Environmental Geotechnical and Materials Engineering
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GEOTECHNICAL INVESTIGATION

PROPOSED AREA STRUCTURE PLAN
TOWNSHIP ROAD 514 & RANGE ROAD 261
W½-25-51-26-W4M
PARKLAND COUNTY, ALBERTA

PREPARED FOR

1285827 ALBERTA LTD.

EDMONTON, ALBERTA

PREPARED BY

PARKLAND GEO-ENVIRONMENTAL LTD.

SHERWOOD PARK, ALBERTA

PROJECT No.: ED-1285

DATE: NOVEMBER 2, 2011

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APPENDICES

1.0 INTRODUCTION

1285827 Alberta Ltd. is proposing to develop a rural residential subdivision in Parkland County, Alberta. The site is to be located at the W½-25-51-26-W4M, east of Range Road 261 and north of Township Road 514, as shown on Figure 1. ParklandGEO was commissioned to perform an investigation of the site and provide preliminary geotechnical recommendations for the proposed development.

This report summarizes the results of the field and laboratory testing program and presents general geotechnical recommendations for site preparation and initial information to support the preparation of an Area Structure Plan.

1.1 SCOPE OF WORK

The scope of work was outlined in ParklandGEO's proposal PRO-ED11-66, dated July 21, 2011. Authorization to proceed was provided by Ms. Lisa Sharun, BA, MEDes of Focus Corporation on August 5th, 2011 via email.

2.0 PROJECT & SITE DESCRIPTION

The proposed project will consist of the development of two quarter sections into a rural residential subdivision within Parkland County, Alberta. Access to the property was from Range Road 261 to the west of the site, and Township Road 514 to the south of the site.

The quarter sections consisted mostly of relatively flat agricultural land with an oil well lease site towards the north, a residence to the west, and an undeveloped low-lying area in the southwest corner of the site (Photographs 1 to 4). At the time of investigation, NW¼-25-51-26-W4M had been harvested and SW¼-25-51-26-W4M was an unharvested wheat field. The low-lying area in the southwest encompassed about 10 percent of the developable area. The vegetation in this area consisted primarily of native grasses, thistles, and stands of deciduous trees.

There were several pipelines present on the site including: ATCO Gas and Pipelines Ltd. pipeline right-of-ways along the south and west boundaries of the SW¼-25-51-26-W4M; Penn West pipeline right-of ways along the west, north, and east boundaries of the NW¼-25-51-26-W4M; and buried Telus lines located within the road right-of-way along the south boundary of the property.

The surrounding quarter sections generally consisted of agricultural land and undeveloped treed areas, with existing rural residential subdivisions located to the west and northwest of the property. The nearest major water body is the North Saskatchewan River located approximately 2.75 km to the east of the site.

It is understood that the proposed development will make use of private sewage disposal systems such as septic tanks and disposal fields, as applicable. If feasible, it is proposed to use the local groundwater aquifer for potable water supply.

3.0 FIELD AND LABORATORY PROGRAMS

On August 17, 2011, eight (8) boreholes were drilled to depths of 8 m. Adjacent to each borehole an additional 0.9 m hole was drilled for percolation testing. The approximate borehole locations are shown on the Site Plan (Figure 2).

The drilling was conducted using a truck-mounted, continuous flight, 150 mm diameter, solid-stem auger drill, owned and operated by Beck Drilling & Environmental Services Ltd. Supervision of the drilling, soil sampling, and logging of the various soil strata was performed by Ms. Melissa Kober, E.I.T. of ParklandGEO.

During the drilling, the following sampling and testing procedures were followed:

- The soil was examined in the field and classified using the Modified Unified Soil Classification System. The borehole logs and the explanation sheets of the terms and symbols used on the borehole logs are provided in Appendix A.

- Disturbed soil samples were obtained at 1.0 m intervals to determine the soil moisture profiles.

- Standard Penetration Tests (SPTs) were performed at depth intervals of 1.5 m in all boreholes. Soil from the penetrometer tube was bagged for testing. The number of blows required to drive the SPT split-spoon sampler 300 mm into the soil was noted and plotted on the borehole logs as SPT "N" values.

