golder Report No. 09-1140-W091B) **GROUND SURFACE** 0.00 CS 0 Firm to stiff, black clayey topsoil (FILL) 0.30 Borehole dry during SS 0 drilling on September 2, 2009. Firm, brown and grey silty clay, some topsoil **(FILL)** 3 SS 6 0 Firm, mottled brown and grey SILTY CLAY, some sand, trace gravel, occasional sand pockets (TILL) 0 SS 6 2.13 Very stiff, brown SILTY CLAY, some SS 20 0 sand, trace gravel, occasional silt partings (TILL) 3.05 Stiff, grey **SILTY CLAY**, some sand, trace gravel, occasional silty partings SS 12 0 (TILL) 3.66 Stiff, grey **CLAYEY SILT**, some sand, trace gravel **(TILL)** SS 10 SS >96_ >96_ SS 2 Firm to very stiff, grey SILTY CLAY, Φ some sand, trace gravel, occasional silt and sand partings at depth (TILL) Ф 10/26/09 DATA INPUT: ss WH 10 0 140W091B.GPJ GLDR_LON.GDT Ф + Ф SS 3 0 --- CONTINUED NEXT PAGE --

991

RECORD OF BOREHOLE 12

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 2, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION SOIL PROFILE) HYDRAULIC CONDUCTIVITY,

ш	8	SOIL PROFILE			SA	MPLI	ES		DYNAMIC PEN RESISTANCE,	ETRATI BLOWS	ON /0.3m)	HYDRAUL k.	LIC CONDUCT cm/s	TIVITY, T	G	
DEPTH SCALE METRES	BORING METHOD		ТО		Ī.,		Æ	ELEVATION			60 8	。 `	10 ⁰		0 ² 10 ³	ADDITIONAL LAB. TESTING	INSTALLATION AND
ET S	∑	DESCRIPTION	STRATA PLOT	ELEV.		TYPE	BLOWS/0.3m	EVA	SHEAR STREN Cu, kPa	1	1 1			ER CONTENT		1 E E I	GROUNDWATER OBSERVATIONS
.e. E	N	DESCRIF HON	RAT,	DEPTH	N	Т	Ŏ.	E	Cu, kPa		rem V. 🕀	U - O		OW		ADE	OBSERVATIONS
	ĕ		ST	(m)			B				60 8		10	20 3	30 40		
Ļ	L	CONTINUED FROM PREVIOUS PAGE	17. 16				_		_(Golder	r Rej	port l	Vo. (09-114	10-W09	<i>1B</i>)		
L 10				1					1	•			I				
	 	Firm to your offiff grow SILTY CLAY	9/	1					⊕+								_
ţ.	AUG	Firm to very stiff, grey SILTY CLAY, some sand, trace gravel, occasional silt and sand partings at depth (TILL)		1					+	-							1
F	POWER AUGER	and sand partings at depth (TILL)	lik	}													1
F		£	Ш	10.67		00	.,,,										1
- 11		Very soft, grey SILTY CLAY		1	12	SS	WH								1		4
E		END OF BOREHOLE	T '	11.13]
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02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

RECORD OF BOREHOLE 13

SHEET 1 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 3, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SLOWS/0. BORING nat V. + Q - ● rem V. ⊕ U - O SHEAR STRENGTH nat V. WATER CONTENT PERCENT DESCRIPTION DEPTH _0₩ Wp 📙 10 20 (Golder Report No. 09-1140-W091B) **GROUND SURFACE** 0.00 Grey crushed limestone (FILL) 1 AS 0.15 0 Very stiff, black clayey topsoil, some sand, trace gravel (FILL) Borehole dry during SS 19 0 drilling on September 3, 0.76 SS 0 Firm to stiff, brown silty clay, some sand, trace gravel, occasional sand seams/pockets **(FILL)** 0 SS 0 Firm, mottled brown and grey SILTY CLAY, some sand, trace gravel (TILL) 2.44 5 SS 8 0 ss 15 0 Firm to stiff, brown SILTY CLAY, some sand, trace gravel, occasional silt seams/partings (TILL) SS 0 4.42 SS 6 С Ф Ф 0 SS 3 Stiff, grey SILTY CLAY, some sand, trace gravel, occasional silt partings (TILL) Ф 10/26/09 DATA INPUT: 10 SS 0 140W091B.GPJ GLDR_LON.GDT 0 0 9.30 SS 23 Compact, grey SANDY SILT, trace to d some clay, trace gravel (TILL) 9.75 --- CONTINUED NEXT PAGE ---

DEPTH SCALE

1:50

991

LOGGED: TA CHECKED:

RECORD OF BOREHOLE 13

SHEET 2 OF 2

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

BORING DATE: September 3, 2009

DATUM: NOT SURVEYED

DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES

Щ	₽	SOIL PROFILE		_	SA	MPL	ES	_	RESISTA	NCE, B	LOWS/)N).3m	(HYDRA	k, cm/s	NDUCI	IVITY,	T	밀	INSTALLATION
DEPTH SCALE METRES	BORING METHOD		10		~		3m	ELEVATION	20	40		0 8	10	10	D ⁰ 10	0 ¹ 10	0 ² 1	_{0³} ⊥	ADDITIONAL LAB. TESTING	AND
置	οğ	DESCRIPTION	STRATA PLOT	ELEV.		TYPE	BLOWS/0.3m	≡VA∵	SHEAR S Cu, kPa	STRENG					ATER CO	NTENT	PERCE	NT	ĔË.	GROUNDWATER OBSERVATIONS
ΕĒ		DESCRIPTION	₹	DEPTH	≥		Θ.	ELE	Cu, kPa		re	em V. 🕀	U - O		·			wı	AB	OBSERVATIONS
	BC		STF	(m)	_		В		20	40	6	0 8	10	10				.0		
		CONTINUED FROM PREVIOUS PAGE							(G			enor	t No	. 09-	1140)- W(91R	()		
10			1.7	1					<u>ر</u> ر	ome	, I	cpoi	1110	. U)	i	- 770		′ —		-
ļ.	[₂ ₂		K.,	1	12	SS	6								0					1
ļ.	POWER AUGER HOLLOW STEM]																
Ŀ	일	Stiff, grey SILTY CLAY , some sand, trace gravel (TILL)]																_
ŀ		trace gravel (TILL)	li k	4																-
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DEPTH SCALE 1:50

BHS_02 091140W091B.GPJ GLDR_LON.GDT 10/26/09 DATA INPUT: SJL

RECORD OF BOREHOLE 14

SHEET 1 OF 2

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5kg; DROP, 760mm

BORING DATE: September 3, 2009

DATUM: NOT SURVEYED

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES METHOD ADDITIONAL LAB. TESTING DEPTH SCALE METRES INSTALLATION STRATA PLOT NUMBER GROUNDWATER OBSERVATIONS ELEV. SLOWS/0. BORING nat V. + Q - ● rem V. ⊕ U - O TYPE SHEAR STRENGTH WATER CONTENT PERCENT nat V. DESCRIPTION DEPTH _0₩ Wp | 20 (Golder Report No. 09-1140-W091B) GROUND SURFACE Black clayey topsoil, numerous rootlets 0.00 CS 0 0.20 Borehole dry during SS 0 drilling on September 3, 2009. Firm, brown silty clay, some sand, trace gravel **(FILL)** 3 SS 0 Firm, mottled brown and grey **SILTY CLAY**, some sand, trace gravel SS 0 (TILL) SS 19 0 Stiff to very stiff, brown **SILTY CLAY**, some sand, trace gravel, occasional silt partings (TILL) SS 6 14 0 3.66 SS 3 0 SS 3 0 Stiff to very stiff, grey SILTY CLAY, some sand, trace gravel, occasional silt partings (TILL) Ф SS 0 >96 >96 10/26/09 DATA INPUT: Loose, grey **SANDY SILT**, some clay, trace gravel **(TILL)** SS 9 10 8.23 140W091B.GPJ GLDR_LON.GDT >96_ Very stiff to stiff, grey **CLAYEY SILT**, some sand and gravel **(TILL)** SS 0 -- CONTINUED NEXT PAGE --

991

RECORD OF BOREHOLE 14

SHEET 2 OF 2

LOCATION: SEE LOCATION PLAN

BORING DATE: September 3, 2009

DATUM: NOT SURVEYED

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

111	8	SOIL PF	ROFILE		SA	MPLE	s		DYNAN	AIC PEN	ETRATIONS/	ON '0.3m	<u>\</u>	HYDR	AULIC CO	ONDUCT	IVITY,	Т	(2)	
DEPTH SCALE METRES	BORING METHOD		Ь		 		m E	ELEVATION	2				30	1				₀₃	ADDITIONAL LAB. TESTING	INSTALLATION AND
THS FTR	≥	DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.3m	EVA-				L—— nat V. † em V. ⊕		w	ATER CO	ONTENT	PERCE	NT	DITIC F. TES	GROUNDWATER OBSERVATIONS
DEF	30RI		I RA	DEPTH (m)	Į į		S C	Щ							·—				P. P. P. P. P. P. P. P. P. P. P. P. P. P	1
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- 10	_	_											>96+							
-	POWER AUGER	Very stiff to stiff, grey CLAYI some sand and gravel (TILL	EY SILT,								Φ	+								- -
-	ER A	some sand and gravel (TILL	-) <u>}</u>																	-
-	POW	HOL		9		1														_
- - 11		Soft, grey SILTY CLAY	91	10.82	12	SS	3										0			- -
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DEPTH SCALE 1:50 Golder LOGGED: Associates CHECKED:

RECORD OF BOREHOLE 1

SHEET 1 OF 5

LOCATION: SEE LOCATION PLAN

BORING DATE: May 25, 2010 - May 27, 2010

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV.	BER	TYPE	BLOWS/0.3m	ELEVATION		1	40	60	80 + Q - ● ⊕ U - O	V	k, cm/s 10 ⁻⁶ 1 VATER C	0 ⁻⁵ 10 ⁻ ONTENT F	4 10 ³ PERCENT	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATE OBSERVATION
1	BOR		STRA	(m)	₹	-	BLO	ш					80	_ v		OW 30	WI) 40	Ϋ́	
									(Gol	der I	Repo	ort N	7 o. 1 6)-11 4	10-00 	990-10	000-L02)		WL in piezometer May 31/10
		GROUND SURFACE	×	177.23	<u>i</u>														***************************************
					1	ss	25	177						0					Bentonite
		Compact to dense, dark brown sand, trace gravel, trace silt (FILL)			2	ss	37	176						(Seepage May 25/10
				175.10 2.13		ss	12								0				¥ = = = = = = = = = = = = = = = = = = =
0.14	HOLLOW STEM	Stiff, brown and bluish grey SILTY CLAY, some sand, trace gravel, occasional sand layers/pockets,		2.13	4	ss	4	175							0				
		occasional sand layers/pockets, occasional trace organics (LACUSTRINE)		170	5	ss	5	174				+				0			
				173.57 3.66	6	ss	9	173					>96+		(}			Grout
					7	ss	4									φ			
		Very stiff to stiff, grey						172		⊕	+								
0.41	CORE	CLAYEY SILT to SILTY CLAY, some sand, trace to some gravel, occasional to numerous sand layers/pockets			8	ss	15	171					>96+	-	•				
TO A HOO	HQ ROCK CORE																		
					9	ss	7	170							C) 			
r		CONTINUED NEXT PAGE			l													\exists	<u> </u>

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Golder Associates

RECORD OF BOREHOLE 1

SHEET 2 OF 5

LOCATION: SEE LOCATION PLAN

BORING DATE: May 25, 2010 - May 27, 2010

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

ا _ک در	THOC	SOIL PROFILE	T -	1	SA	MPL	-	NC	I		BLOWS					ONDUCT			₽ã	INSTALLATIO
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION			1	1	80 - Q - ● 9 U - O	W		0° 1 ONTENT	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATE OBSERVATION
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	RY DRI	Very stiff to stiff, grey								Φ		+								Grout
13	ROTARY DRILLING HQ ROCK CORE	Very stiff to stiff, grey CLAYEY SILT to SILTY CLAY, some sand, trace to some gravel, occasional to numerous sand layers/pockets						164												
				\parallel	13	SS	8	104							0					
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RECORD OF BOREHOLE 1

SHEET 3 OF 5

LOCATION: SEE LOCATION PLAN

BORING DATE: May 25, 2010 - May 27, 2010

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

SALE	THOD	SOIL PROFILE	T E		SA	MPL		NC	DYNAMIC PENE RESISTANCE, E	BLOWS/	0.3m	\		k, cm/s			, I	INSTALL	
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 I I SHEAR STRENG Cu, kPa	GTH n	ıat V. + em V. ⊕		v	VATER C	ONTENT	PERCEI	wı 📮	GROUND' GROUND' OBSERVA	WATER
\dashv		CONTINUED FROM PREVIOUS PAGE	S						20 40			30		10	20 3	30 4			
18								159	(Golder K	керо 	ri No	0. 10	-114				-L02)		
20					15	SS	11	157		<u>Ф</u>		+		(
21								156											
22	ROTARY DRILLING HQ ROCK CORE	Very stiff to stiff, grey CLAYEY SILT to SILTY CLAY, some			16	ss	15	155						0				Grout	
23	ROTAR HQ RC	CLAYEY SILT to SILTY CLAY, some sand, trace to some gravel, occasional to numerous sand layers/pockets						154											
24								153											
25					17	SS	27	152							0				
26								151											
27								150											
		CONTINUED NEXT PAGE																	
DEF	PTH S	CALE						(Go Asso	ldei	•							LOGGED:	SM

SHEET 4 OF 5

LOCATION: SEE LOCATION PLAN

BORING DATE: May 25, 2010 - May 27, 2010

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES METHOD ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT 10⁻⁵ NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE BLOWS/0. SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT BORING DESCRIPTION DEPTH -OW Wp -(m) --- CONTINUED FROM PREVIOUS PAGE ---(Golder Report No. 10-1140-0090-1000-L02) 149 18 SS 10 \circ 29 148 Grout Very stiff to stiff, grey CLAYEY SILT to SILTY CLAY, some sand, trace to some gravel, occasional to numerous sand layers/pockets 147 146 31.39 145.61 19 ss >100 Very dense, grey BOULDERS NQ RC DD 20 ROTARY DE HQ ROCK Bentonite Grey, CLAYEY SILT to SILTY CLAY, 'ARY (coated) some sand, trace gravel, occasional boulders 145 32.54 SS >100 0 Very dense, grey **SANDY SILT**, some clay, some gravel **(TILL)** 143.09 NQ RC DD 143 =107.9mPa qu=98.6mPa 23 HQ DD 57 69 142 Poor to excellent quality, grey **DOLOSTONE BEDROCK**, occasionally % S.C.R. (%) R.a.D. (%) Sand fractured, occasional sand seams - occasional light petroleum odour 141 NQ RC 24 DD 69 43 80 ROTARY DRILLING NQ ROCK CORE Screen NQ RC 25 DD 93 86 82 --- CONTINUED NEXT PAGE ---

