RADLER CONSTRUCTION SERVICES INC.

GEOTECHNICAL INVESTIGATION

56 Acre Ptn. of the SW ¼, SEC. 15, TWP 14, RGE 28, W4M
RADLER SUBDIVISION PHASE 2
M.D. of WILLOW CREEK No. 26, ALBERTA

September 26, 2006

TECH
EARTH SCIENCES CORP.

Geology - hydrogeology, geophysics, oil & gas
Environment - audit, assessment, remediation
Civil - geotechnical, material testing,
foundations, slope stability, permafrost

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0.0 EXECUTIVE SUMMARY

A geotechnical investigation was conducted on September 6, 2006 for Radler Construction Services Inc. The investigation is for Phase 2 of a country residential development located on the SW ¼, Section 15, Township 14, Range 28, West of the 4th Meridian, referred to as the "Radler Subdivision" in the M.D. of Willow Creek No. 26, Alberta.

Four test holes were drilled on site for the investigation. The site presents favourable conditions for the planned development with respect to workability and compactibility of in-situ till and integrity of building and road foundations. Groundwater was encountered to within 1.14m below ground surface (bgs) in test hole TH 04 which is located in the south-east portion of the site. Groundwater levels generally lowered to over 2.0m bgs westward and northward.

Surficial formations include 0.08m to 0.25m of topsoil overlying low to medium plastic fine grained till (clayey sandy silt or sandy clayey silt), which overlies medium hard sandstone bedrock.

Foundations based at depths from 0.76m to 1.52m bgs can be designed with an allowable (25mm allowable settlement) soil bearing capacity of 100 kPa or 2,088 lb/ft^2. Soil bearing capacity for foundations based in soils at more than 1.52m bgs can be increased to 150 kPa or 3,132 lb/ft^2. Half of these values should be used when the foundations are within 1.0m of groundwater level. Foundations based in the sandstone bedrock can be designed with a bearing capacity of 350 kPa or 7,309 lb/ft^2 with a skin friction of 35 kPa (731 lb/ft^2).

Laboratory testing on samples retrieved from all test holes at varied depths indicated sulphate concentrations ranging from 0.042% to 0.056% by weight which suggests that the potential for sulphate attack on concrete that will be in contact with the soil is negligible. Due to the presence of sulphates and the potential for concentrations to increase, sulphate resistant concrete is recommended. Increased compressive strength concrete is needed for concentrations over 0.10%.

Percolation tests indicate that the majority of the site is suitable for conventional septic fields. Unsuitable areas may be manipulated using on site soils to become suitable. However, shallow groundwater and/or bedrock may present conflict with Alberta Environment Guidelines.

1.0 INTRODUCTION

This report presents the results of a geotechnical site characterization conducted by G Tech Earth Sciences Corp. (G Tech) for a proposed country residential development in the M.D. of Willow Creek No. 26, Alberta, known as the Radler Subdivision Phase 2. The investigation was authorized by Mr. Andreas Radler of Radler Construction Services Inc. The objective of this evaluation was to assess the general subsurface soil and groundwater conditions and provide geotechnical comments and recommendations for development of the site. The planned scope of investigation is summarized below:

- Drilling program of four test holes to a maximum depth of 6.1m or to hard bedrock/auger refusal and record SPT "N" values @ 1.52m intervals. Starting depths to alternate between 0.76m and 1.52m.
- Install 25mm PVC standpipes in all test holes to allow future monitoring of groundwater levels.
- Measure initial groundwater elevations soon after the drilling program.
- Conduct percolation tests near each test hole for conventional septic field recommendations.
- Undertake laboratory testing, as required, to determine geotechnical properties of the soils.
- Prepare a geotechnical characterization report based on findings of the site investigation, lab analyses, data interpretation and evaluation.
- Provide geotechnical comments and recommendations for development of the site.

The following sections represent our understanding of the project, the results of our investigation and pertinent geotechnical comments and recommendations

1.1 Project Details

The subject property consists of approximately 56 acres of unoccupied native grassed land and is the second phase of an overall country residential development. A total of 14 lots are planned. It is our understanding that the project may involve: stripping and rough grading, installation of deep and/or shallow underground utilities, conventional septic fields, and continuation of the current gravel roads. No asphalt or concrete surface improvements are anticipated.

1.2 Site Location and Description

The subject property is situated on the north side of Highway 527, approximately 4.5 miles west of Stavely, Alberta. Phase 1 of the subdivision borders the west side of Pine Coulee Reservoir. Site plans are included in Appendix 1.

The subject property, currently native grassed lands, is comprised of rolling hills with a few flat areas. The site slopes predominantly from north to south and secondarily from west to east. The site is generally well drained. Drainage off occurs in ditching along Highway 527 and Range Road 283. There are a few low-lying areas. No permanent pooling of water occurs in these areas.

1.3 Methodology

A total of four geotechnical test holes and eight percolation test holes were drilled on September 6, 2006 using a flight auger rig supplied by Mobile Augers and Research Ltd. of Calgary, Alberta.

Soil conditions were logged during the drilling process and soil samples were obtained for laboratory testing. All geotechnical test holes were equipped with 25mm standpipes to monitor groundwater levels. A site plan that shows approximate test hole locations is included in Appendix 1.

Standard Penetration Tests (SPT) blow counts, which indicate soil strengths, were recorded at 1.52m interval. Starting depths of SPT counts alternated from 0.76m to 1.52m at test hole locations. Laboratory testing on selected soil samples consisted of: moisture content determinations, sieve and hydrometer grain size determinations and sulphate content of the soils. Test hole logs are included in Appendix 2. Initial groundwater levels were measured on September 11, 2006.

2.0 SUBSURFACE CONDITIONS

The lithological sequence of soils is described as organic topsoil overlying till, which overlies bedrock. More detailed description, thickness and ranges of depth and strengths of the soil for each test hole are given below.

2.1 Soil Conditions

TOP SOIL:

The topsoil was described as: Dark brown organic silt, dry to damp, vegetative. The depth of topsoil ranged from 0.08m to 0.25m. The average thickness of the topsoil was approximately 0.14m (5 ½ inches). One of the four test hole locations had a thicker depth (0.25m at TH 03) which may overall influence the average for the site. Generally, topsoil depths were between 0.08m and 0.13m.

TILL:

Till immediately underlying the topsoil had thickness from 2.16m to 3.86m. The till was characterized as: Medium brown clayey sand silt or sandy clayey silt, generally damp to moist but wet in places, gravely, stiff to hard, medium dense, fine grained, low to medium plastic, with cobble and boulder inclusions.

BEDROCK:

Medium brown, medium hard sandstone bedrock was encountered at all test hole locations. Two feet or 0.61m of soft bedrock preceded medium hard sandstone at test hole TH 04 whereas bedrock at other test holes were only described as medium hard. Table 1 summarizes the depth of bedrock encountered.

Table 1: Depth of Bedrock at Radler Subdivision Phase 2

Test Hole	Depth of Bedrock Below Ground Surface (m)
TH 01	3.96
TH 02	3.66
TH 03	3.35
TH 04	2.29

Materials, their thickness, depths and SPT "N" values are summarized in Table 2.