- Piezometers consisting of hand slotted 25 mm diameter PVC pipe were installed in all eight (8) of the boreholes. The boreholes were then backfilled with auger cuttings and sealed with bentonite.

- The groundwater conditions were noted while drilling, on completion of the drilling and approximately 1 week following drilling.

- All soil samples were returned to ParklandGEO's laboratory for select testing to determine soil properties. The laboratory program consisted of obtaining moisture contents, Atterberg Limits, water soluble sulphate concentrations, grain size distribution, and density. The results of all laboratory testing are shown on the borehole logs (Appendix A) and are included in Appendix A.

- Percolation testing was conducted according to methods outlined in the Alberta Municipal Affairs' *"Alberta Private Sewage System Standard of Practice Handbook"* 2009 (AMA Handbook).

4.0 SUBSURFACE CONDITIONS

The general soil profile consisted of a thin layer of topsoil overlying a clay and silt soil which extended to depths of at least 8 m below grade. This soil profile is considered to be typical for the area. Detailed descriptions of the soil conditions encountered are provided on the borehole logs in Appendix A. Definitions of the terminology and symbols used on the logs are provided on the accompanying explanation sheets in Appendix A.

4.1 TOPSOIL

A surficial layer of topsoil was encountered at all borehole locations. The topsoil thickness was typically 0.1 to 0.2 m, however increased to 0.4 m at two borehole locations. The topsoil thickness is expected to vary between the borehole locations and thicker deposits should be expected in some areas. The topsoil was organic, contained trace rootlets, was dry to damp, and black.

4.2 CLAY AND SILT

A clay and silt soil was encountered below the topsoil in boreholes and extended below the completion depths of 8 m. The deposits contained varying amounts of clay, silt and sand, with 16 to 69 percent clay, 18 to 77 percent silt, and 1 to 11 percent sand. There were some sand or silt seams within the upper portions of the deposit, as well as occasional gravel, rust precipitates and coal inclusions. The silty clay was medium plastic with Liquid Limits of 37 to 52 percent and Plastic Limits of 16 to 23 percent. The consistency of the silt and clay deposits varied from very soft to stiff, with Standard Penetration Test “N” values of 0 to 14 and a typical value of 6. The variable deposits had moisture contents of 14 to 41 percent. The moisture contents generally increased with depth.

4.3 SOIL SULPHATES

Four (4) soil samples were analyzed for water soluble sulphate concentrations, and all samples contained between 0.0034 and 0.0076 percent water soluble sulphates.

4.4 GROUNDWATER

Groundwater seepage was not observed in the boreholes during the drilling. Minor sloughing was noted in all boreholes. Groundwater levels six days following drilling are summarized in the following table.

TABLE 1: GROUNDWATER MONITORING
DATE: AUGUST 23, 2011

Borehole	Depth from Ground Surface (m)
11-01	5.20
11-02	6.96
11-03	5.28
11-04	4.90
11-05	2.13
11-06	damaged
11-07	2.57
11-08	4.48

The piezometer installed at Borehole 11-06 was plugged and therefore no groundwater elevation measurements were obtained at this location. Groundwater elevations are expected to fluctuate up to 2 m higher on a seasonal basis and will be highest after periods of heavy precipitation. The seasonally high groundwater levels will decrease during dry periods as the groundwater infiltrates. Areas in close proximity to the low-lying area in the southwest the site were found to have shallower groundwater levels. There appears to be a trend of shallower groundwater towards the south.

4.5 PERCOLATION TESTING

On-site percolation tests were conducted at all eight (8) borehole locations. The percolation tests were used to determine the capacity of soil to transmit and retard septic effluent. The results of the field percolation tests are shown in Table 2.