DEPTH SCALE 1:50 Golder

RECORD OF BOREHOLE 1

SHEET 5 OF 5

LOCATION: SEE LOCATION PLAN

BORING DATE: May 25, 2010 - May 27, 2010

DATUM: GEODETIC

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

رَاٍّ	HOD.	SOIL PROFILE	1.		SA	MPL	_	ž	DYNA RESIS	MIC PI	ENE E, E	LOW	iON S/0.3m	, \		k, cm/s			Ţl	AL	INSTALLATION
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEA Cu, kF			GTH		80 . + Q - ● 7. ⊕ U - O	V	VATER (CONTEN	T PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
\dashv		CONTINUED FROM PREVIOUS PAGE	0				Ħ			20	40)	60	80		10	20	30 4	40		
38	ROTARY DRILLING NQ ROCK CORE						DD	139	7.C.R. (%)	(%	97	R.O.D. (%)						qu=96.8m. 			
40	ROT	- occasional light petroleum odour		136.74		NQ RC	DD	137	94		92_	92						qu=72.5m	Pa		
		END OF BOREHOLE		40.49				((- Golda	or I	20	nor	1 Ν	o. 10	 1 <i>14(</i>	 -////0	 	 } }	 02		
42 43 44									- Harris de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la constante de la			<i>joi</i>		0. 10-							Groundwater seepag encountered at about elevation 175.7m dur drilling on May 25, 20 Water level in piezom at about elevation 179.2m on May 31, 2
45																					
46																					
47																					
DEF		SCALE			<u> </u>			(As	30	lde	r			1	1				LOGGED: SM CHECKED:

SHEET 1 OF 3

LOCATION: SEE LOCATION PLAN

BORING DATE: February 10, 2012

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

щ		QQ	SOIL PROFILE			SAN	//PLES		DYNAMIC PENE RESISTANCE, E		\	HYDRAULIC k, cr		ΓΙVITY, –	٥٦	INSTALLATION
DEPTH SCALE	METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENG Cu, kPa	GTH nat V. rem V	80 + Q - ● ⊕ U - ○	10 ⁻⁶ WATEF Wp I—	CONTENT	0 ⁻⁴ 10 ⁻³	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
	0 1	POWER AUGER 140mm OD SOLID STEM	PAVEMENT SURFACE ASPHALT (GM) SILTY GRAVEL and SAND, angular; grey, (GRANULAR BASE). (ML) CLAYEY SILT, some sand, trace gravel; brown, some organic pockets, trace red brick, (FILL); firm. (ML) CLAYEY SILT, some sand, trace gravel; brown and grey, some organic pockets, sand pockets (possible FILL); cohesive, w~PL, firm to stiff. (ML) CLAYEY SILT, trace sand; brown and grey, laminated with silt partings; cohesive, w~PL, firm. END OF BOREHOLE		182.91 0.05 0.18 181.69 1.22 180.78 2.13	3	SS 9 SS 8 SS 5	182	(Golde	r Repo	rt No.		0	0-R01)	_	Borehole dry during and after drilling on February 10, 2012.

PROJECT: 11-1140-0200

RECORD OF BOREHOLE 2

LOCATION: SEE LOCATION PLAN

BORING DATE: February 10, 2012

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

I	щ	ОО	SOIL PROFILE			SA	MPLE	ES	_	DYNAMIC I RESISTAN	PENETRA CE, BLOV	TION /S/0.3m	1	HYDRA	AULIC Co	ONDUCT	IVITY,	Т	Ğ	INIOTALLATION
	DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	. =	TYPE	BLOWS/0.3m	ELEVATION	20 SHEAR ST Cu, kPa 20	40 RENGTH 40	nat V. rem V.	80 + Q - ● ∌ U - ○	Wp	ATER C	DNTENT OW	PERCEI		ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
ס וויין וויים איים איים איים איים איים איים איי	- 0	POWER AUGER 140mm OD SOLID STEM	PAVEMENT SURFACE ASPHALT (GM) SILTY GRAVEL and SAND, angular; grey, (GRANULAR BASE). (SW) SAND, trace to some gravel; brown, (FILL). (ML) CLAYEY SILT, some sand, trace gravel; brown, trace organic pockets; cohesive, w>PL. END OF BOREHOLE		181.54 0.05 180.26 0.38	1	cs		181						Ì	D)			l .	Borehole dry during and after drilling on February 10, 2012.
ر د الا	DE	PTH S	SCALE						1		Cald	~*								LOGGED: SM

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SHEET 2 OF 3

LOCATION: SEE LOCATION PLAN

BORING DATE: February 10, 2012

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

U SOIL PROFILE SAMPLES TWANIC PENE IRA I I OF RESISTANCE, BLOWS/0	HYDRAULIC CONDUCTIVITY, k, cm/s INSTALLATION
SOIL PROFILE SAMPLES SAMPLES PRESISTANCE, BLOWS/0 RESISTANCE, BLOWS/0 20 40 60 SHEAR STRENGTH na Cu, kPa rei 20 40 60	80 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$ 10 $^{\circ}$
0 20 40 60	80 10 20 30 40 PORT No. 11-1140-0200-R01) Borehole dry during and after drilling on February 10, 2012.

PROJECT: 11-1140-0200

RECORD OF BOREHOLE 4

LOCATION: SEE LOCATION PLAN

BORING DATE: February 10, 2012

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

ш		ОО	SOIL PROFILE			SA	MPLE	ES		DYNAMIC I RESISTAN	PENETRAT CE, BLOW	ΓΙΟΝ 'S/0.3m	1	HYDRA	AULIC C	ONDUCT	IVITY,	Т	Ğ	
NEDTHING	METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	. =	TYPE	BLOWS/0.3m	ELEVATION	20 SHEAR ST Cu, kPa 20	40 RENGTH 40	nat V. + rem V. ⊕	Q - • U - O	W	ATER C		PERCENT	Г	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
	1 2 3	POWER AUGER 140mm OD SOLID STEM	GROUND SURFACE (SW/ML) SAND and SILT, some gravel, trace clay; brown and black, some organic material, trace red brick, (FILL). (ML) CLAYEY SILT, some sand, trace gravel; mottled brown and grey; cohesive, w~PL. (SM) SILTY SAND; brown; moist. END OF BOREHOLE		181.34 0.00 180.90 0.44 180.29 1.05 179.82	2	CS CS		181						0					Borehole dry during and after drilling on February 10, 2012.
		DT. 1.6																		

DEPTH SCALE 1:50



LOGGED: SM

SHEET 3 OF 3

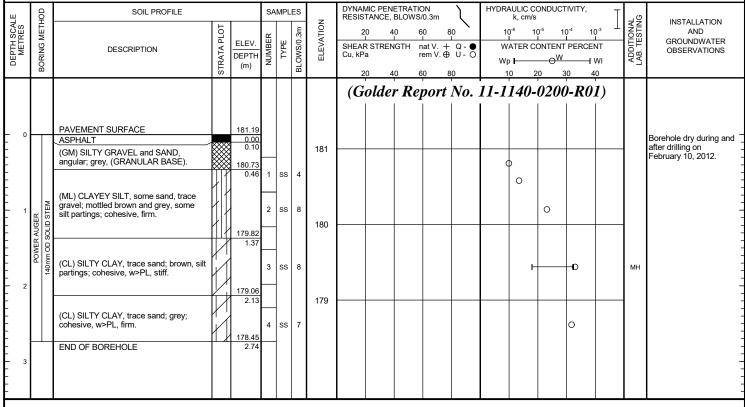
LOCATION: SEE LOCATION PLAN

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

BORING DATE: February 10, 2012

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm



PROJECT: 11-1140-0200

RECORD OF BOREHOLE 6

LOCATION: SEE LOCATION PLAN

BORING DATE: February 10, 2012

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

	ш	ОО	SOIL PROFILE			SA	MPL	ES.		DYNA! RESIS	ЛІС PEN TANCE,	ETRATI	ON /0.3m	1	HYDRA	AULIC C k, cm/s	ONDUCT	IVITY,	Т	. (1)	
	DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	ι ≔	TYPE	BLOWS/0.3m	ELEVATION	SHEAF Cu, kP	0 4 R STREN	IO 6 NGTH I	60 8 L nat V. + rem V. ⊕	Q - • U - O	W	Of 1 ATER C	0 ⁻⁵ 10 ONTENT	PERCE	NT WI	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
סייים יוים יוים איים האים בויהסבו עסייסרן בערה_בעונים לווים וויו סייים וויוים איים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים העיים ווים ווים ווים ווים ווים ווים ווים	0	POWER AUGER 140mm OD SOLID STEM	PAVEMENT SURFACE (ASPHALT (GM) SILTY GRAVEL and SAND, angular; grey, (GRANULAR BASE). (SW/ML) SAND and SILT, some gravel; brown, trace red brick, (FILL). (ML) CLAYEY SILT, some sand, trace gravel; brown; cohesive, w>PL. END OF BOREHOLE		181.45 0.05 0.18 180.08 1.37 1.52	1	CS		181							0	•			l	Borehole dry during and after drilling on February 10, 2012.
ı	D.		20415						4												LOCOED: CM

11-1140-0200.GPJ GLDR LDN.GDT

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 13, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mmDYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s QO SOIL PROFILE SAMPLES

METRES	BORING METHOL		DESCRIPTION	A PLOT	ELEV.	H	TYPE	æ.	ELEVATION	RESISTANCE, BL	60	80 + Q - •	1	0 ⁻⁵ 10 ⁻⁴ 10 L L ONTENT PERCEN	———1 ≌ ӹ	INSTALLATIO AND GROUNDWA ^T
Σ	BORIN		DESCRIPTION	STRATA PLOT	DEPTH (m)	NUMBER	Υ	BLOW	33	SHEAR STRENG Cu, kPa	60	80	10 :	O 30 40		OBSERVATIO
										(Golder	<i>Repor</i>	<i>t No.</i>	<i>13-1140-</i> 	0026-R01	!)	
0		4	ROAD SURFACE ASPHALT		175.85				176							
		-	CONCRETE	P 4	175.85 0.00 0.10 175.57 0.28	L										Borehole dry upor completion of drilli March 13, 2013.
			(CL) sandy SILTY CLAY , trace gravel; mottled brown and grey, (TILL); cohesive, w~PL, stiff.		0.20		ss	8	175				0			March 13, 2013.
1				16	174.84		ss	10	170				0			
						3	ss	18	174				0			
2	UGER	OW STEM	(01)													
- 1	POWER AUGER	83mm ID HOLLOW STEM	(CL) sandy SILTY CLAY , trace gravel; brown, (TILL) , cohesive, w~PL, very stiff to stiff.	6		4	ss	17	173				0			
3		8				5	ss	13					0			
4					171.74		ss	12	172				0			
			(CL) sandy SILTY CLAY , trace gravel; grey, (TILL); cohesive, w~PL, stiff to firm.		4.11											
5			END OF BOREHOLE		170.82 5.03	ı	ss	5	171				0			
									170							
6																
7																
8																
9																
_ DF	PTH	1 80	CALE		1		1			Gol	1.					LOGGED: LS

DEPTH SCALE 1:50



BHS_02 1311400026.GPJ 22/03/13 DATA INPUT: DMB

1:50

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 13, 2013

DATUM: GEODETIC

CHECKED:

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

S		ТНОД	SOIL PROFILE	1 5	1	┢	AMPL		NO		ETRATION BLOWS				AULIC Co				NAL	INSTALLATION
METRES		BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	R STREN	IGTH I	⊥ nat V. + rem V. ⊕	Q - • U - O	W	O ⁻⁶ 10 ATER CO	DNTENT	PERCE	WI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
		В		, v	. ,			В			,		<i>No.</i>		1140			<i>01</i>)		
0	L	Τ	ROAD SURFACE ASPHALT CONCRETE	00	175.97				176										_	Borehole dry upon
			(CL) sandy SILTY CLAY, trace gravel; mottled brown and grey, with organic pockets, (TILL); cohesive, w>PL, firm to		0.22	1	ss	6							C	,			1	completion of drilling or March 13, 2013.
1			pockets, (TILL); cohesive, w>PL, firm to stiff.			L	ss	8	175)				
				2/	174.60	3	ss	19							0					
2	GER	W STEM							174										-	
	POWER AUGER	83mm ID HOLLOW	(CL) sandy SILTY CLAY , trace gravel; brown, (TILL) , cohesive, w~PL, very stiff to stiff.			4	ss	14							0					
3		83				5	ss	11	173						0					
4					172.31 3.66	6	ss	6	172				>96_+		0					
			(CL) sandy SILTY CLAY , trace gravel; grey, (TILL); cohesive, w~PL, very stiff to firm.				33	0		⊕		+								
5	L		END OF BOREHOLE		170.94 5.03	ı	ss	3	171						0					
6									170											
7																				
8																				
9																				
DF	<u>L</u>	TH S	CALE		<u> </u>															LOGGED: LS

RECORD OF BOREHOLE BH-105

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 13, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

	HOD		SOIL PROFILE			SA	MPL	-	z	DYNAMIC PENETRA' RESISTANCE, BLOW	ION S/0.3m	(HYDRAU	JLIC CONI k, cm/s	DUCTIVITY,	Ţ	무일	INSTALLATION
METRES	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGTH Cu, kPa		Q - • U - ○	10 ⁻⁶ WA	TER CONT	10 ⁻⁴ TENT PERCI		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
+	BOF	5		STR	(m)	ž		BLC		20 40	60	80 4 N 7 o	10	20	30	40	۲,	
										(Golder F	eport 	1 VO. 	13-1. 	140-0 	 	<i>01)</i> 		
۰		-	ROAD SURFACE ASPHALT CONCRETE	0.4	176.21 0.00 0.10				176									Borehole dry upon
					0.25	1	ss	8	170					0				completion of drilling March 13, 2013.
			(CL) sandy SILTY CLAY , trace gravel; mottled brown and grey, layers/pockets of topsoil, (TILL) ; cohesive, w>PL, stiff			2	ss	6										
			to firm.		174.84			Ů	175									
l					1.37	3	ss	12						0				
		EM				_												
	POWER AUGER	LS WOJJC	(CL) sandy SILTY CLAY , trace gravel; brown, (TILL) , cohesive, w~PL, stiff to very stiff.			4	ss	15	174					0				
	POWE	83mm ID HOLLOW																
١		8			172.86	5	ss	9	173					-				
					3.35	_						. 06		0				
			(CL) sandy SILTY CLAY, trace grayel:			6	ss	5				>96+		0				
			(CL) sandy SILTY CLAY , trace gravel; grey, (TILL) ; cohesive, w~PL, very stiff to firm.						172									
l						ı	SS	4		Φ	+			0				
5		1	END OF BOREHOLE	11/1	171.18 5.03				171									
l																		
1										Gold								