Table 2: Materials encountered at Radler Subdivision Phase 2

Test Hole	Materials Encountered	Thickness (m)	Depth below ground (m)	SPT "N" Value
TH 01	Topsoil	0.10	0.0 to 0.10	
	TILL	3.86	0.10 to 3.96	20
	BEDROCK	2.14+	3.96 to end at 6.10	
TH 02	Topsoil	0.08	0.0 to 0.08	
	TILL	3.58	0.08 to 3.66	12 to 33
	BEDROCK	0.30+	3.66 to end at 3.96	
TH 03	Topsoil	0.25	0.0 to 0.25	
	TILL	3.10	0.25 to 3.35	25
	BEDROCK	0.31+	3.35 to end at 3.66	
TH 04	Topsoil	0.13	0.0 to 0.13	
	TILL	2.16	0.13 to 2.29	15
	BEDROCK	1.52+	2.29 to end at 3.81	

Test hole logs are included in Appendix 2.

2.2 Groundwater Levels

Piezometers (25mm PVC standpipes) were installed full depth at all geotechnical test holes. Groundwater levels were measured on September 11, 2006, five days after drilling, to allow the static water level to reach equilibrium. Table 3 shows groundwater levels.

Table 3: Groundwater Levels Measured at Radler Subdivision Phase 2

Test Hole	Depth Below Ground (m)
TH 01	2.11
TH 02	2.38
TH 03	2.52
TH 04	1.14

Due to relatively high groundwater, which is also subject to seasonal fluctuations and/or climatic changes, an open joint storm sewer system is recommended.

3.0 GEOTECHNICAL PROPERTIES

In order to evaluate the site and make comments/recommendations with respect to development, geotechnical properties of the in-situ soils were ascertained from laboratory and field testing applied to our engineering knowledge and experience.

3.1 Laboratory Testing

Laboratory testing was conducted on samples retrieved from the split spoon of the auger rig during the drilling process.

3.1.1 Moisture Content of In-Situ Soils

Moisture contents of the till were measured between 10.2% and 14.3%. The average moisture content was 12.1%. Generally, moisture contents were between 10.2% and 13.2%. These values are believed to be less than the optimum moisture content for compaction.

3.1.2 Sieve and Hydrometer Results

Two grain size determinations were conducted on the native soils encountered. Table 4 summarizes the results.

Table 4: Sieve and Hydrometer Results for Soils at Radler Subdivision Phase 2

TH 01 @ 1.52m (%)		**TH 04 @ 0.76m (%)**	
Gravel	2.3	Gravel	0.0
Sand	25.6	Sand	23.2
Silt	53.8	Silt	52.4
Clay	18.3	Clay	24.4

3.1.3 Atterberg Limits

Atterberg Limits is a test method used to determine the liquid limit, plastic limit and plasticity index of fine-grained soils for classification purposes. These characteristics, individually or combined, correlated with other soil properties can also be useful in predicting engineering behaviour such as compressibility, permeability, compactibility, shrink-swell and shear strength of the soil.

Two Atterberg Limit tests were performed. Results indicate that the till is low to medium plastic (see Appendix 3 for details of the Atterberg Limits).

3.1.4 Sulphate Content of the Soils

Four Sulphate content tests were performed on samples retrieved at different depths from each test hole respectively. Tests were performed using a field screening kit and in accordance with ASTM methods. No samples were taken to a licensed chemical laboratory for analyses. Table 5 summarizes sulphate concentrations.

Table 5: Sulphate Concentrations of the Soil at Radler Subdivision Phase 2

Test Hole	Depth (m)	Sulphate Content (% by weight)
TH 01	3.05	0.050
TH 02	0.76	0.056
TH 03	1.52	0.042
TH 04	2.29	0.048

These results suggest that the potential for sulphate attack on the concrete is negligible. However, due to the presence of sulphates and the possibility of concentrations to increase, sulphate resistant concrete is recommended. Should sulphates be suspected of having higher concentrations (i.e. at or above 0.10% by weight) additional testing should be done. Higher concentrations of sulphates in the soil would necessitate higher compressive strength concrete in addition to being sulphate resistant.

3.2 Standard Penetration Tests

Standard Penetration Test (SPT) is a field test method used in estimating in-situ soil strengths at varied depths. The number of blows per foot (N Values) can be used to determine soil bearing capacities normally expressed in pressure units of kilopascal (kPa) or pounds per square foot (lb/ft^2).

Standard Penetration Test N Values ranged from 12 to 33 in the till (see Table 7, Section 4.2.1 "Soil Bearing Capacity" for corresponding design recommendations).

3.3 Percolation Tests

Two percolation test holes were drilled near each of the geotechnical test holes to a depth of 0.91m (3 feet). Table 6 summarizes percolation test results.

Table 6: Percolation Test Results at Radler Subdivision Phase 2

TH #	Trial #	Time of Readings	Readings (mm)	Duration of Test (min)	Change in Height (mm)	Percolation Rate (min/inch)
1W	1	Start: 13:20	124	30	59	12.92
		End: 13:50	183			
1E	1	Start: 13:21	126	30	25	30.48
		End: 13:51	151			
1W	2	Start: 13:54	115	30	90	8.47
		End: 14:24	205			
1E	2	Start: 13:55	47	30	54	14.11
		End: 14:25	101			
1W	3	Start: 14:26	109	33	98	8.55
		End: 14:59	207			
1E	3	Start: 14:27	102	30	30	25.40
		End: 15:00	132			
2N	1	Start: 13:30	125	30	141	5.40
		End: 14:00	266			
2S	1	Start: 13:28	185	30	172	4.43
		End: 13:58	357			
2N	2	Start: 14:01	143	30	126	6.05
		End: 14:31	269			
2S	2	Start: 14:02	156	30	155	4.92
		End: 14:32	311			
2N	3	Start: 14:33	79	30	166	4.59
		End: 15:03	245			
2S	3	Start: 14:34	110	30	167	4.56
		End: 15:04	277			
3N	1	Start: 13:35	150	30	142	5.37
		End: 14:05	292			
3S	1	Start: 13:36	148	30	135	5.64
		End: 14:06	283			
3N	2	Start: 14:07	124	30	134	5.69
		End: 14:37	258			
3S	2	Start: 14:08	103	30	137	5.56
		End: 14:38	240			
3N	3	Start: 14:39	104	30	139	5.48
		End: 15:09	243			
3S	3	Start: 14:40	79	30	127	6.00
		End: 15:10	206			
4W	1	Start: 13:41	155	30	43	17.72
		End: 14:11	198			
4E	1	Start: 13:42	128	30	33	23.09
		End: 14:12	161			
4W	2	Start: 14:13	108	30	74	10.30
		End: 14:43	182			
4E	2	Start: 14:14	88	30	55	13.85
		End: 14:44	143			
4W	3	Start: 14:45	106	30	62	12.29
		End: 15:15	168			
4E	3	Start: 14:46	90	30	43	17.72
		End: 15:16	133			

Result outside Alberta Environment Guidelines

Percolation Tests were conducted using Alberta Environment Guidelines. Alberta Environment requires percolation rates between 5 minutes per inch drop and 60 minutes per inch drop.