TABLE 2: PERCOLATION TEST RESULTS

Borehole No.	Percolation Rate (min/25 mm)	Acceptable Loading Rate (L/m^2)
11-01	30	14.89
11-02	98	Unsuitable
11-03	124	Unsuitable
11-04	8	28.83
11-05	10	25.78
11-06	55	10.99
11-07	4	Unsuitable
11-08	31	14.64

These results are considered to be highly variable. The acceptable loading rate is based on the AMA Handbook and calculations.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 GEOTECHNICAL EVALUATION

It is understood that the two quarter sections will be developed into rural residential lots. These lots will not be tied to municipal services and as such will require private sewage disposal systems and a source of potable water.

The results of the percolation tests were highly variable across the site. Therefore, site specific testing will be required at each proposed septic field location to determine the suitability for septic fields.

A desktop study was conducted to determine the feasibility of using the aquifer as a source of potable water. The results of this study and options for potable water will be discussed further in Section 5.3.

The soil conditions at the site are considered to be typical for the area and will be suitable for the proposed residential development. Due to the very soft soils at depth, foundations for structures larger than a typical two-storey house would require a detailed site specific investigation. The silt and silty clay soils may be adversely impacted by wet weather and seasonal high groundwater conditions. Shallow groundwater in the fine grained silty soils in the southwest portion of the site may increase the potential for groundwater to “pump up” to surface due to repetitive construction traffic resulting in a significant weakening / failure of the subgrade.

Based on the results of the borings, the site soils become increasingly soft and wet with depth. The subsoil conditions are considered to be suitable for lightly loaded spread or strip footing foundations. Care will be required preparing the bearing surfaces. Deep foundations are not recommended at this site given the size and scope of the proposed development and the very soft soils encountered at depth.

Basements would be permissible in most areas. However, where the groundwater table is within 3 m of the ground surface the building pocket should be built up around the basement rather than the basement constructed below the existing grade.

It is generally recommended for this site to maintain site grades as high as possible, particularly in the south of the site and other areas with shallow groundwater tables. Measures undertaken during site preparation should be designed to minimize disturbance of the sensitive subgrade by construction traffic. Construction methods may need to be review based on the weather, groundwater, and subgrade conditions at the time of construction.

5.2 PRIVATE SEWAGE DISPOSAL

It is understood that on-site septic tanks with septic fields are considered for sewage treatment system. The Alberta Municipal Affairs' *"Alberta Private Sewage System Standard of Practice Handbook"*, 2009 (AMA Handbook) specifies that a subsurface effluent disposal system, or other systems that use the absorption of effluent into the soil for treatment and disposal, shall absorb the effluent into the soil at a rate of:

- not faster than 5 minutes per 25 mm (1 in.) as determined by percolation test using water, or 5 Litres per square metre per minute; and

- not slower than 60 minutes per 25 mm (1 in.) as determined by percolation test using water or 0.042 Litres per square metre per minute.

The AMA Handbook also states that a subsurface effluent disposal system, or other systems that use the absorption of effluent into the soil for treatment and disposal, shall maintain a vertical separation between the point of effluent infiltration into the soil and water table or an impervious layer of not less than:

- 1500 mm in a disposal system supplied with effluent from a septic tank and no other treatment; or

- 900 mm in:

  i) a disposal field supplied with effluent from a Class 1 packaged sewage treatment plant or a sand filter;
  ii) a treatment mound; or
  iii) an open bottom sand filter.

The absorption rates were measured with percolation tests conducted at each borehole location using standard methods as outlined in Appendix B of the AMA Handbook. The results of the percolation tests, summarized in Table 2, indicate that the majority of the tested locations have soil conditions suitable for a subsurface effluent disposal system. However, three tested locations had soil conditions that are unsuitable for a subsurface effluent disposal system. One percolation test (Borehole 11-07) resulted in an absorption rate faster than the specified allowable absorption rate outlined in the AMA Handbook and two tests (Boreholes 11-02 and 11-03) resulted in absorption rates slower than the required absorption rate specified in the AMA Handbook. The percolation rates were highly variable across the site, therefore, more site specific testing is required at each proposed septic field location. Proper design and installation procedures, as outlined in the AMA Handbook, should be followed.