BHS_02 1311400026.GPJ 22/03/13 DATA INPUT: DMB 1:50

LOGGED: LS CHECKED:

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 13, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 lb; DROP, 760 in

PENETRATION TEST HAMMER, 63.5 lb; DROP, 760 in

	٥	SOIL PROFILE			SAMF	PLES		DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, RESISTANCE, BLOWS/ft k, cm/s	$\overline{\top}$	
DEP IN SCALE FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	ŀ	ELEVATION	RESISTANCE, BLOWS/ft	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
	BC	PAVEMENT SURFACE	STE	(ft) 574.8		a	575	400 800 1200 1600 10 20 30 40 (Golder Report No. 13-1140-0031-R01)		
0		ASPHALT (SW/GW) SAND AND GRAVEL, angular; brown, (GRANULAR BASE);		9:9 573.6	1 A		373			Borehole dry upon completion of drilling on March 13, 2013.
		\moist. (CL) SILTY CLAY, trace sand; black, (TOPSOIL); cohesive, w>PL.	222 222 222 222	571.3	3 S					Wardi 13, 2013.
5		(CL/CI) sandy SILTY CLAY , trace gravel; mottled brown and grey, (TILL); cohesive, w~PL, soft to very stiff.		3.5	4 S	s 4	570	0		
	JGER	•	6	567.8 7.0				>2000		
	POWER AUGER	(CL/Cl) sandy SILTY CLAY , some gravel; brown, (TILL); cohesive, w <pl,< td=""><td></td><td></td><td>5 S</td><td>S 22</td><td>565</td><td></td><td>МН</td><td></td></pl,<>			5 S	S 22	565		МН	
10		ত্তী very stiff.	9	562.0	6 S	S 19				
		(CL/CI) sandy SILTY CLAY , trace to	2	562.8	7 S	s 6				
15		(CL/Cl) sandy SiLTY CLAY, trace to some gravel; grey, (TILL); cohesive, w>PL, stiff to firm.			8 S	s 5	560	⊕ + _O	-	
		END OF BOREHOLE	1. /	558.3 16.5						
							555			
20							333			
25										
30										
35										
		H SCALE to 5 feet						Golder Associates		LOGGED: LS CHECKED:

RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 13, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 lb; DROP, 760 in

PENETRATION TEST HAMMER, 63.5 lb; DROP, 760 in

H ₁	HOD	SOIL PROFILE			SAN	/PLES	s	z	DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, K, cm/s	NSTALLATION
DEPTH SCALE FEET	BORING METHOD	DESCRIPTION DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/FI	ELEVATION	20 40 60 80 10 ⁶ 10 ⁵ 10 ⁴ 10 ³ 10 ⁵ 5 6	AND ROUNDWATER BSERVATIONS
- 0 - - - - 5		PAVEMENT SURFACE ASPHALT (SW/GW) SAND AND GRAVEL, angular; brown, (GRANULAR BASE); moist. (CL) SILTY CLAY, some sand; black, (TOPSOIL); cohesive, w>PL. (CL/CI) sandy SILTY CLAY, trace gravel; mottled brown and grey, (TILL); cohesive, w~PL, firm to very stiff.	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	574.5 0.2 0.8 572.5 2.0	3	AS AS SS &	5	575 570	(Golder Report No. 13-1140-0031-R01)	ole dry about 2 after completion of on March 13,
- - - 10 -	POWER AUGER	(CL/CI) sandy SILTY CLAY, some gravel; brown, (TILL); cohesive, w <pl, stiff="" stiff.<="" td="" to="" very=""><td></td><td>567.5 7.0 562.5 12.0</td><td></td><td>SS 2</td><td></td><td>565</td><td>>2000_</td><td>- - - -</td></pl,>		567.5 7.0 562.5 12.0		SS 2		565	>2000_	- - - -
- - 15 -		(CL/CI) sandy SILTY CLAY , trace to some gravel; grey, (TILL); cohesive, w>PL, very stiff to firm. END OF BOREHOLE		558.0 16.5		ss {		560	>2000	- - -
- - 20 - -								555		- - -
- - 25 - - -										- - -
- 30 - 35										- - - -
1		TH SCALE							l 4≡	OGGED: LS ECKED:

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: May 01, 2014

DATUM: LOCAL

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

8	SOIL PROFILE			SA	MPLE:		DYN RES	AMIC PE	NETRATI	ON 3/0.3m)	HYDR	AULIC CO k, cm/s	ONDUCT	IVITY,	Т	(1)	
METRES BORING METHOD		ТО		t		ا پي					80	11	K, CITVS) ⁻⁴ 1	0-3	ADDITIONAL LAB. TESTING	INSTALLATION AND
ETRI G ME	DECORPTION	l _P C	ELEV.	BER	밁	5/0.3	SHE Cu,						ATER CO				TES	GROUNDWATER
<u>ă</u> <u>ă</u>	DESCRIPTION	STRATA PLOT	DEPTH		TYPE	BLOWS/0.3m	H Cu,	AR STRE kPa		rem V. ⊕	ŭ- Ŏ	\/\/r	ATER CO				AB.	OBSERVATIONS
8		STF	(m)	Ľ	i	<u> </u>		20	40	60	80	1	0 2	0 3	0 4	10		
							(Gold	er R	nori	No.					(1)		
				l				1	1		1		1	0200	1	· - /		
				l		1	02										1	
				l														
				l														
	GROUND SURFACE		101.31															
1	FILL - (CL) sandy clayey TOPSOIL	\mathbb{X}	0.00 101.11	1	AS													Borehole dry upon completion of drilling
		\times	0.20	Ή		1	01										-	completion of drilling May 1, 2014.
		\times		2	ss	6												., 20
		\otimes		H														
1		\otimes	1	3	ss	8												
		\otimes		L														
		\otimes	k			1	00										1	
		\bowtie	1	\vdash	1				⊕		+							
	FILL - (CL) sandy SILTY CLAY, trace	\otimes	}	4	SS	5												
2	FILL - (CL) sandy SILTY CLAY, trace gravel; brown to grey, with pieces of wood, brick, concrete; cohesive, moist, soft to stiff	\otimes		\vdash	+													
POWER AUGER	U SOπ to Stiff	\bowtie	1			,	99		1	L	L	L				L		
AUG		\otimes		5	ss	5 `	20											
WER	8	\times		l°	33	۱ ا												
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3		\bowtie		\vdash				•	-	+								
		\otimes	}	6	ss	4	98											
		\times	1	L	1	`												
		+	97.65 3.66															
		\otimes	1		1													
4	FILL - (CL) sandy SILTY CLAY trace	\otimes		7	SS	3												
	FILL - (CL) sandy SILTY CLAY, trace gravel; black to dark grey, with sand seams, pieces of wood, brick, organic	\times		\vdash		9	97 —				-						-	
	seams, pieces of wood, brick, organic material; cohesive, soft	\otimes	1	L														
		\otimes		8	ss	3												
5		$\perp \!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!$	96.28]~~													
	END OF BOREHOLE		5.03															
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EPTH	SCALE							G	ماطم	10								LOGGED: LS
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BHS_02 1311400188.GPJ 12/05/14 DATA INPUT: DMB

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RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: May 01, 2014

DATUM: LOCAL

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

ړ	THOD	-	SOIL PROFILE	 		SA	MPL		N _C	DYNAMIC PENETRATION HYDRAULIC CONDUCTIVITY, k, cm/s INSTALLATION
METRES	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m
									101	Golder Report No. 13-1140-0188-R01)
0		GR	OUND SURFACE		100.02				100	
		FILI CLA	L, TOPSOIL - (CL) sandy SILTY Y; black		99.36	1	AS SS	5		
1		FILI grav	L - (CL) sandy SILTY CLAY, trace vel; brown to grey, with pieces of d; cohesive, firm to stiff	\bigotimes	98.82	3	ss	13	99	
2	POWER AUGER		L - (SM) SILTY SAND; brown to ck, with pieces of wood, slag, foundry d, brick; non-cohesive, dry, compact lose		1.20	4	ss	8		
	POWE	san to lo	L - (CL) sandy SILTY CLAY; y-brown, with pieces of brick, sand kets; cohesive, very stiff		97.89 2.13	5	ss	22	98	Groundwater seep into borehole encountered at ab elev. 97.0m during on May 1, 2014.
3			L - Refuse debris, brick fragments, crete pieces; loose		97.12 2.90		ss	16	97	Seepage
4			O OF BOREHOLE		96.14 3.88	_7_	ss	50/7	75mm 96	May 1/14 ▼ Water level in bore about elev. 96.2m completion of drillin
										May 1, 2014.
5										
6										
7										
8										
9										
										LOGGED: LS

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: November 25, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

, L	гнор	SOIL PROFILE	T =		SA	MPL		Z	DYNAMIC PENETR RESISTANCE, BLO	WS/0.3m	$\overline{\chi}$		AULIC CONDU k, cm/s		T 48	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGTH Cu, kPa	nat V. + rem V. €		Wp	ATER CONTE	W WI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0 -		ROAD SURFACE ASPHALT FILL - (SM/GW) SILTY SAND and GRAVEL, angular; grey, (GRANULAR BASE); dry	32	190.85 0.00 0.13 190.34	1	AS	14	191	_(Golder I		No.				-	Borehole dry upon completion of drilling November 25, 2013.
1		(CL) sandy SILTY CLAY , trace gravel; mottled brown and grey, organic pockets, (TILL); cohesive, w~PL, firm			H	ss	7	190					0			
3		(CL) sandy SILTY CLAY , trace gravel; brown, fissured, (TILL); cohesive, w <pl, stiff<="" td="" very=""><td></td><td>188.72 2.13</td><td></td><td>ss</td><td>24</td><td>189</td><td></td><td></td><td>>96+</td><td></td><td>0</td><td></td><td></td><td></td></pl,>		188.72 2.13		ss	24	189			>96+		0			
4	POWER AUGER 184mm ID HOLLOW STEM			187.19 3.66	7	ss	21	187				(0			
6	PC 184mm	(CL) sandy SILTY CLAY , trace gravel; grey, fissured in upper portion, (TILL) ; cohesive, w <pl, stiff<="" td="" very=""><td>0 0 0</td><td></td><td>9</td><td>ss</td><td>10</td><td>185</td><td></td><td></td><td></td><td>C</td><td>0</td><td></td><td></td><td></td></pl,>	0 0 0		9	ss	10	185				C	0			
7					10	ss	10	184			>96 + >96 +		•			
9						-		182			>96 + >96 +					
		END OF BOREHOLE		181.25 9.60	l	ss	6					0				
DEI		SCALE							Gold	er				<u> </u>		LOGGED: SG CHECKED:

RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: November 25, 2013

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

1,0	НОР	SOIL PROFILE	1 -		SA	MPL	_	Z	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m
0		ROAD SURFACE		190.75 0.00 0.08					(Golder Report No. 13-1140-0207-R01)
		FILL - (SM/GW) SILTY SAND and GRAVEL, angular; grey, (GRANULAR BASE); dry TOPSOIL - (ML) sandy CLAYEY SILT; black; cohesive, w~PL, stiff	\(\) \(\) \(\) \(\) \(\) \(\) \(\) \(\)	0.25	2	AS SS	11	190	Borehole dry upon completion of drilling on November 25, 2013.
1		(CL) sandy SILTY CLAY , trace gravel; mottled brown and grey, organic pockets, (TILL) ; cohesive, w~PL, firm		0.76	3	ss		189	0
3		(CL) sandy SILTY CLAY , trace gravel; brown, fissured, (TILL) ; cohesive, w <pl, stiff<="" td="" very=""><td></td><td>188.62 2.13</td><td>\vdash</td><td>ss</td><td>24</td><td>188</td><td></td></pl,>		188.62 2.13	\vdash	ss	24	188	
	SER W STEM		9/	187.09 3.66	L	ss	27	187	
	POWER AUGER 184mm ID HOLLOW STEM					ss		186	0
5		(CL) sandy SILTY CLAY , trace gravel; grey, (TILL) ; cohesive, w~PL, very stiff	0					185	
					9	SS	7	184	0
7					10	ss	6	183	>96+
8		END OF BOREHOLE	7/::'	182.67 8.08	10		v		
9								182	
DE:		SCALE							Golder LOGGED: SG CHECKED:

PROJECT: 13-1140-0207

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

BORING DATE: November 25, 2013

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

ای	THOD	SOIL PROFILE	 	1	SA	MPL	_	N _C	DYNAMIC PEN RESISTANCE,			\		k, cm/s			NG F	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAR STREM Cu, kPa	IGTH		Q - • U - O	W	·	ONTENT PE	—ı wı	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		ROAD SURFACE		190.50					(Golder	Rep	ort N	Vo. 1	3-11	40-0	207-K	R01)		
		ASPHALT FILL - (SM/GW) SILTY SAND and GRAVEL, angular; grey, (GRANULAR BASE); dry		0.00 0.15 189.94	,	1	30	190					0					Borehole dry upon completion of drilling November 25, 2013.
1				0.56		ss								0				
		(CL) sandy SILTY CLAY , trace gravel; mottled brown and grey, organic pockets, (TILL); cohesive, w~PL, firm						189										
2	STEM			188.37	4	SS	4					>96+		0				
	POWER AUGER 184mm ID HOLLOW STEM	(CL) candy SN TV CLAV trace gravel:			5	ss	26	188				+		0				
3	184mn	(CL) sandy SILTY CLAY , trace gravel; brown, fissured, (TILL); cohesive, w <pl, stiff<="" td="" very=""><td></td><td></td><td>6</td><td>ss</td><td>29</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td><td></td><td></td><td></td><td></td></pl,>			6	ss	29							0				
				186.84 3.66				187										
4		(CL) sandy SILTY CLAY , trace gravel; grey, fisher, (TILL); cohesive, w <pl,< td=""><td></td><td></td><td>7</td><td>ss</td><td>17</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td><td></td><td></td><td></td><td></td></pl,<>			7	ss	17							0				
5		very stiff to stiff		185.47	8	ss	12	186						0				
		END OF BOREHOLE		5.03				185										
6																		
7																		
8																		
9																		