3.4 Soil Characteristics and Evaluation

3.4.1 General Discussion

The site presents favourable soil conditions for the proposed development. Building foundations placed on undisturbed native soils and road sub-bases are expected to perform well (on condition of proper compaction, drainage and maintenance). Standard Penetration Tests indicate that the undisturbed native till is relatively strong, even at shallow depths. Groundwater was found in the till at all test hole locations and to within 1.14m bgs at test hole TH 04. These measurements suggest that the till is less susceptible to loss of bearing capacity when subjected to water.

In-situ soils were found to be fine-grained with a significant amount of silt. Hence, these soils would be considered moderately to highly frost susceptible.

It is imperative that soils be compacted at moisture contents above their laboratory determined optimum values. Moisture contents indicated that the in-situ soils are below their estimated optimum moisture content. Therefore, use of a water truck to achieve proper compaction is anticipated.

Compactibility of in-situ soils is expected to be good. Permeability of the till when compacted is expected to be semi-pervious to impervious. Shear strength is anticipated to be fair and medium compressibility can be expected (both when compacted and saturated). Workability in general can be expected to be fair. However, workability may be poor when greater amounts of waters are needed for compaction. Bedrock is expected to be reasonably stable.

3.4.2 Construction Difficulties

High groundwater areas may cause concern for construction schedules, budgets and personnel safety. Although not anticipated, wider slopes and/or shoring and possibly the use of pumps may be needed, especially if trenches are left open for extended periods of time.

Medium hard bedrock on site was encountered to within 2.29m bgs at test hole TH 04. Deep underground utilities into the bedrock may require considerable effort to dig through the sandstone. Breaking bedrock for underground utility installation may take considerable time and prove to be expensive. Broken bedrock may not be suitable for backfill and may have to be disposed of off site. It is advisable for underground contractors to perform investigation for contract bidding and procedural purposes.

4.0 COMMENTS AND RECOMMENDATIONS

In-situ soil conditions present good circumstances for development in terms of building and road foundations. The following sections are offered for more detailed consideration.

4.1 Construction Activities

4.1.1 Rough Grading

Test hole logs indicate that the topsoil ranges in depth from 0.08m to 0.25m. The average depth is approximately 0.14m (5 ½ inches). Generally, topsoil thickness ranged from 0.08m to 0.13m. The topsoil is characterized by elevated amounts of organic material. Topsoil is very susceptible to volume changes in connection with moisture content variations. Organic material decomposes with time which can lead to settlements on roads, basement foundations, floor slabs, driveways, etc. Any existing topsoil or organic materials should be removed from underneath roads or structures and used in landscape areas only.

The till is suitable for construction. Moisture contents of the samples taken indicate that the majority of the in-situ soils are below their estimated optimum moisture levels (for compaction). Use of a water truck in order to achieve density/moisture specifications is anticipated.

Recommended specifications for compaction would include a minimum of 97.0% of the laboratory determined maximum dry density and optimum to +3.0% of the laboratory determined optimum moisture content (ASTM D698 Method A) for in-situ till and a minimum of 98.0% and $\pm$3.0% of the optimum moisture for imported pit run gravel (ASTM D698 Method C).

4.1.2 Excavations

Standard backhoe trenching methods may be used in the till. Temporary slopes may be inclined at 1 horizontal to 1 vertical. If at the time of construction wet/saturated or clean uniform sand is encountered, slopes of 2H:1V may be necessary. Temporary surcharge loads, such as stocks of materials, should be kept back from excavated faces a distance equal to at least one-half the excavation depth.

Groundwater may be a consideration for excavations. Bedrock may also present procedural, scheduling and budgetary difficulties for deep utility installation below 2.29m bgs.

Recommended specifications for compaction of utility trenches would include a minimum of 97.0% of the laboratory determined maximum dry density and optimum to +3.0% of the laboratory determined optimum moisture content (ASTM D698 Method A) for the till and a minimum of 98.0% and $\pm$3.0% of the optimum moisture for imported granular material (ASTM D698 Method C).

4.1.3 Gravel Roads

Gravel roads and aprons are expected to perform well on condition of proper compaction, drainage and maintenance. Performance and durability will increase with the use of base gravels over the compacted sub-base. The necessity of base gravel is not anticipated. Clean uniform sands should not be used for sub-base or base material. A minimum depth of 1.2m from groundwater to road surface should be maintained. All organic material should be removed from any road or lane sub-base.

Large cobbles and boulders should not be present at, or to within 0.3m of, the final grade under structures as these present pressure point threats (concrete or asphalt structures) and difficulty for maintenance grader blading.

4.2 Foundation Systems

All recognized foundation systems may be used on site according to the following guidelines.

4.2.1 Soil Bearing Capacity

Table 7 summarizes soil strengths ascertained from Standard Penetration Tests conducted with corresponding soil bearing capacities for design.

Table 7: Soil Strengths and Corresponding Allowable Foundation Design Pressures

Depth Below Existing Ground	SPT N Values	Density Classification of the Soil	Design Bearing Capacity (kPa)	Design Bearing Capacity (lb/ft^2)
0.76m to 1.52m	12 to 15	Medium Dense	100	2,088
1.52m to bedrock	20 to 33	Medium Dense to Dense	150	3,132
Bedrock		Very Dense	350	7,309

These soil bearing pressures were calculated for a maximum allowable settlement of 25mm. For footings based into the till, above bearing capacity values should be reduced by one-half if the groundwater is within 1.0m of foundation level. It is strongly recommended that shallow foundation systems have their own individual geotechnical bearing capacity tests performed with recommendations made prior to installation.

If site grading requires that footings be placed on fill material, the fill should be properly compacted to a minimum of 98.0 percent of the Standard Proctor maximum density. An allowable bearing pressure of 75 kPa can be used for footings placed on properly compacted fill, more than 1.0m above the water table. Some settlement of the fill can be expected even under proper compaction. The total amount of settlement and time required is dependent on many factors, especially the total thickness of fill, the soil type, and the placement moisture conditions and workmanship. Properly compacted in-situ soils can be expected to settle approximately 0.5 percent of the total fill depth in the long term.

4.2.2 Preparation of Foundation Soils

If organic soil or uncontrolled fill is present at residential footing levels, it must be replaced by suitable soil or granular material, or the foundations placed on short piles that penetrate a minimum of 0.60m into hard native sand or silt. Unless otherwise directed by a qualified structural engineer, piles with a minimum diameter of 0.25m should be spaced at 1.52m intervals under footings and in a 2.13m grid under floor slabs.

During construction, water should not be allowed to pond at the base of the footing excavation since this may further soften the foundation soil and lead to increased settlements. The soil beneath the footings should not be disturbed by construction activity. It is strongly recommended that the foundation soil be inspected and tested by a qualified geotechnical engineer prior to pouring the foundation.

4.2.3 Grade Beams and Frost Walls

Grade beams and frost walls may be designed according to recommendations made in Table 7 (Section 4.2.1) above and prepared as per Section 4.2.2 above.

4.2.4 Cast in Place Concrete Piles

In case of foundations on cast in-place concrete piles, they should be based on or in the sandstone bedrock and can be designed with an end bearing capacity of 350kPa (7,309 lb/ft^2) and a skin friction of 35 kPa (731 lb/ft^2).