In areas where subgrade soils do not meet accepted percolation criteria, the most practical option for private sewage disposal will be to modify the existing surface soil by mixing imported silt, sand and clay soils to achieve an acceptable low to moderate permeability subgrade which would support a normal septic field at the proposed field locations. Suitable soils for this option are considered to be present at this site. According to the Standard of Practice guidelines, other acceptable options include: the construction of a septic mound or construction of an engineered sewage disposal/treatment systems.

The groundwater elevations are suitable for the proposed septic fields provided site elevations are maintained, particularly in areas with relatively shallow groundwater levels. If areas of shallow groundwater are encountered, constructed fields or mounds will need to be built with raised grades to provide sufficient soil cover above the groundwater table.

Septic disposal systems should be constructed in accordance with applicable regulations and should be properly sized and installed by a licensed contractor based on normal testing and verification of actual field conditions. The geotechnical/slope restrictions for septic fields given in this report should be followed.

5.3 PRELIMINARY AQUIFER STUDY

A review of the local groundwater use was completed using Alberta Environment's groundwater well database. A total of 300 water wells are listed for the Subject Property and within two quarter section of the Property. Of these 140 wells, approximately 66 water well records provided pump test information. Based on these records, safe well yield was calculated for nine wells, with the results showing an average Q_{20} safe yield of 130 gallons per minute. The selected well records and the yield analysis sheets are included in Appendix A.

From aerial photographs, it was determined that approximately 195 residences and one golf course were located within two quarter sections of the Property. Based on an average household of 5 people and average use of 56 gallons per day per person, the estimated current use of the area is around 56,000 gallons per day, which corresponds to an average well yield of 40 gallons per minute. This usage includes the golf course located southeast of the site.

Based on the number of existing wells and users in the area relying on the groundwater aquifer, it was recommended to hire a hydrogeologist to perform a full scale pump test and groundwater availability assessment on each quarter section in order to determine the ability of the aquifer to sustain water supply to the proposed new residences. Based on the preliminary information and the cost of the pump tests, it is understood that the preferred water source will be a low pressure municipal system with cisterns installed for each new residence, with no additional groundwater used in the area.

5.4 SITE PREPARATION

All organics and other unsuitable material must be removed from areas to be occupied by buildings. Following removal of any undesirable soil, all exposed subgrade soils should be scarified to a minimum depth of 150 mm and compacted to a minimum of 96 percent of Standard Proctor Maximum Dry Density (SPMDD - ASTM D698) in pavement areas and building areas to be occupied by slab-on-grade structures. This may necessitate selective drying in some areas. The final compacted subgrade should then be proof-rolled and monitored by geotechnical personnel to identify non-uniformity and weak or soft areas. The depth of any sub-cut excavation should be sufficient to remove any soft or organic material or to bridge over the material to give proper support to construction traffic and pavement structures. It is recommended that areas of asphalt pavement have a non-woven geotextile separation strip placed over the final prepared clay subgrade prior to placement of gravel pavement layers to minimize the ingress of fines into the granular base course.

Roadways and building pads may be brought up to subgrade level using an approved fill such as a low to medium plastic clay or well graded select granular material such as sand or gravel. If coarse gravel is proposed as granular fill it is recommended to use a gravel with a maximum aggregate size of 100 mm. The maximum thickness of any lift after compaction should not exceed 200 mm. Uniformity is of most importance. If excessively soft subgrade conditions are encountered these compaction recommendations and proposed construction procedures should be reviewed.

Site drainage should be directed away from structures and roadways. It is recommended to provide a 3 to 5 percent back slope from foundations and buildings for a distance of at least 3 m. The slope of exterior backfill should be checked periodically to verify water is shed away from these areas.

5.5 FOUNDATIONS AND BASEMENTS

Standard house basement foundations using strip and spread footings are assumed to be the preferred foundation option at this site, and are considered suitable based on the encountered ground conditions. Basements in the southern area should be raised to ensure a 2 m seperation from the groundwater table.