PROJECT: 13-1140-0207

RECORD OF BOREHOLE BH-104

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

BORING DATE: November 25, 2013

DATUM: GEODETIC

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

[س	THO	SOIL PROFILE	⊤ ⊢	1	SA	MPL		Z Z	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.		HYDRAULIC CONDUCTIVITY, k, cm/s	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 60 SHEAR STRENGTH nat Cu, kPa ren 20 40 60	t V. + Q - ● m V. ⊕ U - O	10 ⁵ 10 ⁵ 10 ⁴ 10 ³ WATER CONTENT PERCENT WP I	POLITION OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITICAL OF THE POLITIC
0		ROAD SURFACE		190.30						ort No.	13-1140-0207-R01)	
		ASPHALT FILL - (SM/GW) SILTY SAND and GRAVEL, angular; grey, (GRANULAR BASE); dry		0.00 0.13 189.92 0.38	1	AS	16	190			0	Borehole dry upon completion of drilling November 25, 2013
1		(CL) sandy SILTY CLAY , trace gravel; mottled brown and grey, organic pockets, (TILL); cohesive, w–PL, very stiff to stiff				ss					0	
			9/	188.78 1.52	4	ss	18	189			Φ	
2		(CL) sandy SILTY CLAY , trace gravel; brown, fissured, (TILL); cohesive, w <pl, stiff<="" td="" very=""><td></td><td></td><td>5</td><td>ss</td><td>28</td><td>188</td><td></td><td></td><td>0</td><td></td></pl,>			5	ss	28	188			0	
3	POWER AUGER 184mm ID HOLLOW STEM	W-FL, very Suii			6	ss	27	187				
4	PO 184mm			186.64 3.66	7	ss	13				0	
			6 8		8	ss	12	186			0	
5		(CL) sandy SILTY CLAY , trace gravel; grey, (TILL); cohesive, w <pl, stiff<="" td=""><td>6</td><td></td><td></td><td></td><td></td><td>185</td><td></td><td></td><td></td><td></td></pl,>	6					185				
6			0 0		I -	ss	9	184			0	
7		END OF BOREHOLE	11.4	183.75 6.55								
								183				
8												
9												

RECORD OF BOREHOLE BH-101

SHEET 1 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 27, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 140 lb; DROP, 30 in

	멀	SOIL PROFILE	 -	1	SAN	//PLES	- I z	DYNAMIC PENETRAT RESISTANCE, BLOW	S/ft	HYDRAULIC C k, cm/s	3	∏ ⁴ S	INSTALLATION
	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE BLOWS/FT	ELEVATION	20 40 SHEAR STRENGTH Cu, psf	60 80 nat V. + Q - ●	WATER C	0.5 10.4 10.3 ONTENT PERCENT	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
	BOR		STRA	DEPTH (ft)	2	T BLO	"		1200 1600	Wp -	OW WI 20 30 40	 44	
T									Report No				
₀┝		GROUND SURFACE	XX	579.0 0.0									
		FILL - (SM) SILTY SAND mixed with clay and gravel; brown, organic pockets,			Ė	AS				0			
		asphalt and concrete fragments; moist, compact		576.5	2	SS 25				0			
		FILL - (CL) sandy SILTY CLAY, trace gravel; brown, with concrete fragments; cohesive, w <pl, stiff<="" td="" very=""><td>\otimes</td><td>2.5</td><td>3</td><td>SS 18</td><td>; </td><td></td><td></td><td>o</td><td></td><td></td><td></td></pl,>	\otimes	2.5	3	SS 18	;			o			
		cohesive, w <pl, stiff<="" td="" very=""><td>\bigotimes</td><td>574.5 4.5</td><td></td><td></td><td>575</td><td></td><td></td><td></td><td></td><td>\dashv</td><td></td></pl,>	\bigotimes	574.5 4.5			575					\dashv	
5		FILL - (SW) SAND and CONCRETE;		4.5		ss 23							
		grey; non-cohesive, moist, compact		572.0									Mar. 27/14▼_
		FILL - (SM) SILTY SAND, trace gravel; black, with pockets of foundry sand,		7.0						0			Water level in boreho
		cemented; non-cohesive, wet, compact	\prod	570.5 8.5		SS 15	570						upon completion of drilling on March 27,
٥								/					2014.
					6	SS 5					0		
					7	SS 2							
							565						
5					8	SS 2							
					\vdash								
<u>ا</u> ۾	STEM												
POWER ALIGER	LLOW						560					_	
0 8	3/4" ID HOLLOW STEM	(SM) SILTY SAND ; grey, with organic			Н								
	3/4	fibres, shells, rootlets; non-cohesive, wet, loose			9	SS 1							
				-									
5							555						
					10	ss 1							
							550					\dashv	
0					11	ss 1							
					H	- '							
				546.0									
				33.0			545					_	
5		(SW) SAND ; grey, with organic fibres,											
		shells, rootlets; non-cohesive, wet, compact			12	ss 5							
\vdash				-								+	
\perp		CONTINUED NEXT PAGE						Colde					

RECORD OF BOREHOLE BH-101

SHEET 2 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 27, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 140 lb; DROP, 30 in

į	THOD	SOIL PROFILE	1 ⊨	1	SA	MPL	ES.	z	DYNAMIC PER RESISTANCE			\		k, cm/s			Ţ	NG NG	INSTALLATION
FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/FT	ELEVATION	SHEAR STRE Cu, psf	NGTH			Wp	ATER CO	0 ⁵ 10 ONTENT	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
┪		CONTINUED FROM PREVIOUS PAGE								,		Repo							
40		(SW) SAND ; grey, with organic fibres, shells, rootlets; non-cohesive, wet, compact			13	ss	1	540								0			
45	POWER AUGER	(ML) CLAYEY SILT, some sand; grey; cohesive, w>PL, soft		533.0 46.0 531.5 47.5		ss	2	535							0		0		
50		(ML) CLAYEY SILT, some sand, trace gravel; grey, sand and gravel layers and pockets, (TILL); cohesive, w>PL, stiff to very stiff		527.5 51.5	15	ss	12	530		Φ		>2000		0				-	
55								525										_	
60																			
65																			
70																			
75																			
DEF	РТН	ISCALE							A G	olde	r							Ш	LOGGED: SM

RECORD OF BOREHOLE BH-102

SHEET 1 OF 2

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 27, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 140 lb; DROP, 30 in

ļ	HOD.	SOIL PROFILE	1.	1	SA	MPL	.ES	ž	RESIS	TANCE,	BLOWS	ON S/ft	HYDRA	k, cm/s		IVIIY,	Ţ 	AL NG	INSTALLATION
FEET	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/FT	ELEVATION		RSTREN	IGTH	60 8 nat V. + rem V. ⊕	W	ATER C	ONTENT	0 ⁻⁴ 10 ⁻³ PERCENT W 30 40		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE FILL - (SM) SILTY SAND and GRAVEL, angular; grey, (GRANULAR BASE); non-cohesive, moist, compact FILL - (SM) SILTY SAND, trace gravel; brown, with glass fragments; non-cohesive, moist, compact FILL - (SM) SILTY SAND, trace gravel; grey, with clay pockets, concrete fragments; non-cohesive, moist, compact		578.5 0.0 576.5 2.0 574.0 4.5 572.0 6.5	3	SS	33	575					No		977	-R01)			Mar. 27/14 <u>▼</u>
10		(SW) SAND , some silt, trace gravel; grey to black, with shells; non-cohesive, wet, loose to compact		569.0	\vdash	ss	6	570							0				Water level in borehol about elev. 571.52 ft upon completion of drilling on March 27, 2014.
15	POWER AUGER 34" ID HOLLOW STEM	(SM) SILTY SAND ; grey, with organic fibres, shells, rootlets; non-cohesive, wet, loose to compact			7	ss ss	7	565 560							0				
30		(SW) SAND ; grey, with organic fibres and shells; non-cohesive, wet, loose to compact		550.5		ss		550 545								0			
35				540.5	12	ss	5									0			
		CONTINUED NEXT PAGE						l											

RECORD OF BOREHOLE BH-102

SHEET 2 OF 2

LOCATION: REFER TO LOCATION PLAN SAMPLER HAMMER, 140 lb; DROP, 30 in

BORING DATE: March 27, 2014

DATUM: GEODETIC

L L		5	SOIL PROFILE	1 -		SA	AMPI	ES	l z	RESIS	MIC PEN TANCE,	BLOWS	S/ft	Į			k, cm	/s			T	A P	INSTALLATION
FEET	BOBING METHOD	KING ME	DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/FT	ELEVATION		20 4 R STREI f		60 nat V. rem V.	80 + Q ⋅ ⊕ U ⋅	· - •	10 WA	ATER			f 1 PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
2		Š		STR	(ft)	Ž		В		4	00 8	00 1	200	1600			0		30		10 10	, ,	
		\square	CONTINUED FROM PREVIOUS PAGE	<u> </u>	38.0	L			540		-(G	olde	r R	epo	rt	No.	140	097	77-	<i>R01</i>	() <u> </u>		
]									1									
40																							
			(CL) SILTY CLAY, some sand, trace			13	SS	4									С)					
			gravel; grey, with sand seams and shells; cohesive, w~PL, stiff to firm																				
		2			1							₫	,		+								
	SER	V STE			534.0				535				Ð	+								1	
45	R AU	3/4" ID HOLLOW STEM		I	44.5	<u> </u>																	
	POWE	¥ □			1	14	ss	3										9					
		3/4			1	Н	1																
			(CI) SILTY CLAY , trace sand; grey; cohesive, w>PL, firm to soft		1							+											
			cohesive, w>PL, firm to soft		1				530	Φ		+		+								1	
50				K	1																		
50					1	15	ss	WH	ı									þ					
		Н	END OF BOREHOLE	\mathcal{L}	527.0 51.5	\vdash																	
									525					+					+			1	
55																							
60																							
65																							
70																							
75																							
						L					<u> </u>												
DE	PT	ΉS	CALE						1		G Ass	ماراه	r										LOGGED: SM
1 ir	nch	to 5	5 feet						'	VI	Ass	ocia	tes										CHECKED:

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 27, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 140 lb; DROP, 30 in

<u> </u>	HOD	2	SOIL PROFILE	١.		SA	MPL	.ES	z	DYNA RESIS	MIC PEN TANCE,	ETRATION BLOWS	ON /ft		HYDRA	AULIC C k, cm/s	ONDUCT	TIVITY,	T	NG NG	INSTALLATION
FEET	BORING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS/FT	ELEVATION	SHEA Cu, ps	R STREM	IGTH r	60 8 hat V. + rem V. ⊕	U - O	W	ATER C	ONTENT	PERCE	WI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
0 -			PAVEMENT SURFACE	o	577.3					4		1	Rep		lo. 1	ı	977-1 		<u>10</u>		
		\	ASPHALT FILL - (SM) SILTY SAND and (GRAVEL, angular; grey, (GRANULAR BASE); non-cohesive, moist FILL - (SP) SAND, some silt; brown, with red brick fragments; moist, compact FILL - (SW) SAND and CONCRETE;		574.8 574.8	2	ss	10	575	+					0	0					
5	POWER AUGER	3/4" ID HOLLOW STEM	\(\sqrt{grey}\); non-cohesive, moist, loose (SW) SAND, trace silt; dark brown; non-cohesive, moist, compact (SW) SAND, fine to coarse, trace silt;		3.3 572.8 4.5	Ľ	ss									0					Mar. 27/14 Water level in borehol about elev. 573.31 ft upon completion of
	POWER	3/4" ID HOL	brown; non-cohesive, wet, compact		570.3 7.0		ss		570								0				drilling on March 27, 2014.
10			(SM) SILTY SAND , trace gravel; grey; non-cohesive, wet, compact to loose			6	ss										0				
=			END OF BOREHOLE		565.8 11.5				565												
15																					
20																					
25																					
30																					
35																					
			CALE								G										

RECORD OF BOREHOLE BH-104

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: March 27, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 140 lb; DROP, 30 in

	HOH		SOIL PROFILE	1 -		SA	MPL	LES	Z	DYNAMIC RESISTA		OWS/				AULIC C k, cm/s	5		T	AL	INSTALLATION
DEP IN SCALE FEET	BOBING METHOD		DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/FT	ELEVATION	SHEAR S Cu, psf	40 TRENGT	H n			W	/ATER C	1	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
	- a	2		STF	(ft)	_		M		400			00 16		<u> </u>	10 2	20 3	30 4	10		
0			GROUND SURFACE FILL, TOPSOIL - (CL) SILTY CLAY; brown, with wood and roots; moist	\otimes	577.8 0.0 576.8	1	AS			((30lae	er I	Kepo	rt N	0. 1 ² 	4009 °	//-K	(01)			
			(SW) SAND, fine; trace gravel; brown; non-cohesive, dry, loose to compact		1.0	2	SS	6	575						0						
5	AUGER	OW STEM	(SM) SILTY SAND, some gravel; brown, with rootlets; non-cohesive, wet,		573.3 4.5																Mar. 27/14 Water level in boreho about elev. 573.56 ft
	POWER AUGER	3/4" ID HOLLOW STEM	brown, with rootlets; non-cohesive, wet, compact		570.8 7.0		SS	26)				upon completion of drilling on March 27, 2014.
40			(SM) SILTY SAND , trace clay; grey; non-cohesive, wet, loose			5	ss	7	570								0				
10			END OF BOREHOLE		566.3 11.5	6	SS	3									0				
									565												
15																					
20																					
25																					
30																					
35																					
DE	PTI	H S	CALE	<u> </u>	I			<u> </u>		A	Cal	dor			<u> </u>	1	I		<u>I</u>	I	LOGGED: SM

RECORD OF BOREHOLE BH-101 PROJECT: 1405019 SHEET 1 OF 14 LOCATION: REFER TO LOCATION PLAN BORING DATE: July 2, 2014 DATUM: NOT SURVEYED

Ш	дç	SOIL PROFILE			SA	MPLES		RF	YNAMIC I ESISTAN	PENE NCE, B	TRATIC	N 0.3m	\	HYDRA	AULIC Co k, cm/s	ONDUCT	IVITY,	Т	L IG	INSTALLATION
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	St Ct	20 HEAR ST u, kPa 20	40 ΓRENC 40	GTH n	at V. + em V. ⊕	Q - • U - O	10 Wr 1	ATER C	0°5 10 DNTENT	PERCEN W	T ′I	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
									(Go	olde	r R	epor	t No.	. 140	501	9-R0	1)			
_ 0	GEOPROBE 6820 MACRO CORE SAMPLING SYSTEM	ROAD SURFACE ASPHALT FILL - (SW-GW) SAND and GRAVEL, angular; grey, (ROADBASE); non-cohesive, moist FILL - (SP-GP) SAND and GRAVEL, angular; greyish brown, with asphalt, red brick, and concrete pieces, (RECYCLED SUB-BASE); non-cohesive, moist (CL) sandy SILTY CLAY; mottled brown and grey, (TILL); cohesive, w~PL END OF BOREHOLE		0.00 0.13 0.36 0.66	3	sc sc									0 0					Borehole dry upon completion of drilling on July 2, 2014.
PR	OJEC	T: 1405019		R	EC	COF	RD (OF E	3OR	EH	OLI	E I	BH-1	102						