4.2.5 Other Piles

Other piles may be designed with end bearing values in accordance with recommendations made in table 5, Section 4.2.1.

4.3 Septic Fields

Percolation tests indicate that the majority of the site is suitable for conventional septic fields. Unsuitable areas can likely be manipulated using soils on site to become suitable.

However, shallow bedrock and groundwater may present difficulty for septic field design. In addition to suitability of septic field soils, Alberta Environment also requires that a vertical separation be maintained between the point of effluent infiltration into the soil and a water table or an impervious layer. The minimum vertical separation suggested by the regulations is:

(a) 1500 mm (5 ft) in a disposal system supplied with effluent from a septic tank and no other treatment, or
(b) 900 mm (3 ft) in a disposal field supplied with effluent from a class 1 packaged sewage treatment plant or a sand filter, a treatment mound or an open bottom sand filter.

4.4 Frost Protection

Soils encountered on site are moderately to highly frost susceptible in the presence of water at freezing temperatures. To provide adequate frost protection, exterior footings should be based at a minimum depth of 2.7m for unheated structures and 1.4m for heated structures. The foundation soil should not be allowed to freeze or be disturbed by heavy precipitation either during or after construction.

4.5 Concrete

Laboratory testing on samples retrieved from all four test holes at varied depths, indicated sulphate concentrations ranging from 0.042% to 0.056% by weight. This suggests that the potential for sulphate attack on the concrete is negligible. Due to the presence of sulphates and the possibility of concentrations to increase, sulphate resistant concrete is recommended. Should sulphates be suspected of having higher concentrations (i.e. at or above 0.10% by weight) additional testing should be done. Higher concentrations of sulphates in the soil would necessitate higher compressive strength concrete in addition to being sulphate resistant (CSA A23.1-15.8, Table 12, page 53).

4.6 Weeping Tile

Weeping tile is recommended for all foundations. Groundwater levels varied around the site, but were relatively high in places. Groundwater levels may increase depending on seasonal fluctuations, climatic conditions, or development of the subject property and surrounding area. Weeping tile can also provide inexpensive additional protection for foundations against temporary influxes of large amounts of water (e.g. unusually high amounts of precipitation, exposed foundations during construction, improper landscaping or settled areas immediately around foundation walls that collect surface water, etc.).

The weeping tile should be connected to an internal sump with automatic pump. Discharged water should not be allowed to collect around the building. Two pumps (and sumps) will protect basements from flooding in the case where one pump fails to work. High groundwater areas are of particular concern. Continual use of the pump may prove discomforting to residences and increase the risk of sump pump failure. Foundations under groundwater should be avoided.

4.7 Lateral Earth Pressures

Basement walls or retaining walls can be designed based on a coefficient of earth pressure at-rest K_o of 0.40. The lateral earth pressure force is given by:

$$P = 0.5 K o \gamma H^2$$

Where: P = lateral earth pressure force in kN
Ko = 0.4 (coefficient of earth pressure at-rest)
γ = $20 kN/m^3$ (bulk unit weight)
H = height of wall in metres.

The above lateral force does not include surcharge loadings or hydrostatic water pressures.

5.0 CLOSURE

This report was prepared by G Tech Earth Sciences Corp. for the account of Park Pacific Properties Inc., its engineers and financial agents. The material in it reflects the best judgement of G Tech Earth Sciences Corp. in light of the information available at the time of preparation. Although every caution was taken in gathering the information therein, the results obtained are only advisory for the use of our client. The study was conducted in accordance with generally accepted practices. No other warranty is intended or implied. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. G Tech

Earth Sciences Corp. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report. Any discrepancies or new information that becomes available should be brought to G Tech's attention immediately to enable any amendments or revisions to the above conclusions contained within this report.

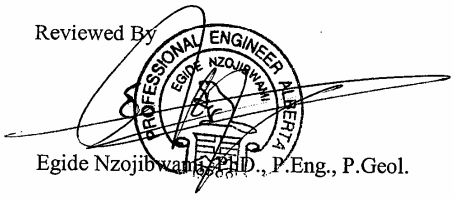
This report is for advisory purposes only. No warrantee or guarantee is implied or given.

Sincerely,
G Tech Earth Sciences Corp.

Stephen Maher

Stephen Maher, Principal

Reviewed By



Egide Nzojibwami, PhD., P.Eng., P.Geol.