Footings should be placed on undisturbed inorganic soil free from loosened material. The design and construction of residential foundations should conform to the Alberta Building Code - Section 9. In general, excavations should be protected against surface water; footing bases should not be allowed to dry out excessively during construction; and the bearing soil should be protected against freezing during and after construction. All exposed bearing surfaces should be reviewed by a qualified geotechnical engineer in order to assess the bearing conditions prior to footing placement.

Floor slabs should rest on at least 150 mm of well graded, free draining, granular base. Suitable materials would include coarse sand or crushed gravel with less than 10 percent passing the 0.080 mm sieve. The drainage layer below the slab should be compacted uniformly to at least 95 percent of SPMDD. Small vertical subgrade movements may be experienced therefore, provisions should be made for movements between partitions and adjoining columns or load bearing walls. In addition, where partitions are placed under structural members a space should be left at the top of the partition to allow vertical movement (at least 25 mm). Columns in basements which support floor joists should be adjustable. Water lines should be installed carefully to minimize the potential for breakage and leaks below the slabs. Heating ducts below grade should be insulated to prevent drying of the subgrade soils.

The groundwater table is expected to fluctuate seasonally. A standard weeping tile drain is recommended around the outside perimeter of the basement areas to control potential surface infiltration around the perimeter of the houses. The weeping drain should be surrounded with free draining crushed rock or washed rock to prevent the fine grained native soil from being washed directly into the drain. Groundwater infiltration flows can be significantly increased by poor site drainage around houses, improperly directed roof leaders and poorly graded or compacted backfill.

Backfill soils are capable of exerting significant horizontal pressures onto a basement wall. It is recommended that the backfilling should be delayed until the concrete has gained enough strength to support the horizontal loads. The top and bottom of the wall should be braced prior to backfilling. Therefore, it is recommended to place the basement floor slab and floor joists prior to backfiling around the walls. Backfill should be brought up evenly around the building perimeter to minimize differential horizontal pressures on the basement walls. Rather than heavily compacting the backfill around the basements, it is recommended to nominally compact the backfill (90 - 95 percent of SPMDD) recognizing that settlement of the backfill will occur, particularly after the first freeze/ thaw and moisture infiltration cycle.

5.6 FLEXIBLE PAVEMENT DESIGN

The proposed pavement design sections are based on the assumption that the pavement will be constructed on a stable, prepared subgrade with a soaked California Bearing Ratio of at least 3.0. This is indicative of a relatively low level of subgrade support as expected during spring thaw when the subgrade soils will exist in a weakened condition. As previously discussed in Section 5.2, subgrade problems may be encountered depending on local weather and groundwater conditions at the time of construction. If soft subgrade conditions are encountered, it is assumed that the subgrade will be improved with coarse gravel to support construction traffic and paving activities. If required, the subgrade improvement gravel and the subbase layer are typically placed together effectively increasing the thickness of the sub-base layer.

Two flexible pavement designs are proposed for this parking lot, one for light traffic and one for heavier traffic areas depending on the final road configuration. The assumed loading for heavy truck traffic is 25 truck loadings per day. If it is anticipated that traffic will exceed these levels, the design section provided below should be reviewed.

TABLE 3: FLEXIBLE PAVEMENT DESIGN

Lift	Light	Moderate
Asphalt Concrete (ACP)	75 mm	100 mm
25 mm Crushed Base Gravel	150 mm	150 mm
Granular Sub-Base (minimum)	300 mm	350 mm

A geotextile separation barrier should be placed over the prepared subgrade prior to placement of any gravel. If a suitable coarse gravel cannot be found, substitution of crushed gravel material may be necessary and has worked very well based on past experiences. If crush gravel is used for granular sub-base, the sub-base layer thickness may be reduced by 25 percent. In many instances it is most economical to use 20 or 25 mm crush gravel. Du to the very soft subgrade conditions at this site, additional gravel may be required in the pavement structure. Once the site is prepared, the site conditions should be reviewed by a qualified geotechnical engineer in order to ensure the pavement recommendations are adequate.