LOCATION: REFER TO LOCATION PLAN BORING DATE: July 2, 2014 DATUM: NOT SURVEYED

Ī	щ	dob	SOIL PROFILE			SAI	MPLE	ES	-	DYNAN RESIS	IIC PEN ANCE,	ETRAT BLOW	ION S/0.3m	1	HYDRA	AULIC C k, cm/s	ONDUC	ΓΙVΙΤΥ,	T	0 ا	INSTALLATION
	DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	1 ∢ 1	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	24 SHEAF Cu, kPa	STREN	IGTH	nat V. + rem V. ⊕	30 · Q - ● • U - ○	W	ATER C	ONTENT	PERCE	IO ³ ⊥ ENT WI 40	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
1405019.GPJ GLDR_LDN.GDT 03/10/14 DATA INPUT: DMB	_ 0	GEOPROBE 6620 MACGO CORE SAMPLING SYSTEM	ROAD SURFACE ASPHALT FILL - (SW-GW) SAND and GRAVEL, angular; grey, (ROADBASE); non-cohesive, dry FILL - (SP-GP) SAND and GRAVEL, angular; greyish brown, with asphalt, red brick, and concrete pieces, (RECYCLED SUB-BASE); non-cohesive, moist (CL) sandy SILTY CLAY; mottled brown and grey, (TILL); cohesive, w~PL END OF BOREHOLE		0.00 0.10 0.36 0.61	2 3	sc sc sc								C		0			М	Borehole dry upon completion of drilling on July 2, 2014.
S_03									4												

DEPTH SCALE 1:50

RECORD OF BOREHOLE BH-103 PROJECT: 1405019 SHEET 2 OF 14 LOCATION: REFER TO LOCATION PLAN BORING DATE: July 2, 2014 DATUM: NOT SURVEYED DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SAMPLES SOIL PROFILE METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION 80 10⁻⁵ STRATA PLOT BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. **BORING N** TYPE SHEAR STRENGTH nat V. + Q - ● Cu, kPa rem V. ⊕ U - ○ WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp **⊢** (m) 20 (Golder Report No. 1405019-R01) ROAD SURFACE ASPHALT
FILL - (SW-GW) SAND and GRAVEL,
angular; grey, (ROADBASE);
non-cohesive, dry
FILL - (SP-GP) SAND and GRAVEL, 0.00 1 SC 0.10 2 Borehole dry upon completion of drilling on July 2, 2014. 2 sc d 0.38 3 SC 0 0.58 angular; greyish brown, with asphalt, red brick, and concrete pieces, 4 SC 0 (RECYCLED SUB-BASE); non-cohesive, moist to wet (CL) sandy SILTY CLAY; brown, (TILL); cohesive, w~PL END OF BOREHOLE 1.22 RECORD OF BOREHOLE **BH-104** PR JECT: 1405019 BORING DATE: July 2, 2014 LOCATION REFER TO LOCATION PLAN DATUM: NO SURVEYED DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES **BORING METHOD** k, cm/s DEPTH SCALE METRES INSTALLATION 80 10⁻⁵ 10⁻⁴ OWS/0.3m 60 AND NUMBER GROUNDWATER FLFV TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O ERCENT WATER CONTENT DESCRIPTION **OBSERVATIONS** DEPTH AB. Wp F (m) ROAD SURFACE ASPHALT
FILL - (SW-GW) SAND and GRAVEL,
angular; grey, (ROADBASE);
non-cohesive, dry
FILL - (SP-GP) SAND and GRAVEL, 0.00 Water present in borehole from coring asphalt. SC 0.46 2 sc angular; greyish brown, with asphalt, red brick, and concrete pieces, 0.71 3 sc 0 (RECYCLED SUB-BASE); (CL) sandy SILTY CLAY; mottled brown and grey, (TILL); cohesive, w~PL END OF BOREHOLE LDN.GDT 03/10/14 DATA INPUT: GLDR H SCALE LOGGED DE

CHECKED:

1:50

RECORD OF BOREHOLE BH-118 PROJECT: 1405019 SHEET 9 OF 14 BORING DATE: July 1, 2014 DATUM: NOT SURVEYED LOCATION: REFER TO LOCATION PLAN DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SAMPLES SOIL PROFILE BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION 80 10⁻⁶ 10⁻⁵ STRATA PLOT BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● Cu, kPa rem V. ⊕ U - ○ WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp **⊢** (m) 20 (Golder Report No. 1405019-R01) ROAD SURFACE 0.00 **ASPHALT** 0.13 **FILL** - (SW-GW) SAND and GRAVEL, angular; grey, **(ROADBASE)**; non-cohesive, moist SC 0 0.69 2 sc 0 GEOPI (CL) sandy SILTY CLAY; mottled brown and grey, (TILL); cohesive, w~PL ∇ END OF BOREHOLE WL Water level in borehole 1.52 at about 1.5m depth upon completion of drilling on July 1, 2014. RECORD OF BOREHOLE **BH-119** PROJECT: 1405019 BORING DATE: July 1, 2014 LOCATION: REFER TO LOCATION PLAN DATUM: NOT SURVEYED DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, SOIL PROFILE SAMPLES **BORING METHOD** DEPTH SCALE METRES ADDITIONAL LAB. TESTING k, cm/s INSTALLATION ELEVATION 80 10⁻⁶ 10⁻⁵ 10⁻⁴ 10⁻³ STRATA PLOT OWS/0.3m 60 AND NUMBER GROUNDWATER FLFV TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION OBSERVATIONS DEPTH OW Wp **⊢** (m) 60 10 20 30 ROAD SURFACE Borehole dry upon 0.00 **ASPHALT** completion of drilling on July 1, 2014. 0.13 FILL - (SW-GW) SAND and GRAVEL, angular; grey, (ROADBASE); non-cohesive, moist 1 SC 0 0.69 2 sc 0 LDN.GDT 03/10/14 DATA INPUT: DMB 3 SC 0 GEO (CL) sandy SILTY CLAY; mottled brown and grey, (TILL); cohesive, w>PL to w~PL END OF BOREHOLE 1.52

> Golder Associates

GLDR

DEPTH SCALE

1:50

RECORD OF BOREHOLE BH-120 PROJECT: 1405019 SHEET 10 OF 14 LOCATION: REFER TO LOCATION PLAN BORING DATE: July 1, 2014 DATUM: NOT SURVEYED DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION 80 10⁻⁵ STRATA PLOT BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● Cu, kPa rem V. ⊕ U - ○ WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp **⊢** (m) 20 (Golder Report No. 1405019-R01) ROAD SURFACE Borehole dry upon 0.00 **ASPHALT** completion of drilling on July 1, 2014. FILL - (SW-GW) SAND and GRAVEL, angular; grey, (ROADBASE); non-cohesive, moist 0 SC 0.56 2 sc 0 GEOPF (CL) sandy **SILTY CLAY**; mottled brown and grey, **(TILL)**; cohesive, $w \sim PL$ END OF BOREHOLE 1.52 RECORD OF BOREHOLE **BH-121** QJECT: 1405019 BORING DATE: July 1, 2014 LOCATION: REFER TO LOCATION PLAN DATUM: NO SURVEYED DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES **BORING METHOD** DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION 80 10⁻⁵ 10⁻⁴ OWS/0.3m 60 AND NUMBER GROUNDWATER FLFV TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT ERCENT DESCRIPTION OBSERVATIONS DEPTH Wp I (m) ROAD SURFACE Borehole dry upon ASPHALT completion of drilling on July 1, 2014. 1 SC 0 **FILL** - (SW-GW) SAND and GRAVEL, angular; grey, **(ROADBASE)**; non-cohesive, moist SC 0 0.66 3 SC 0 FILL - (CL) sandy SILTY CLAY; mottled LDN.GDT 03/10/14 DATA INPUT: DMB brown and grey, with topsoil nodules; cohesive, w>PL END OF BOREHOLE H SCALE LOGGED: DE 1:50 CHECKED:

GLDR

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 16, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

L F	ДОН	SOIL PROFILE	1.		SA	MPLE	-	z	DYNAMIC PEN RESISTANCE,	ETRATION S	ON /0.3m	\	HYDRA	ULIC CC k, cm/s	ONDUCT	IVITY,	T	NG PL	INSTALLATION
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 4 SHEAR STREN Cu, kPa		60 8 nat V. + rem V. ⊕			ATER CO	o ⁵ 10 ONTENT	PERCE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
_	BC		STF	(m)	_		ᆸ	186	²⁰ 4 (Golde	er Re	o 8 eport	<i>No.</i>	10) 2	0 3	0 4	10		
0		GROUND SURFACE		185.59				100			<u> </u>								
U		TOPSOIL - (SP) SAND, trace silt; brown; non-cohesive, moist	2 2 2	0.00 185.31 0.28	1	AS								0					Borehole dry during and on completion of drilling on July 16, 2014.
		(CL) sandy SILTY CLAY , trace gravel; mottled brown and grey, with topsoil nodules, (TILL) ; cohesive, w~PL, stiff			2	ss	8	185)				on only 10, 2014.
1		nodules, (TILL); cohesive, w~PL, stiff				ss	10							0					
				184.22 1.37				184										-	
2					4	ss	20							0					
		(CL) sandy SILTY CLAY , trace gravel; brown, oxidized, fissured, (TILL); cohesive, w <pl, stiff<="" td="" very=""><td></td><td></td><td>5</td><td>ss</td><td>20</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td><td></td><td></td><td></td><td></td><td></td></pl,>			5	ss	20							0					
2	STEM	cohesive, w <pl, stiff<="" td="" very=""><td></td><td></td><td></td><td></td><td></td><td>183</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></pl,>						183											
3	POWER AUGER		16		6	ss	23							0					
	POW			181.93 3.66				182										-	
4					7	ss	12							0					
						-		181											
5		(CL) sandy SILTY CLAY , trace gravel; grey, with silt partings, (TILL); cohesive, w~PL, very stiff to firm			8	ss	9							0					
		w~PL, very stiff to firm						180				>96 +							
6								100				>96+							
,						ss	7							0					
		END OF BOREHOLE	11:12	179.04 6.55				179											
7																			
8																			
9																			
									G										

ON_BHS_02_1

Golder Associates

RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 16, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

H _L	유	SOIL PROFILE			SA	AMPLE	S	z	DYNAMIC PEN RESISTANCE,	ETRAT BLOW	ION S/0.3m	\	HYDRA	AULIC C k, cm/s	ONDUCT	TIVITY,	T _ş	INSTALLATION
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 4 SHEAR STREM Cu, kPa	1	1	80 - Q - •	W	ATER C	ONTENT	0 ⁻⁴ 10 ⁻³ PERCENT	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
DEF	BORII		STRAI	DEPTH (m)	Ñ	F	BLOM	<u> </u>				80			O 3	WI 80 40	LAB	
									(Gold	ler I	Repo	rt No	. 14	0576	8-R0	(01)		
- 0		GROUND SURFACE	7	185.27														_
Ė		TOPSOIL, FILL - (SP) SAND, trace silt; brown; non-cohesive, moist	2,22 2,22	0.00 184.97 0.30	1	AS		185						0			_	Borehole dry during and on completion of drilling on July 16, 2014.
-		FILL - (CL) sandy SILTY CLAY, trace gravel; brown, with topsoil pockets; cohesive, w <pl, firm<="" stiff="" td="" to=""><td></td><td></td><td></td><td>ss</td><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td><td></td><td></td><td></td><td>on July 16, 2014.</td></pl,>				ss	9							0				on July 16, 2014.
- - 1		TOPSOIL - (CL) sandy SILTY CLAY;	222	184.36 0.91		ss	5							0	0			-
-		black; cohesive, w>PL, firm	2, X	183.90 1.37				184									-	-
-		(SM) clayey SILTY SAND , trace gravel; brown and grey; cohesive, w>PL, firm				ss	5								0			
- - 2 -		brown and grey; conesive, w>PL, iirm		183.14		$\left\{ \ \ \right $												
-				2.13		ss	18	183						0			1	=
	E E				Ĺ	-												
- 3 -	POWER AUGER						40	182										-
- - -	POWER m ID HO				6	ss	16	102						0				
	83																	-
- 4 - -		(CL) sandy SILTY CLAY , trace gravel; grey, with sand pockets and partings.			7	ss	9	181						0			_	-
-		grey, with sand pockets and partings, (TILL); cohesive, w <pl to="" w="">PL, very stiff to firm</pl>				$\left \cdot \right $												=
- - - 5					8	ss	6							0				
			12					180				>06						
- - -												>96 + >96 +						-
- 6				: 								+						=
-				178.72		ss	4	179						0			-	-
		END OF BOREHOLE	10-2	6.55														
- - 7																		
- - -								178										-
-																		
- 8 - -																		=
- - - 9																		=
- °																		
F																		-
DE	PTH	SCALE	1	1	_	1 1				ماطم	.10	<u> </u>		<u> </u>	<u>I</u>	<u>ı l</u>		LOGGED: SM
1:	50								Ass	ocia	ites							CHECKED:

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 16, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