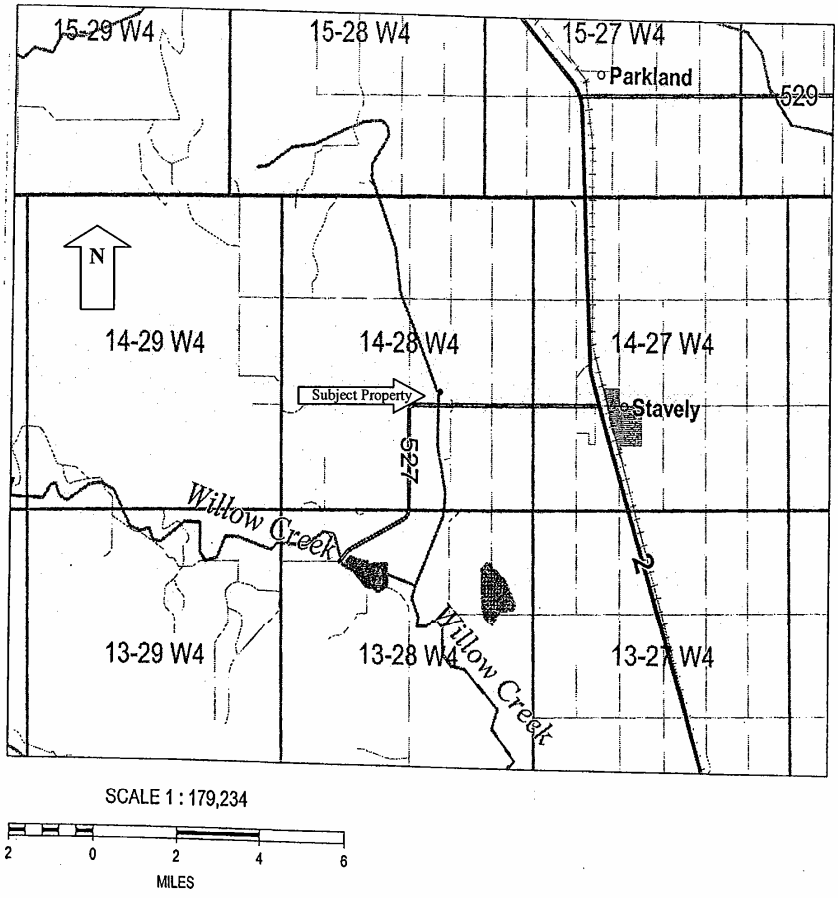
APPENDIX 1

SITE PLANS
TEST HOLE LOCATIONS

SITE LOCATION

56 Acre Ptn. of SW ¼ -15-14-28-W4M

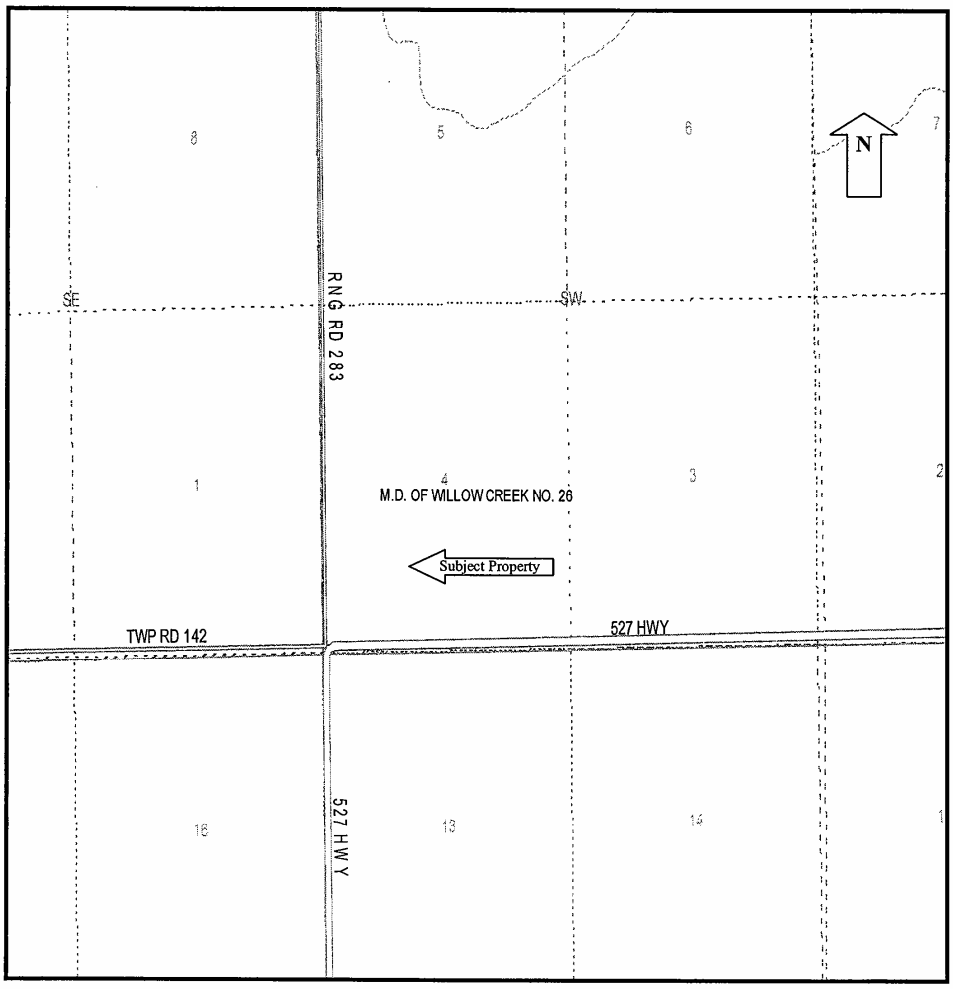
RADLER SUBDIVISION PHASE 2



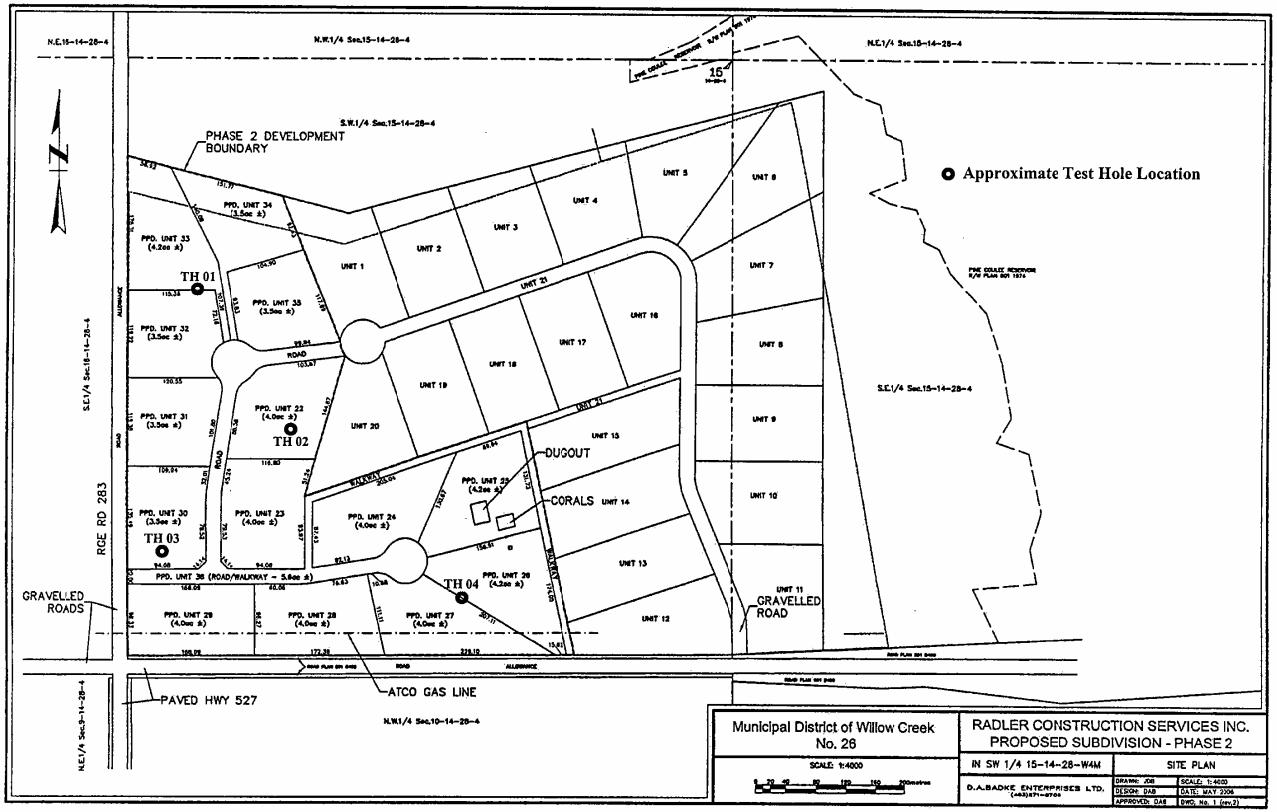
SITE LOCATION

56 Acre Ptn. of SW ¼ -15-14-28-W4M

RADLER SUBDIVISION PHASE 2



SITE PLAN and TEST HOLE LOCATIONS
56 Acre Ptn. of SW ¼-15-14-28-W4M
RADLER SUBDIVISION PHASE 2



APPENDIX 2

TEST HOLE LOGS

G Tech Earth Sciences Corp.