The thickness of subbase given above is considered to be the minimum requirement assuming no subgrade improvement is required. If it is proposed to reduce the ACP layer for the heavy section as cost savings it is suggested to increase the subbase thickness, because the cost of a future overlay would be significantly less than repairing a subgrade problem. The pavement could be thickened in the future when the "serviceability performance" warrants an overlay. It is recommended to use pavement materials conforming to the following specifications:

TABLE 4: ASPHALT CONCRETE

Parameter	Heavy
Stability (kN minimum)	5.4
Flow (mm)	2 - 4
Air Voids (percent)	3 - 5
VMA (minimum percent)	14.5
Asphalt Cement (penetration grade)	150-200 (A)

The performance of the proposed pavement design sections will be, in part, dependent on achieving an adequate level of compaction in subgrade and pavement materials. The recommended levels of compaction for the granular materials in the pavement section should be a minimum of 98 percent of SPMDD. The asphalt concrete should be compacted to a minimum of 97 percent of Marshall density based on a 50 blow laboratory Marshall test. Aggregate materials for base and subbase gravel should be composed of sound, hard, durable particles free from organics and other foreign material. It is recommended to use aggregates conforming to the following Alberta Transportation (AT) specifications.

TABLE 5: RECOMMENDED AGGREGATE SPECIFICATIONS

Material	AT Specifications
Asphalt Gravel	Designation 1, Class 16
Crushed Base Gravel	Designation 2, Class 20 or 25
Subbase Gravel	Designation 2, Class 40

Based on availability of local materials at the time of tendering or construction, alternate materials could be considered upon review by the geotechnical engineer.

5.7 EXCAVATIONS

All excavation work must comply with the requirements of the Alberta Occupational Health and Safety Act, OHS Regulation and OHS Code. The OHS Code contains the technical requirements that support the Act and Regulation.

Specifically with reference to Section 422 the OHS Code, the soils on this site would be classified as "soft, sandy or loose". From Section 451 of the OHS Code, the soils must be cut at an angle of not less than 45 degrees measured from the vertical or 1V:1H, extending from toe to crest.

Alternatively, near vertical trenched excavations may be constructed in conjunction with a movable shield.

Stockpiles of materials and excavated soil should be kept back from the crest by a distance equal to at least the depth of excavation. Similarly, wheel loads should be kept back at least 1 m from the crest.

5.8 CONCRETE

Water soluble sulphate concentrations on two test samples from the site indicated a negligible potential for chemical attack of subsurface concrete (SO4 concentrations less than 0.10 percent). General Use Hydraulic (Type GU) cement may be used for all concrete in contact with soil at the site.

All concrete exposed to a freezing environment either during or after construction should be air entrained. Concrete should be placed in accordance with CSA Standard CAN3-A23.1-M04. All concrete exposed to a freezing environment either during or after construction should be air entrained.

5.9 INSPECTION

It is recommended that on-site inspection and testing be performed to verify that actual site conditions are consistent with assumed conditions which meet or exceed design criteria. All bearing surfaces should be reviewed by a qualified geotechnical engineer in order to ensure adequate bearing conditions are present prior to footing placement. Based on the Alberta Building Code, adequate levels of inspection include: testing of engineered fill and review of all completed bearing surfaces for footings.

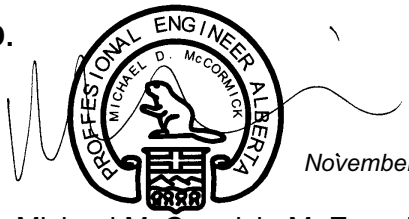
6.0 LIMITATIONS AND CLOSURE

This report has been prepared for the exclusive use of **1285827 Alberta Ltd.**. 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. PARKLAND GEO-ENVIRONMENTAL LTD., and The ParklandGEO Consulting Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. No other warranty, expressed or implied, is made. The General Terms and Conditions of this report are attached and should be considered part of this report.

We trust that this report meets with your current requirements. If there are any questions, please contact the undersigned at 780 / 416 - 1755.