	오	SOIL PROFILE	1.	1	SA	MPL	-	z	DYNAMIC PEN RESISTANCE,	BLOWS	5/0.3m	l	אטוח	k, cm/s			Ţ	무의	INSTALLATION
METRES	BORING METHOD		STRATA PLOT	ELEV.	띪	ш	BLOWS/0.3m	ELEVATION				30	10		0 ⁻⁵ 10		0 ⁻³	ADDITIONAL LAB. TESTING	AND GROUNDWATER
Ĭ B	RING	DESCRIPTION	SATA	DEPTH	NUMBER	TYPE	/SMO	ELEV	SHEAR STREM Cu, kPa	IGTH	nat V. + rem V. ⊕	Q - • U - O	Wn		TMETMC WO			ADDI:	OBSERVATIONS
4	BC		STF	(m)	_		BL		20 4	0	60 8	30	1	0 2	0 3	30 4	0		
									(Gold	ler l	Repo	rt No	. 140	0576	8-R	<i>01</i>)			
								186			1								
٥	\top	GROUND SURFACE TOPSOIL, FILL - (SP) SAND, trace silt;	222	185.72 0.00	1	AS								0					
		brown; non-cohesive, moist		0.15															Borehole dry during on completion of dri
			\otimes		2	SS	8							0					on July 16, 2014.
		FILL - (CL) sandy SILTY CLAY, trace gravel; brown and grey; cohesive, w~PL, stiff to firm	\otimes		\vdash			185											
1		stiff to firm	\otimes		3	ss	6							0					
			\boxtimes	184.35	┢														
				1.37															
					4	ss	15	184						0 H	1			МН	
2					\vdash														
		(CL) sandy SILTY CLAY trace gray-1			\vdash														
		(CL) sandy SILTY CLAY , trace gravel; brown, oxidized, fissured, (TILL) ; cohesive, w <pl, stiff<="" td="" very=""><td></td><td></td><td>5</td><td>ss</td><td>21</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td><td></td><td></td><td></td><td></td><td></td></pl,>			5	ss	21							0					
	LEM	Coriesive, War E, very sum						183											
3	OW ST				\vdash	-													
	VER A HOLL				6	ss	26							0					
	83mm ID HOLLOW STEM			182.06				,,,-											
- 1	88			3.66	\vdash			182										1	
4					7	SS	21							0					
								181											
5		(CL) sandy SILTY CLAY , trace gravel;			8	SS	11	101						0					
1		(CL) sandy SILTY CLAY , trace gravel; grey, with oxidized fissures, (TILL) ; cohesive, w <pl to="" w="">PL, very stiff to</pl>																	
		firm																	
								180			1								
6			10,																
					Ĺ	SS	6							_					
	Ш			179.17		35	٥							0					
		END OF BOREHOLE		6.55				179			+								
7																			
8																			
9																			
- 1																			

RECORD OF BOREHOLE BH-101

EHOLE BH-101 SHEET 1 OF 1

2. July 03, 2014 DATUM: GEODETIC

LOCATION: REFER TO LOCATION PLAN SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

BORING DATE: July 03, 2014

ٍ إ	ПНОБ	SOIL PROFILE	L		SA	MPL	_	Z	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	RESISTANCE, BLOWS/0.3m
									(Golder Report No. 1406552-R01)
0 -		GROUND SURFACE TOPSOIL, FILL - (CL) sandy SILTY CLAY; black; cohesive, w>PL FILL - (CL) sandy SILTY CLAY, trace gravel; mottled brown and grey, topsoil		175.48 0.00 175.18 0.30	1	AS			O Borehole dry during drilling on July 3, 2014
1		pockets, some sand pockets; cohesive, w>PL, firm (CL) sandy SILTY CLAY, trace gravel; mottled brown and grey, trace sand		174.73 0.75		ss ss		175	
		pockets, (TILL) ; coȟesive, w>PL, firm	9/	174.11 1.37		ss	13	174	
2		(CL) sandy SILTY CLAY , trace gravel; brown, oxidized fissures, (TILL); cohesive, w <pl, stiff="" stiff<="" td="" to="" very=""><td></td><td></td><td></td><td></td><td></td><td>470</td><td></td></pl,>						470	
3	GER IW STEM			172.58		ss	20	173	
	POWER AUGER 83mm ID HOLLOW STEM	(CL) sandy SILTY CLAY , trace gravel; brown to grey, (TILL) ; cohesive, w <pl, stiff<="" td=""><td></td><td>171.82 3.66</td><td></td><td>ss</td><td>11</td><td>172</td><td></td></pl,>		171.82 3.66		ss	11	172	
4					7	ss	9		
5		(CL) sandy SILTY CLAY , trace gravel; grey, (TILL); cohesive, w-PL, very stiff			8	ss	5	171	>96+
		to firm						170	+ + + + + + + + + + + + + + + + + + + +
6					9	ss	4		
7		END OF BOREHOLE	11:1	168.93 6.55				169	
								168	
8									
9									
DEF	PTH S	SCALE	•	-		•		-	Golder LOGGED: SM CHECKED:

RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 03, 2014

DATUM: GEODETIC

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

S	T C	201	SOIL PROFILE	T _F	ı	SA	MPL	_	N C	DYNAMIC PEN RESISTANCE,	BLOWS	S/0.3m	\	HYDRAULIC CONDU k, cm/s		- ING ING	INSTALLATION
METRES	BOBING METHOD		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAR STREN Cu, kPa	NGTH		Q - • U - O	vvp — — — —	W WI	ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
				0)						(Gold	ler 1	Repor	t No	10 20 0. 1406552-K	R01)	T	
0 -			GROUND SURFACE TOPSOIL, FILL - (CL) sandy SILTY CLAY; black; cohesive, w>PL FILL - (CL) sandy SILTY CLAY, trace gravel; mottled brown and grey, topsoil pockets, some sand pockets; cohesive,		175.41 0.00 175.11 0.30 174.80 0.61	2	AS SS	5	175					0	φ		Borehole dry during drilling on July 3, 2014
1			(CL) sandy SILTY CLAY, trace gravel; mottled brown and grey, sand pockets, (TILL); cohesive, w>PL, firm to stiff				ss		174					0			
2		W	(CL) sandy SILTY CLAY , trace gravel; brown, oxidized fissures, (TILL); cohesive, w <pl, stiff<="" td="" very=""><td></td><td>173.28 2.13</td><td>5</td><td>ss</td><td></td><td>173</td><td></td><td></td><td></td><td></td><td>0</td><td></td><td></td><td></td></pl,>		173.28 2.13	5	ss		173					0			
3	POWER AUGER	83mm ID HOLLOW STE			2.90	6	ss	9	172					0			
5			(CL) sandy SILTY CLAY , trace gravel; grey, (TILL) ; cohesive, w~PL, very stiff to firm			8	ss		171				>96+	0			
6									170		Φ	+	+			_	
7			END OF BOREHOLE	10 1	168.86 6.55		SS	5	169					0			
8									168								
9																	
DEI		H S	CALE			<u></u>				GGASS	olde	r					LOGGED: SM CHECKED:

1:50

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: July 03, 2014

DATUM: GEODETIC

CHECKED:

SAMPLER HAMMER, 63.5 kg; DROP, 760 mm

_	딮	SOIL PROFILE	١.		SA	MPL	_	z	DYNAMIC PENETR RESISTANCE, BLO	WS/0.3m		HYDRAULIC CONDU k, cm/s		₽ _N	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	MBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGTH Cu, kPa	60 I nat V.	80 + Q - •	10 ⁻⁶ 10 ⁻⁵ WATER CONTE		ADDITIONAL LAB. TESTING	AND GROUNDWATER OBSERVATIONS
[]	BORII		STRAI	DEPTH (m)	Ž	F	BLOW	□ □				Wp O	W WI	AD	
1			- 0,						20 40 (Golda	r Ror	ort N	70. 1406552-	R01)		
									(Goille						
0	$\overline{}$	GROUND SURFACE	XX	175.31 0.00	-										
		TOPSOIL, FILL - (CL) sandy SILTY CLAY; black; cohesive, w>PL FILL - (CL) sandy SILTY CLAY, trace	\times	175.01 0.30	1	AS		175				0			Borehole dry during drilling on July 3, 201
		gravel; mottled brown and grey, topsoil pockets, some sand pockets; cohesive,	\otimes	1	2	ss	6					0			
		w>PL, firm	\overrightarrow{N}	174.56 0.75	Г										
1				1	3	SS	6					0			
		(CL) sandy SILTY CLAY, trace gravel; mottled brown and grey, trace sand		1				174							
		pockets, shale fragments, (TILL); cohesive, w <pl, firm="" stiff<="" td="" to=""><td></td><td>]</td><td>4</td><td>ss</td><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></pl,>]	4	ss	8								
2			Jo [173.18	_										
		(01)		2.13				173							
		(CL) sandy SILTY CLAY , trace gravel; brown, oxidized fissures, (TILL) ; cohesive, w <pl, stiff<="" td="" very=""><td>1</td><td>1</td><td>5</td><td>ss</td><td>20</td><td></td><td></td><td></td><td></td><td>0</td><td></td><td></td><td></td></pl,>	1	1	5	ss	20					0			
	TEM	-		172.41											
3	83mm ID HOLLOW STEM			2.90											
	OWER ID HOL				6	SS	11	172				0			
	83mm														
4			9		7	ss	8								
								171							
		(CL) sandy SILTY CLAY, trace grayel:		1											
		(CL) sandy SILTY CLAY , trace gravel; grey, (TILL) ; cohesive, w~PL, stiff to firm		1	8	ss	5			0	+	0			
5															
								170		+					
6			9												
					9	ss	4	169							
-		END OF BOREHOLE	10 }	168.76 6.55	\vdash	-									
7															
								168							
8															
9															
- [I

PROJECT: 1527635 (1000)

RECORD OF BOREHOLE BH-103

DATUM: GEODETIC

SHEET 1 OF 2

BORING DATE: April 27, 2015 DRILLING CONTRACTOR: London Soil Test Ltd. LOCATION: REFER TO LOCATION PLAN PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm SAMPLER HAMMER, 63.5 kg; DROP, 760 mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES BORING METHOD ADDITIONAL LAB. TESTING INSTALLATION ELEVATION STRATA PLOT 80 10⁻⁶ 10⁻⁵ BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SHEAR STRENGTH nat V. Cu, kPa rem V. nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp **⊢** (m) 10 20 (Golder Report No. 1527635-1000-R01) 181 GROUND SURFACE 180 0.00 AS 0 TOPSOIL - sandy SILTY CLAY; black 179.76 SS 5 0 Granular Bentonite sandy SILTY CLAY, trace gravel; 3 SS 6 0 mottled brown and grey, trace organic pockets and roots, (TILL); firm 179 0 178.38 4 SS 14 1.68 0 178 SS 0 5 30 sandy SILTY CLAY, trace gravel; brown, oxidized fissures, silt partings, (TILL); stiff to hard 177 27 6 SS 0 176.40 SS 13 176 SS 0 175 Cuttings/ Bentonite >96 >96_ 174 sandy SILTY CLAY, trace gravel; grey, some sand seams/pockets with depth, (TILL); very stiff to firm SS 8 0 173 >96_ 10 SS 0 172 GLDR_L Ф --- CONTINUED NEXT PAGE ---

DEPTH SCALE 1:50



LOGGED: SM

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE BH-201

BORING DATE: July 30, 2015 DRILLING CONTRACTOR: Landshark Drilling SHEET 1 OF 1

DATUM: LOCAL

	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	ě	NOMBER	TYPE	ELEVATION	HEADSPACE COMBUSTIBLE
							((Golde 	er Report No. 1520407-2000-R01) Top of Pipe Elev. 97.75m Flushmount
0		GROUND SURFACE FILL - SILTY CLAY, some sand and gravel; brown to dark brown, trace ash,	\boxtimes	97.96 0.00				98	Protective Casing Concrete
		brick and organic material FILL - SAND, fine to coarse, with	\bigotimes	97.15 0.81		1A	sc		Granular Bentonite
1		gravel; brown FILL - SILTY CLAY, trace sand, trace gravel; grey to brown and black, mixed		96.59		2A	sc sc	97	Bentonite
22DT	SYSTEM	with glass, cinders and wood sandy SILTY CLAY, trace gravel; grey, (TILL); cohesive		96.13			sc sc	96	Sand
GEOPROBE 7822DT	DT SAMPLING SY	SAND AND GRAVEL, fine to coarse; brown, mixed with grey-brown silty clay sandy SILTY CLAY, trace gravel; grey,		95.52 2.44 95.22 2.74	2	3A	sc		50mm Dia. Slot 10 Sch. 40 PVC Screen
3		mixed with grey and black organics, (TILL); w>PL			3	3В	sc	95	50mm Dia.
4						4A	sc	94	
		SILTY CLAY, trace sand, trace gravel; grey, (TILL)		93.39 4.57 93.08	1	-	sc sc		
5		END OF BOREHOLE		4.88				93	
6									
7									
8									
9									
9 DEPT 1:50		CALE							Golder CHECKED:

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE BH-202

BORING DATE: July 30, 2015 DRILLING CONTRACTOR: Landshark Drilling

SHEET 1 OF 1

DATUM: LOCAL

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	RUN No.	NUMBER	ELEVATION	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM] ND = Not Detected 50 100 150 200 HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected 20 40 60 80	ER
- 0 -									
2 2 1 3 3 4 4	GEOFROBE RAZDI DTSAMPLING SYSTEM	GROUND SURFACE TOPSOIL - SILTY CLAY, trace sand, trace gravel; brown FILL - SILTY CLAY; grey, mixed with sand, gravel, glass, brick and cinders FILL - SAND; dark brown, with ash, cinders,brick, glass and organics sandy SILTY CLAY, trace gravel; dark grey to light grey, mixed with ash, trace organics; w>PL sandy SILTY CLAY, trace sand; grey, mixed with ash and wood, with decaying wood at about elev. 93.5m DECAYING WOOD; brown SILTY CLAY, trace sand, trace gravel; grey, (TILL)		97.83 97.88 97.88 0.18 96.71 1.12 96.26 1.57 94.96 2.87	2 3	11A SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTTO SCOTT	98 97 96 95 95	Ser Report No. 1520407-2000-R01)	
6 7 P	TH S	ORGANIC SILTY CLAY; dark brown END OF BOREHOLE		92.98			93		OGGED: KL

1:50

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE BH-203

BORING DATE: July 30, 2015 DRILLING CONTRACTOR: Landshark Drilling SHEET 1 OF 1

DATUM: LOCAL

CHECKED:

HEADSPACE COMBUSTIBLE
VAPOUR CONCENTRATIONS [PPM]
ND = Not Detected
50 100 150 SOIL PROFILE SAMPLES **BORING METHOD** \oplus ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT 200 RUN No. NUMBER GROUNDWATER OBSERVATIONS ELEV. HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected DESCRIPTION DEPTH (Golder Report No. 1520407-2000-R01) GROUND SURFACE
TOPSOIL - SILTY CLAY, trace sand, 0.00 98 trace gravel; brown FILL - SILTY CLAY, trace sand, trace gravel; brown, mixed with ash, glass, cinders, wood and concrete debris 1A SC 97 2A sc 96.23 1.85 2 FILL - DEBRIS; brown, black and grey, ash, cinders, wood, brick, glass, copper, porcelain, some silty clay 96 2B SC GEOPROBE 3 3 SC 95 4A SC SILTY CLAY, trace sand, trace gravel; grey, with shells and silt layers, (TILL) 4.01 94 4B sc 93.20 END OF BOREHOLE 93 1520407-2000.GPJ DEPTH SCALE LOGGED: KL Golder