REPORT ON SITE INVESTIGATION

FILE: 0608G081 | 1 OF 1

BOREHOLE: TH 01

SITE INFORMATION	DRILLING INFORMATION	BOREHOLE AND WATER DATA	SYMBOLS	SAMPLES
CLIENT: Radler Construction Services	**CONTRACTOR:** Mobile Augers	**NORTHING:** n/a	Water table ▼	Standard Penetration ☒
PROJECT: Geotechnical Investigation	**DRILLING TECHNIQUE:** Flight Auger	**EASTING:** n/a	Unconfined compression Q_u	Undisturbed (Shelby) ☒
LOCATION: Radler Subdivision Ph 2	**SAMPLING TECHNIQUE:** Split Spoon	**STATIC DEPTH:** 2.11m	Sulfate content SO_4	Bag sample ☒
FIELD SUPERVISOR: S.M.	**DRILLING DATE:** September 6, 2006	**DATE MEASURING:** Sep. 11, 2006	Dry unit weight γ_d	Pocket Penetrometer pp
	TOTAL DEPTH: 6.10m		Penetration resistance N	

DEPTH (m)	WATER CONTENT ● PLASTIC LIMIT △ LIQUID LIMIT ■ (%) 20 40 60 80	SPT (BLOW COUNT) 0 2 4 6 8	SOIL PROFILE AND DESCRIPTION GROUND ELEVATION: n/a	MISCELLANEOUS SAMPLE TYPE	MISCELLANEOUS OTHER TESTS	DEPTH (m)
0			TOPSOIL: Dark brown organic silt, dry, vegetative			0
1			TILL: Clayey sandy silt, medium brown, fine grained, low plastic, gravelly, stiff, medium dense, damp, moist @ 4.5', hard @ 7'		Gravel=2.3% Sand=25.6% Silt=53.8% Clay=18.3%	1
2						2
3					S04=0.050%	3
4			BEDROCK: Sandstone, medium brown, medium hard			4
5						5
6						6
7						7
8						8
9						9

G Tech Earth Sciences Corp.

REPORT ON SITE INVESTIGATION

FILE: 0608G081 | 1 OF 1

BOREHOLE: TH 02

SITE INFORMATION	DRILLING INFORMATION	BOREHOLE AND WATER DATA	SYMBOLS	SAMPLES
CLIENT: Radler Construction Services	**CONTRACTOR:** Mobile Augers	**NORTHING:** n/a	Water table ⊻	Standard Penetration ☒
PROJECT: Geotechnical Investigation	**DRILLING TECHNIQUE:** Flight Auger	**EASTING:** n/a	Unconfined compression Q_u	Undisturbed (Shelby) ☒
LOCATION: Radler Subdivision Ph 2	**SAMPLING TECHNIQUE:** Split Spoon	**STATIC DEPTH:** 2.38m	Sulfate content SO_4	Bag sample ☒
FIELD SUPERVISOR: S.M.	**DRILLING DATE:** September 6, 2006	**DATE MEASURING:** Sep. 11, 2006	Dry unit weight γ_d	Pocket Penetrometer pp
	TOTAL DEPTH: 3.96m		Penetration resistance N	

DEPTH (m)	WATER CONTENT ● PLASTIC LIMIT △ LIQUID LIMIT ■ (%) 20 40 60 80	SPT (BLOW COUNT) 2 4 6 8	SOIL PROFILE AND DESCRIPTION	MISCELLANEOUS: SAMPLE TYPE	MISCELLANEOUS: OTHER TESTS	DEPTH (m)
0			GROUND ELEVATION: n/a			0
1			TOPSOIL: Dark brown organic silt, damp, vegetative			1
2			TILL: Sandy clayey silt, medium brown, fine grained, low to medium plastic, stiff, medium dense, damp, gravelly @ 3', hard @ 6'		S04=0.056%	2
3						3
4			BEDROCK: Sandstone, medium brown, medium hard			4
5						5
6						6
7						7
8						8
9						9

G Tech Earth Sciences Corp.

REPORT ON SITE INVESTIGATION

FILE: 0608G081 | 1 OF 1

BOREHOLE: TH 03

SITE INFORMATION	DRILLING INFORMATION	BOREHOLE AND WATER DATA	SYMBOLS	SAMPLES
CLIENT: Radler Construction Services	**CONTRACTOR:** Mobile Augers	**NORTHING:** n/a	Water table ⧗	Standard Penetration ☒
PROJECT: Geotechnical Investigation	**DRILLING TECHNIQUE:** Flight Auger	**EASTING:** n/a	Unconfined compression Q_u	Undisturbed (Shelby) ☐
LOCATION: Radler Subdivision Ph 2	**SAMPLING TECHNIQUE:** Split Spoon	**STATIC DEPTH:** 2.52m	Sulfate content SO_4	Bag sample ⊡
FIELD SUPERVISOR: S.M.	**DRILLING DATE:** September 6, 2006	**DATE MEASURING:** Sep. 11, 2006	Dry unit weight γ_d	Pocket Penetrometer pp
	TOTAL DEPTH: 3.66m		Penetration resistance N	

DEPTH (m)	WATER CONTENT ● PLASTIC LIMIT △ LIQUID LIMIT ■ (%) 20 40 60 80	SPT (BLOW COUNT) 20 40 60 80	SOIL PROFILE AND DESCRIPTION	MISCELLANEOUS: SAMPLE TYPE	MISCELLANEOUS: OTHER TESTS	DEPTH (m)
0			**GROUND ELEVATION:** n/a			0
0			TOPSOIL: Dark brown organic silt, damp, vegetative			0
1			TILL: Clayey sandy silt, medium brown, fine grained, low plastic, gravelly, stiff, medium dense, moist, hard @ 7', cobbles and boulders			1
2					S04=0.042%	2
3						3
3			BEDROCK: Sandstone, medium brown, medium hard			3
4						4
5						5
6						6
7						7
8						8
9						9

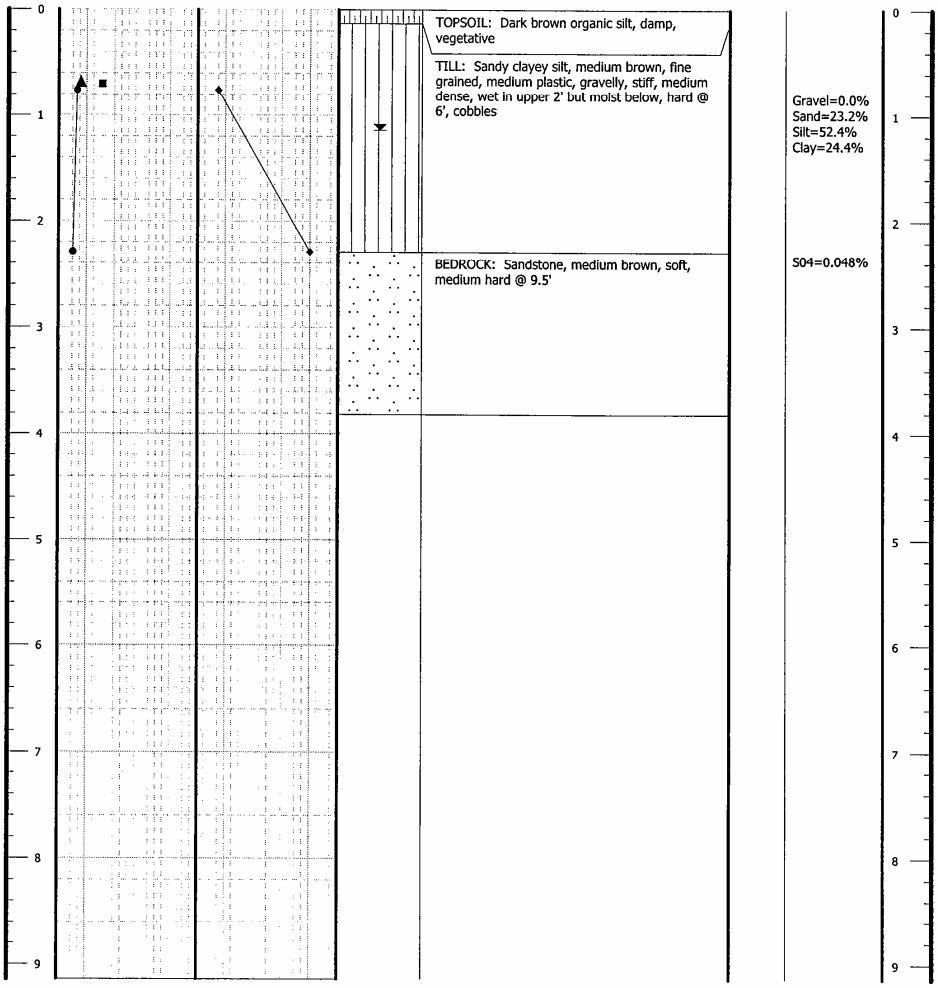
G Tech Earth Sciences Corp.