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE BH-204

BORING DATE: July 30, 2015 DRILLING CONTRACTOR: Landshark Drilling

SHEET 1 OF 1

DATUM: LOCAL

	9	SOIL PROFILE			SA	MPLE	s		HEADSPACE COMBUSTIE	3LE	Φ		
SCALE	ETH H		то <u>-</u>			~		TION	HEADSPACE COMBUSTIE VAPOUR CONCENTRATIOND = Not Detected 50 100	лка [РРМ] 150	200	STING	INSTALLATION AND
PTH 8	NG N	DESCRIPTION	TA PL	ELEV.	S N	MBEF	YPE	LEVA	HEADSPACE COMBUSTIE	BLE		DDITI(B. TE	GROUNDWATER OBSERVATIONS
ä	BOR		STRA	(m)	집	≥	$\lceil \rceil$	Ш	[%LEL] ND = Not Detected 20 40	60	80	ΕĀ	
DEPTH SCALE NOT TO THE TOTAL TO THE TOTAL TO THE TOTAL TO THE TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTAL TOTA	GEOPROBE 7822DT BORING METHOD	GROUND SURFACE TOPSOIL - SILTY CLAY, trace sand, trace gravel; brown FILL - SILTY CLAY; brown, mixed with cinders, gravel and organics FILL - SAND and GRAVEL, some silt and clay, medium to coarse; brown FILL - SILTY CLAY; brown-black, mixed with sand, ash, brick and porcelain	STRATA PLOT	DEPTH	1	1A 1B 2A 2B 2B 3	sc	98 97 96 95	HEADSPACE COMBUSTIE VAPOUR CONCENTRATION [%LEL] ND = Not Detected	BLE ONS 60	80	ADDITIONAL LAB. TESTING	AND GROUNDWATER
5 7 7 DE		ORGANIC SILTY CLAY; dark brown SILTY CLAY, trace sand, trace gravel; grey, (TILL) END OF BOREHOLE H SCALE		93.63 4.22 93.43 4.42 92.97 4.88	4	4A :	sc	94	Golder				LOGGED: KL
ı	50 50	I OUALL							Golder Associate	es			CHECKED:

1:50

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE BH-205

BORING DATE: July 30, 2015
DRILLING CONTRACTOR: Landshark Drilling

SHEET 1 OF 1

DATUM: LOCAL

CHECKED:

HEADSPACE COMBUSTIBLE
VAPOUR CONCENTRATIONS [PPM]
ND = Not Detected
50 100 150 SOIL PROFILE SAMPLES **BORING METHOD** Ф ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT 200 RUN No. NUMBER GROUNDWATER OBSERVATIONS ELEV. HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected DESCRIPTION DEPTH (m) MW-205 (Golder Report No. 1520407-2000-R01) Top of Pipe Elev. 97.67m Flushmount Protective Casing 98 GROUND SURFACE
TOPSOIL - SILTY CLAY, trace sand, 0.00 Concrete trace gravel; brown FILL - SILTY CLAY; brown-grey, mixed with gravel, sand and ash sc Granular 97 Bentonite Sand 96 2 2 SC FILL - SILTY CLAY; brown, mixed with blue-grey sitty clay, glass, brick and ash

SII TY CLAY, trace sand, trace

""h ash, gravel 95.09 2.72 95 94.76 FILL - SILTY CLAY, trace sand, trace gravel; grey, mixed with ash, gravel brick, glass and concrete debris 3 50mm Dia. Slot 10 Sch. 40 PVC ЗА sc Screen 94 4A SC 4 93.34 4.47 SILTY CLAY, trace sand, trace gravel; 4B SC dark grey, with layers of organics at about elev. 97.1m 93.09 4.72 93 SILTY CLAY, trace sand, trace gravel; \grey END OF BOREHOLE 92 GLDR_LON.GDT 25/08/15 DATA INPUT: WDF/DCH -2000.GPJ DEPTH SCALE Golder LOGGED: KL

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE BH-206

BORING DATE: July 30, 2015 DRILLING CONTRACTOR: Landshark Drilling

SHEET 1 OF 1

DATUM: LOCAL

щ	5	2	SOIL PROFILE			SA	MPLE	S		HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [PPM]
DEPTH SCAL METRES	HT3M SNIGOR	DOISING INCL	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	RUN No.	NUMBER	TYPE	ELEVATION	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected AND SO GROUNDWATER OBSERVATIONS Q MANA OCC AND GROUNDWATER OBSERVATIONS D MANA OCC
DEPTH SCALE 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	GEOPROBE 7822DT			STRATA PLOT	DEPTH	1 2 2 3	1 2A 2B 3A 4A	TYPE	98 97 96 95 94	HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution
- 5		нѕ	grey END OF BOREHOLE		93.10		45	30	93	
1	50		<u></u>							Golder LOGGED: KL Associates CHECKED:

1:50

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE BH-207

BORING DATE: July 30, 2015
DRILLING CONTRACTOR: Landshark Drilling

SHEET 1 OF 1

DATUM: LOCAL

CHECKED:

HEADSPACE COMBUSTIBLE
VAPOUR CONCENTRATIONS [PPM]
ND = Not Detected
50 100 150 SOIL PROFILE SAMPLES **BORING METHOD** Ф ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT 200 RUN No. NUMBER GROUNDWATER OBSERVATIONS ELEV. HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS [%LEL] ND = Not Detected DESCRIPTION DEPTH (m) (Golder Report No. 1520407-2000-R01) 98 GROUND SURFACE
TOPSOIL - SILTY CLAY, trace sand, 0.00 trace gravel; brown FILL - SILTY CLAY; brown - grey, mixed with sand and gravel, trace glass 1A 97.03 FILL - SAND, medium to coarse, with 97 0.84 gravel; brown, with pockets of silty clay 1B sc 96.24 FILL - SILTY CLAY; grey-brown, mottled, mixed with cinders and brick 2A SC 2 96 95.89 FILL - SILTY SAND; brown, with pockets of silty clay, cinders, ash glass pockets of silty clay, cinders, ash and glass 2B sc 95 94.87 3.00 3 3A SC SILTY CLAY, trace sand, trace gravel; dark grey, with rootlets, with organic silty clay at about elev. 93.6m 3B sc 94 4 4A SC 93.37 SILTY CLAY, trace sand, trace gravel; grey-blue 4B SC 92.99 93 END OF BOREHOLE 92 -2000.GPJ DEPTH SCALE LOGGED: KL Golder

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE BH-208

BORING DATE: July 30, 2015
DRILLING CONTRACTOR: Landshark Drilling

SHEET 1 OF 1

DATUM: LOCAL

HEADSPACE COMBUSTIBLE
VAPOUR CONCENTRATIONS [PPM]
ND = Not Detected
50 100 150 SOIL PROFILE SAMPLES **BORING METHOD** Ф ADDITIONAL LAB. TESTING INSTALLATION STRATA PLOT 200 RUN No. NUMBER GROUNDWATER OBSERVATIONS ELEV. HEADSPACE COMBUSTIBLE VAPOUR CONCENTRATIONS DESCRIPTION DEPTH [%LEL] ND = Not Detected (m) MW-208 (Golder Report No. 1520407-2000-R01) Top of Pipe Elev. 97.87m Flushmount Protective Casing 98 GROUND SURFACE

TOPSOIL - SILTY CLAY, trace sand, 0.00 trace gravel; brown FILL - SILTY CLAY; mottled brown and grey, mixed with sand and gravel 97 Granular Bentonite Sand 96 2 FILL - SAND; medium to coarse, with gravel; brown, with pockets of silty clay 2A SC 95.80 1.96 gravel; brown, with pockets of silty clay 2B sc GEOPROBE 78 DT SAMPLING S' 95 ЗА SC 3 94.64 3.12 sandy SILTY CLAY, trace gravel; dark 50mm Dia. grey; w>PL at top to w~PL at bottom Slot 10 Sch. 40 PVC 3В SC Screen 94 4A SC 93.42 4 ORGANIC SILTY CLAY; dark brown 4.40 SILTY CLAY, trace sand, trace gravel; 4B SC 93 92.88 END OF BOREHOLE 92 GLDR_LON.GDT_25/08/15_DATA INPUT: WDF/DCH 1520407-2000.GPJ DEPTH SCALE LOGGED: KL Golder 1:50 CHECKED:

PROJECT: 1527635 (1000)

RECORD OF BOREHOLE BH-103

DATUM: GEODETIC

SHEET 1 OF 2

BORING DATE: April 27, 2015 DRILLING CONTRACTOR: London Soil Test Ltd. LOCATION: REFER TO LOCATION PLAN PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm SAMPLER HAMMER, 63.5 kg; DROP, 760 mm DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES BORING METHOD ADDITIONAL LAB. TESTING INSTALLATION ELEVATION STRATA PLOT 80 10⁻⁶ 10⁻⁵ BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SHEAR STRENGTH nat V. Cu, kPa rem V. nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp **⊢** (m) 10 20 (Golder Report No. 1527635-1000-R01) 181 GROUND SURFACE 180 0.00 AS 0 TOPSOIL - sandy SILTY CLAY; black 179.76 SS 5 0 Granular Bentonite sandy SILTY CLAY, trace gravel; 3 SS 6 0 mottled brown and grey, trace organic pockets and roots, (TILL); firm 179 0 178.38 4 SS 14 1.68 0 178 SS 0 5 30 sandy SILTY CLAY, trace gravel; brown, oxidized fissures, silt partings, (TILL); stiff to hard 177 27 6 SS 0 176.40 SS 13 176 SS 0 175 Cuttings/ Bentonite >96 >96_ 174 sandy SILTY CLAY, trace gravel; grey, some sand seams/pockets with depth, (TILL); very stiff to firm SS 8 0 173 >96_ 10 SS 0 172 GLDR_L Ф --- CONTINUED NEXT PAGE ---

DEPTH SCALE 1:50



LOGGED: SM

PROJECT: 1527635 (1000)

RECORD OF BOREHOLE BH-103

DATUM: GEODETIC

SHEET 2 OF 2

LOCATION: REFER TO LOCATION PLAN SAMPLER HAMMER, 63.5 kg; DROP, 760 mm BORING DATE: April 27, 2015
DRILLING CONTRACTOR: London Soil Test Ltd.
PENETRATION TEST HAMMER, 63.5 kg; DROP, 760 mm

	ЕТНОГ	SOIL PROFILE	10			MPL		NOI	DYNAMI RESISTA 20				30	10	k, cm/s			NAL	INSTALLATION AND
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAR Cu, kPa	STREN	GTH	nat V. + rem V. ⊕	1		TER CO	ONTENT F	PERCENT WI	ADDITIONAL LAB. TESTING	GROUNDWATER OBSERVATIONS
9		CONTINUED FROM PREVIOUS PAGE	<u> </u>					171									$-R01)_{\pm}$		
10						ss		170			- Φ	+			0				Cuttings/ Bentonaite _{2/15} ▼
12	POWER AUGER 152mm OD SOLID STEM	sandy SiLTY CLAY , trace gravel; grey, some sand seams/pockets with depth, (TILL); very stiff to firm			13	ss	6	169			Φ	+			(D D			Granular Bentonite
13	152				14	ss	5	167		Φ	+					Э— I		МН	Screen
15			0		15	ss	7	165		Φ	+				0				Sand
16		END OF BOREHOLE	4 7	164.36 15.70				164											Borehole dry during a upon completion of drilling on April 27, 20
17																			Water level in standpi measured at elev. 170.06m on May 12, 2015.
18																			
19																			

1:50

Associates

1:50

LOCATION: REFER TO LOCATION PLAN

HAMMER TYPE: Auto Hammer

RECORD OF BOREHOLE BH-101

BORING DATE: January 12, 2016 DRILLING CONTRACTOR: Henderson Drilling Inc.

SHEET 1 OF 1

DATUM: GEODETIC

_	HOD	SOIL PROFILE		ı	SAI	MPL		Z	DYNAM RESIST		ETRATIO BLOWS/				k, cm/s			Ţ	NG NG	INSTALLATIO
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAR Cu, kPa	STREN	IGTH n	unat V. + em V. ⊕	Q - • U - O	W	/ATER C	ONTENT	PERCE	0 ⁻³	ADDITIONAL LAB. TESTING	AND GROUNDWATE OBSERVATION
								186					No. 1			1				
0 -	<u> </u>	GROUND SURFACE ASPHALT FILL, gravelly sand, crushed; brown		185.12 0.00 0.11 184.79 0.33				185												
1		FILL, sand, trace gravel; brown; compact	2,2,2	184.36 0.76			13								6					
	V	TOPSOIL, silty; black; firm	2,2,2	183.75 1.37		SS		184								0				Borehole dry during drilling on January 12, 2016.
2	POWER AUGER 83mm ID HOLLOW STEM	(CL) sandy SILTY CLAY, trace gravel; mottled brown and grey, TILL; firm		182.99 2.13	3	SS	4	183								0				
	POW 83mm ID				4	SS	19						>96 +		0					
3		(CL) sandy SILTY CLAY , trace gravel; brown, silt partings, TILL ; very stiff			5	SS	28	182							0					
4				180.85	6	ss	24	181							0					
	•	END OF BOREHOLE	N.Zr	4.27																
5								180												
6																				
7																				
8																				
9																				

1:50

LOCATION: REFER TO LOCATION PLAN

HAMMER TYPE: Auto Hammer

RECORD OF BOREHOLE BH-102

BORING DATE: January 12, 2016 DRILLING CONTRACTOR: Henderson Drilling Inc.

SHEET 1 OF 1

DATUM: GEODETIC

<u></u>	THOD	SOIL PROFILE			SAI	MPL	-	Z	DYNAMIC PENETI RESISTANCE, BL	`	、 ''''	DRAULIC CO k, cm/s		_ [[ĀĀ	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 40 SHEAR STRENGT Cu, kPa		•	Wp 	NTENT PERCEI		ADDITIONAL LAB. TESTING	AND GROUNDWATE OBSERVATION
			U)						(Gold	der Repor	t No.	15464	30 4 52- R01)			
0 -		GROUND SURFACE TOPSOIL, silty; brown ASPHALT FILL, gravelly sand, crushed; brown FILL, sandy clayey silt; brown, gravel pockets, sand layers; stiff	2, 2, 4	184.99 0.00 0.15 0.23 0.33	1	SS	14	185				0				
1	2	(CL) sandy SILTY CLAY , trace gravel; mottled brown and grey, TILL ; stiff to firm		0.76	2	SS		184				0			MH	Borehole dry during drilling on January 12, 2016.
2	R3mm ID HOLLOW STEM	83mm ID HOLLOW ST		182.86 2.13	4	SS	18	183				0				
3		(CL) sandy SILTY CLAY , trace gravel; brown, silt partings, TILL ; very stiff to hard			5	SS	31	182				0				
4		END OF BOREHOLE		180.72 4.27	6	SS	22	181				0				
5								180								
6																
7																
8																
9									Gol							

RECORD OF BOREHOLE BH-103

HAMMER TYPE: Auto Hammer

LOCATION: REFER TO LOCATION PLAN

BORING DATE: January 12, 2016 DRILLING CONTRACTOR: Henderson Drilling Inc.