REPORT ON SITE INVESTIGATION

FILE: 0608G081 | 1 OF 1

BOREHOLE: TH 04

SITE INFORMATION	DRILLING INFORMATION	BOREHOLE AND WATER DATA	SYMBOLS	SAMPLES
CLIENT: Radler Construction Services	**CONTRACTOR:** Mobile Augers	**NORTHING:** n/a	Water table ▼	Standard Penetration ☒
PROJECT: Geotechnical Investigation	**DRILLING TECHNIQUE:** Flight Auger	**EASTING:** n/a	Unconfined compression Q_u	Undisturbed (Shelby) ☒
LOCATION: Radler Subdivision Ph 2	**SAMPLING TECHNIQUE:** Split Spoon	**STATIC DEPTH:** 1.14m	Sulfate content SO_4	Bag sample ☒
FIELD SUPERVISOR: S.M.	**DRILLING DATE:** September 6, 2006	**DATE MEASURING:** Sep. 11, 2006	Dry unit weight γ_d	Pocket Penetrometer pp
	TOTAL DEPTH: 3.81m		Penetration resistance N	



APPENDIX 3

LABORATORY TEST RESULTS

A Moisture Content
B Sieve and Hydrometers
C Atterberg Limits
D Sulphate Content

G TECH EARTH SCIENCES CORP.

Moisture Content Determination

Client: Radler Construction Services Inc.
Location: Radler Subdivision Phase 2
Project: Geotechnical Investigation

Project No: 0608G081
Date: September 7, 2006
Technician: B.M.

TH No.		1	1					
Depth (ft)		5.0	10.0					
Tare No.		C	E					
Wt. Wet Soil + Tare		293	257					
Wt. Dry Soil + Tare		258	232					
Wt. Water		35	25					
Wt. Tare		3	3					
Wt. Dry Soil		255	229					
Moisture Content (%)		**13.7**	**10.9**					

TH No.		2	2	2				
Depth (ft)		2.5	7.5	11.5				
Tare No.		BU	11B	5A				
Wt. Wet Soil + Tare		235	270	252				
Wt. Dry Soil + Tare		206	244	229				
Wt. Water		29	26	23				
Wt. Tare		3	3	3				
Wt. Dry Soil		203	241	226				
Moisture Content (%)		**14.3**	**10.8**	**10.2**				

TH No.		3	3					
Depth (ft)		5.0	10.0					
Tare No.		BU3	BU5					
Wt. Wet Soil + Tare		252	254					
Wt. Dry Soil + Tare		221	228					
Wt. Water		31	26					
Wt. Tare		3	3					
Wt. Dry Soil		218	225					
Moisture Content (%)		**14.2**	**11.6**					

TH No.		4	4					
Depth (ft)		2.5	7.5					
Tare No.		BU7	A1					
Wt. Wet Soil + Tare		337	345					
Wt. Dry Soil + Tare		298	313					
Wt. Water		39	32					
Wt. Tare		3	3					
Wt. Dry Soil		295	310					
Moisture Content (%)		**13.2**	**10.3**					

G TECH EARTH SCIENCES CORP.

Sieve And Hydrometer Analysis

Client: Radler Construction Services Inc.

Location: Radler Subdivision Phase 2

Project: Geotechnical Investigation

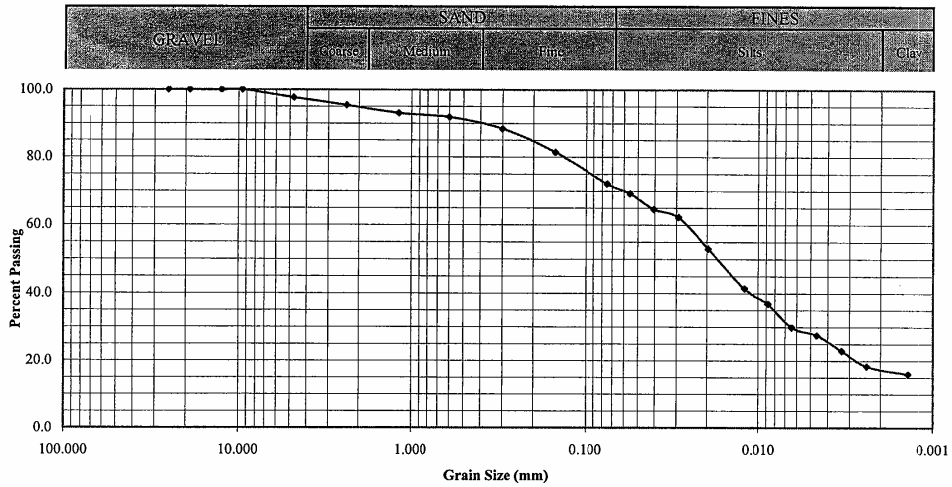
Soil Type: Sandy Silt

Project No: 0608G081

Date: September 13, 2006

Technician: V.T.

Test Sample: TH 01 @ 5 Feet



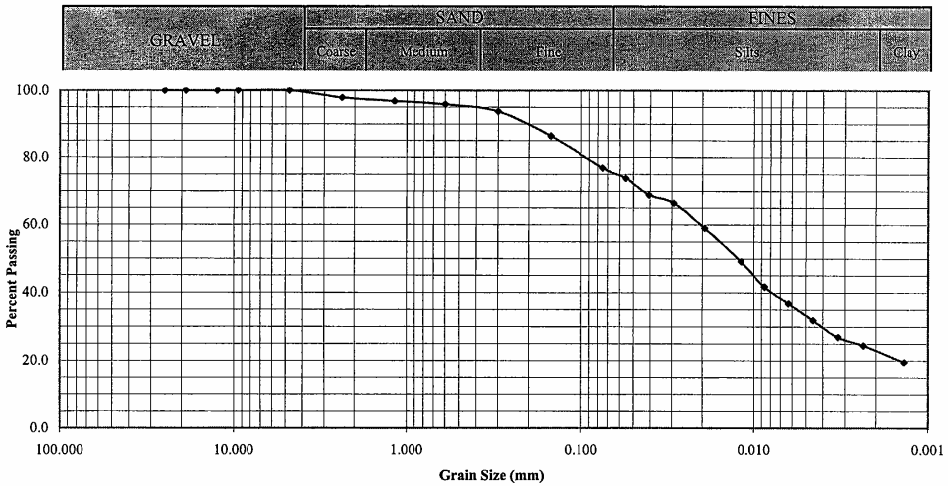
Grain Sizes	% of sample
Gravel	2.3
Sand	25.6
Silt	53.8
Clay	18.3

G TECH EARTH SCIENCES CORP.