SHEET 1 OF 1

DATUM: GEODETIC

;	ДOН	SOIL PROFILE	1.		SA	MPL		z	DYNAMIC RESISTA	PENET NCE, BL	RATIC OWS/	DN 0.3m	\	HYDR	AULIC C	ONDUC	ΓΙVΙΤΥ,	T	NG™	INSTALLATION
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	SHEAR S Cu, kPa			at V. + em V. ⊕	Q - • U - O	W	ATER C	ONTENT	PERCE	WI	ADDITIONAL LAB. TESTING	AND GROUNDWATE OBSERVATION
			03						(Ga	older	,	<u>0 8</u> Pport				2- R0		0		
0 -		GROUND SURFACE TOPSOIL, silty; brown FILL, gravelly silty clay, some sand; brown; stiff TOPSOIL, silty; black; stiff	2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2	184.96 0.00 0.13 184.45 0.51 184.20 0.76	1	SS	11							C		0				
2	POWER AUGER 83mm ID HOLLOW STEM	(CL) sandy SILTY CLAY , trace gravel; mottled brown and grey, TILL ; stiff		182.83	3	SS		184							0 0 I -					Borehole dry during drilling on January 12, 2016.
3	POWEF 83mm ID HO	(CL) sandy SILTY CLAY , trace gravel; brown, TILL ; very stiff		2.13	4		22	182							0					
4		END OF BOREHOLE		4 180.69 4.27		SS	24	181							0					
5								180												
7																				
8																				
9 DEF	PTH S	CALE								Gol	der	•								LOGGED: SM CHECKED:

DEPTH SCALE

1:50

RECORD OF BOREHOLE BH-101

BH-101 SHEET 1 OF 2
, 2016 DATUM: LOCAL

LOCATION: REFER TO LOCATION PLAN

BORING DATE: October 27, 2016
DRILLING CONTRACTOR: Henderson Drilling Inc.

HAMMER TYPE: Auto Hammer

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES BORING METHOD ADDITIONAL LAB. TESTING INSTALLATION ELEVATION 10⁻⁶ 10⁻⁵ 80 AND STRATA PLOT BLOWS/0.3m GROUNDWATER OBSERVATIONS NUMBER ELEV. SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - ○ TYPE WATER CONTENT PERCENT DESCRIPTION DEPTH _____W — wi Wp ---(m) 10 (Golder Report No. 1660023-R01) 100 PAVEMENT SURFACE ASPHALT 0.00 AS 0 FILL - sand and gravel; grey 99 Borehole dry during drilling on October 27, 2016 0.76 SS 5 (SP) - gravelly SAND, coarse; brown; loose 0. 98 3 SS 9 0 97.60 (MI) - CLAYEY SILT, some sand, trace gravel; brown, TILL; firm SS 97 96.84 2.74 5 SS 2 0 96 6 SS 0 95 SS wн 0 Ф 94 (CH) - SILTY CLAY, some sand, trace gravel; grey, TILL; very soft to soft ss WH 0 93 ⊕ |+ 92 9 SS 2 GLDR_LON.GDT 1 91 --- CONTINUED NEXT PAGE ---

Golder

RECORD OF BOREHOLE BH-101

SHEET 2 OF 2 DATUM: LOCAL

LOCATION: REFER TO LOCATION PLAN

HAMMER TYPE: Auto Hammer

BORING DATE: October 27, 2016
DRILLING CONTRACTOR: Henderson Drilling Inc.

DEPTH SCALE METRES BORING METHOD		SOIL PROFILE			SAMPLES			l _	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAUL k,					AULIC C k, cm/s	ULIC CONDUCTIVITY, c, cm/s					
					ĸ.		.3m	ELEVATION	2	20 4	10 6	80 0	10				0-4 1	0 ⁻³	ADDITIONAL LAB. TESTING	INSTALLATION AND
MET	SING I	DESCRIPTION	STRATA PLOT	ELEV. DEPTH	NUMBER	TYPE	BLOWS/0.3m	=LEV/		R STREN	IGTH r	nat V. +	Q - • U - O	W		ONTENT			DDIT \B. TE	GROUNDWATER OBSERVATIONS
	BOF		STR/	(m)	ž	ľ	BLO	"				30 8		VV		OW 20 3		WI !0	Α.7.	
9		CONTINUED FROM PREVIOUS PAGE	ļ.,							(Gol	der l	Repo	rt N	o. 16	6600	23-R	(01)			
										Ì	I	1		I	I					
			P]	10	SS	3									0				
	STEW					l		90												
10	LOW	(011) 011 777 01 477		1																
10	VER 4	(CH) - SILTY CLAY , some sand, trace gravel; grey, TILL ; very soft to soft		1																
	POWER AUGER			1																
	171			1				89												
11				1	11	ss	4									0				
"	L	END OF BOREHOLE		88.45 11.13																
					1			88												
12					1															
12																				
13																				
15																				
14																				
15																				
16																				
					1															
17																				
					1															
18					1															
19																				
			1	1	l		1	ı	l	1			1	ı	1		1	1		

DEPTH SCALE 1:50



LOGGED: AP CHECKED:

DEPTH SCALE

1:50

LOCATION: REFER TO LOCATION PLAN

HAMMER TYPE: Auto Hammer

RECORD OF BOREHOLE BH-101

BORING DATE: July 11, 2017
DRILLING CONTRACTOR: Direct Environmental Drilling Inc.

SHEET 1 OF 2

DATUM: GEODETIC

LOGGED: SM CHECKED: P. X

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES **BORING METHOD** ADDITIONAL LAB. TESTING INSTALLATION 10⁻⁶ 10⁻⁵ 80 STRATA PLOT BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - O WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp -(m) 20 (Golder Report No. 1668632-R01) 190 GROUND SURFACE 189.60 FILL, gravel 0 189 Borehole dry during drilling on July 11, 2017. 2 SS 13 0 188 3 SS 11 0 FILL, gravelly sand, some silt; brown; compact 4 SS 12 187 5 SS 16 186 3.73 TOPSOIL, sandy clayey silt; black 0 185.56 4.04 6 SS 0 185 (CI) sandy **SILTY CLAY**, trace gravel; mottled brown and grey, **TILL**; firm to 7 SS Œ 183.96 5.64 184 SS 8 30 (CL) sandy SILTY CLAY, trace gravel; 183 28/07/17 DATA INPUT: ZJB brown, some oxidized fissures, some silt partings and pockets, TILL; hard to very stiff 182 0 181.68 7.92 9 SS GLDR_LON.GDT 24 \cap (CL-CI) sandy **SILTY CLAY**, trace gravel; grey, some silt pockets, **TILL**; very stiff to stiff 181 --- CONTINUED NEXT PAGE ---

LOCATION: REFER TO LOCATION PLAN

HAMMER TYPE: Auto Hammer

RECORD OF BOREHOLE BH-101

BORING DATE: July 11, 2017 DRILLING CONTRACTOR: Direct Environmental Drilling Inc.

SHEET 2 OF 2

DATUM: GEODETIC

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION 80 10⁻⁶ 10⁻⁵ BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - ○ WATER CONTENT PERCENT DESCRIPTION DEPTH -OW Wp **I**─ 20 --- CONTINUED FROM PREVIOUS PAGE ---(Golder Report No. 1668632-R01) 10 SS 12 0 180 POWER AUGER 108mm ID HOLLOW STEM (CL-CI) sandy **SILTY CLAY**, trace gravel; grey, some silt pockets, **TILL**; very stiff to stiff Ф >144 179 11 SS 9 0 11 178.32 11.28 END OF BOREHOLE 178 13 15 28/07/17 DATA INPUT: ZJB 17 1668632.GPJ GLDR_LON.GDT

DEPTH SCALE 1:50

LOGGED: SM CHECKED: P. H

RECORD OF BOREHOLE BH-102

SHEET 1 OF 2

LOCATION: REFER TO LOCATION PLAN

HAMMER TYPE: Auto Hammer

BORING DATE: July 11, 2017
DRILLING CONTRACTOR: Direct Environmental Drilling Inc.

DATUM: GEODETIC

[]	ТНОБ	SOIL PROFILE			SA	MPL		Z.	DYNAMIC RESISTAN				\		k, cm/s			Ţ	ING ING	INSTALLATION	
METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ELEVATION	20 SHEAR ST Cu, kPa			t V. + n V. ⊕	Q - • U - O	W	ATER C	ONTENT	PERCE	WI	ADDITIONAL LAB. TESTING	AND GROUNDWATE OBSERVATION	
	ш.		S				Ш		((Golde	er R					,		40			
		GROUND SURFACE		189.56				190													
0		FILL, gravel		0.05	1	AS		190						0							
1					2	SS	10	189						0						Borehole dry during drilling on July 11, 2	
2		FILL, gravelly sand, some silt; brown; comapct to very loose			3	SS	13	188						0							
					4	SS	15	187						0							
3			\bigotimes	186.28	5	SS	2	186						0				0			
4	ER N STEM	FILL, gravelly sand, some silt, some coal, some wood; black; very loose to compact	some bose to		6	ss	3	100													
5	108mm ID HOLLOW S				7	SS	20	185									0		МН		
				184.38 5.18	8	SS	11	184							0 H	-1					
6		(ML-CL) sandy SILTY CLAY , trace gravel; brown, some silt pockets and partings; stiff to very stiff	182																		
7							33		183												
				181.71	10	2	24	182							0						
8		(CL-CI) sandy SILTY CLAY , trace gravel; grey, some silt layers and pockets; very stiff to stiff		7.85	10	55	∠4	181							0						
9		CONTINUED NEXT PAGE	N T						 												

DEPTH SCALE

1:50

LOGGED: SM CHECKED: P. H.

LOCATION: REFER TO LOCATION PLAN

HAMMER TYPE: Auto Hammer

RECORD OF BOREHOLE BH-102

BORING DATE: July 11, 2017 DRILLING CONTRACTOR: Direct Environmental Drilling Inc.

SHEET 2 OF 2

DATUM: GEODETIC

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m HYDRAULIC CONDUCTIVITY, k, cm/s SOIL PROFILE SAMPLES BORING METHOD DEPTH SCALE METRES ADDITIONAL LAB. TESTING INSTALLATION ELEVATION STRATA PLOT 80 10⁻⁶ 10⁻⁵ BLOWS/0.3m NUMBER GROUNDWATER OBSERVATIONS ELEV. TYPE SHEAR STRENGTH nat V. + Q - ● rem V. ⊕ U - ○ WATER CONTENT PERCENT DESCRIPTION DEPTH -o^W-Wp **I**─ 10 20 --- CONTINUED FROM PREVIOUS PAGE ---(Golder Report No. 1668632-R01) 0 11 SS 13 180 (CL-CI) sandy **SILTY CLAY**, trace gravel; grey, some silt layers and pockets; very stiff to stiff 179 12 SS 12 0 11 END OF BOREHOLE 178 13 15 28/07/17 DATA INPUT: ZJB 17 1668632.GPJ GLDR_LON.GDT

DEPTH SCALE 1:50

LOGGED: SM CHECKED: P.H

APPENDIX B

Ontario Ministry of Environment, Conservation and Parks Well Records UTM 117 | 2 | 3 | 3 | 6 | 2 | 4 | 0 | E

ONTARIO

Elev. 19 R 0 6 1 1 0 Basin 2 3 1 1 1

The Well Drillers Act
Department of Mines, Province of Ontario

21 Nº 2706

RECEIVED

JAN 25 1951

GEOLOGICAL BRANCH

DEPARTMENT OF MINES

Water Well Record

water v				WINDSOR	e.
County or Territorial District FSSEV	Township Vi	llage, Town	or City. Sam	dwich o	South.
			dand		
	• • •	Rose	dande.		•••••
(day) (month) (year)	wen (exclud	ling pump)	1.2.8.2.	· · · · · · · · · · · · · · · · · · ·	• • • • • • • • • •
Pipe and Casing Record	-	F	umping Test		
Casing diameter(s). 2/2 2	Date	Jun	30	950	
Length(s) of casing(s)	Static level.		30	•••••	· · · · · · · · · · · · ·
Type of screen	Pumping lev	rel	35-		
· · · · · · · · · · · · · · · · · · ·				,	
Distance from top of screen to ground level			••••••		
Is well a gravel-wall type?	Distance fro	m cylinder o	r bowls to groun	d level 🎻 📿	
	ater Record				
Kind (fresh or mineral).				Kind of Water	No. of Feet Water Rises
Quality (hard, soft, contains iron, sulphur, etc.)					-
For what purpose(s) is the water to be used?			· 142	fred	117
1 of what purpose(s) is the water to be used:	ANTONIO POR SELETA	• • • • • • • • • • • • • • • • • • • •	•	<u> </u>	
How far is well from possible source of contamination?	Dire	eis		-	
What is the source of contamination?	•				
Enclose a copy of any mineral analysis that has been made	le of water	• • • • • • • • • • • • •			
Well Log					
Overburden and Bedrock Record	From	То	Loc	cation of Well	1
	0 ft.	ft.	In diagram	below show dist	tances of
Brown Clay	1	20		oad and lot li	
			dicate north	h by arrow.	1 Pow
Bene Charge	20	33	1	251 N.S.L.	~··
		- 100	L		
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Signature of Licensee

Form 5

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The Water-well Drillers Act, 1954GEOLOGICAL BRANCH
DEPARTMENT OF MINES

County or Territorial District...

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Department of Mines

Water-Well Record

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(day) (month) (year) **Pumping Test** Pipe and Casing Record Static level Casing diameter(s) gal put min. Pumping rate4 Length(s) Pumping level Type of screen Duration of test 3 lours Length of screen

Water Record Well Log Depth(s) at which water(s) Kind of water No. of feet То (fresh, salty, or sulphur) From Overburden and Bedrock Record water rises found 0

For what purpose(s) is the water to be used? Jane Is water clear or cloudy?.....clear Is well on upland, in valley, or on hillside?...... lightand Drilling firm Address Name of Driller Wundsen I certify that the foregoing statements of fact are true.

Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



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