Sieve And Hydrometer Analysis

Client: Radler Construction Services Inc.
Location: Radler Subdivision Phase 2
Project: Geotechnical Investigation
Soil Type: Clayey Silt

Project No: 0608G081
Date: September 13, 2006
Technician: V.T.
Test Sample: TH 04 @ 2.5 Feet



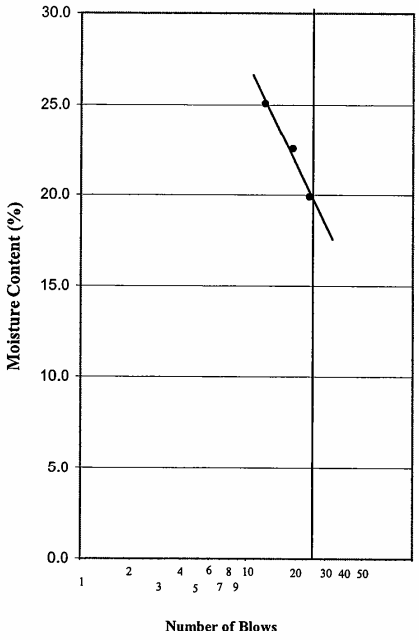
Grain Sizes	% of sample
Gravel	0.0
Sand	23.2
Silt	52.4
Clay	24.4

G TECH EARTH SCIENCES CORP.

Atterberg Limits Test

Client: Radler Construction Services Inc.
Location: Radler Subdivision Phase 2
Project: Geotechnical Investigation
Sample: TH 01 @ 5 feet

Project No: 0608G081
Date Tested: September 13, 2006
Technician: V.T.



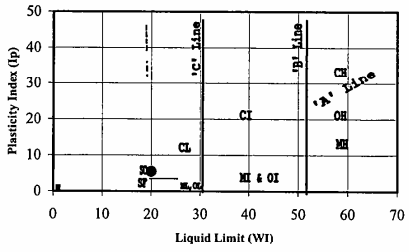
LIQUID LIMIT TEST

Trial Number	1	2	3
No. of Blows	24	19	13
Tare Number	A3	A4	A5
Wt. Wet Soil + Tare	6.15	6.10	5.80
Wt. Dry Soil + Tare	5.35	5.22	4.90
Wt. of Tare	1.33	1.32	1.31
Wt. of Water	0.80	0.88	0.90
Wt. of Dry Soil	4.02	3.90	3.59
Moisture Content (%)	19.9	22.6	25.1

PLASTIC LIMIT TEST

Trial Number	1	2	
Tare Number	A1	A2	
Wt. Wet Soil + Tare	4.88	6.47	
Wt. Dry Soil + Tare	4.43	5.81	
Wt. of Tare	1.32	1.31	
Wt. of Water	0.45	0.66	
Wt. of Dry Soil	3.11	4.50	
Moisture Content (%)	14.5	14.7	

Plasticity Chart



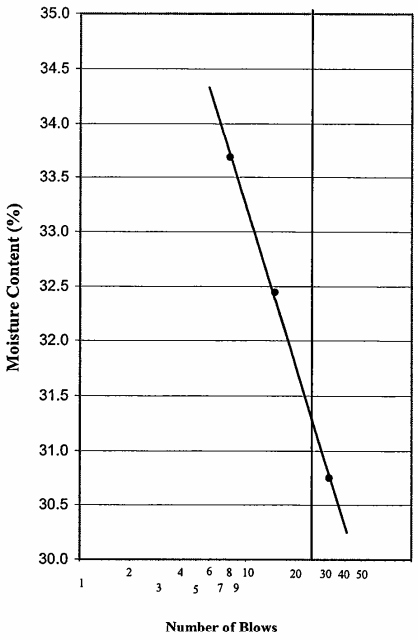
Soil Description:	Sandy Silt
USCS Symbol:	CL
Liquid Limit:	20.0
Plastic Limit:	14.6
Plasticity Index:	5.4
Plasticity Description:	**Low Plasticity**
Remarks:	

G TECH EARTH SCIENCES CORP.

Atterberg Limits Test

Client: Radler Construction Services Inc.
Location: Radler Subdivision Phase 2
Project: Geotechnical Investigation
Sample: TH 04 @ 2.5 feet

Project No: 0608G081
Date Tested: September 13, 2006
Technician: V.T.



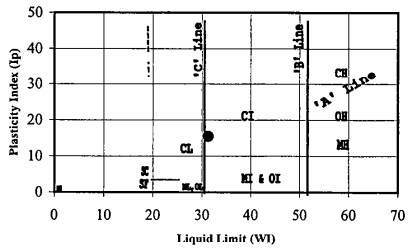
LIQUID LIMIT TEST

Trial Number	1	2	3
No. of Blows	8	15	32
Tare Number	B3	B4	B5
Wt. Wet Soil + Tare	6.42	6.31	5.88
Wt. Dry Soil + Tare	5.14	5.09	4.81
Wt. of Tare	1.34	1.33	1.33
Wt. of Water	1.28	1.22	1.07
Wt. of Dry Soil	3.80	3.76	3.48
Moisture Content (%)	33.7	32.4	30.7

PLASTIC LIMIT TEST

Trial Number	1	2	
Tare Number	B1	B2	
Wt. Wet Soil + Tare	6.99	6.78	
Wt. Dry Soil + Tare	6.27	5.98	
Wt. of Tare	1.35	1.33	
Wt. of Water	0.72	0.80	
Wt. of Dry Soil	4.92	4.65	
Moisture Content (%)	14.6	17.2	

Plasticity Chart



Soil Description:	Clayey Silt
USCS Symbol:	CI
Liquid Limit:	31.3
Plastic Limit:	15.9
Plasticity Index:	15.4
Plasticity Description:	**Medium Plasticity**
Remarks:	

G TECH EARTH SCIENCES CORP.

Water Soluble Sulphate Content Determination

Client: Radler Construction Services Inc.
Location: Radler Subdivision Phase 2
Project: Geotechnical Investigation

Project No: 0608G081
Date Tested: September 13, 2006
Technician: V.T.

Test Hole #	Depth (ft)	Container No.	Volume of water (ml)	Weight of sample (g)	Reading (ppm)	Dilution Factor	Sulphate Content (% by weight)
TH 01	10	1	200	10	25	2	**0.050**
TH 02	2.5	2	200	10	28	2	**0.056**
TH 03	5	3	200	10	21	2	**0.042**
TH 04	7.5	4	200	10	24	2	**0.048**

Remarks: _____