Respectfully Submitted,

PARKLAND GEO-ENVIRONMENTAL LTD.
APEGGA Permit to Practice No. P - 8867



November 2, 2011

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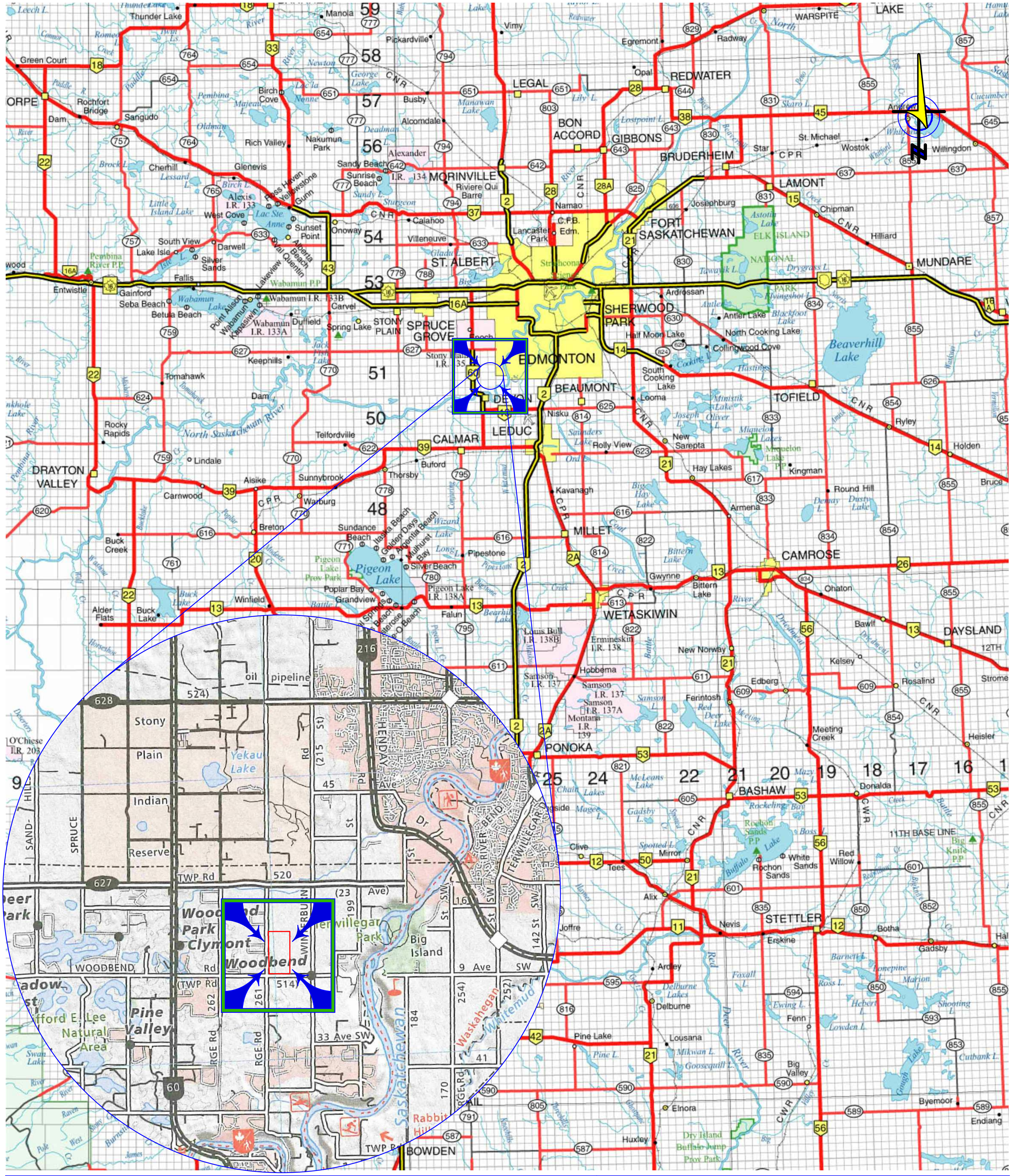
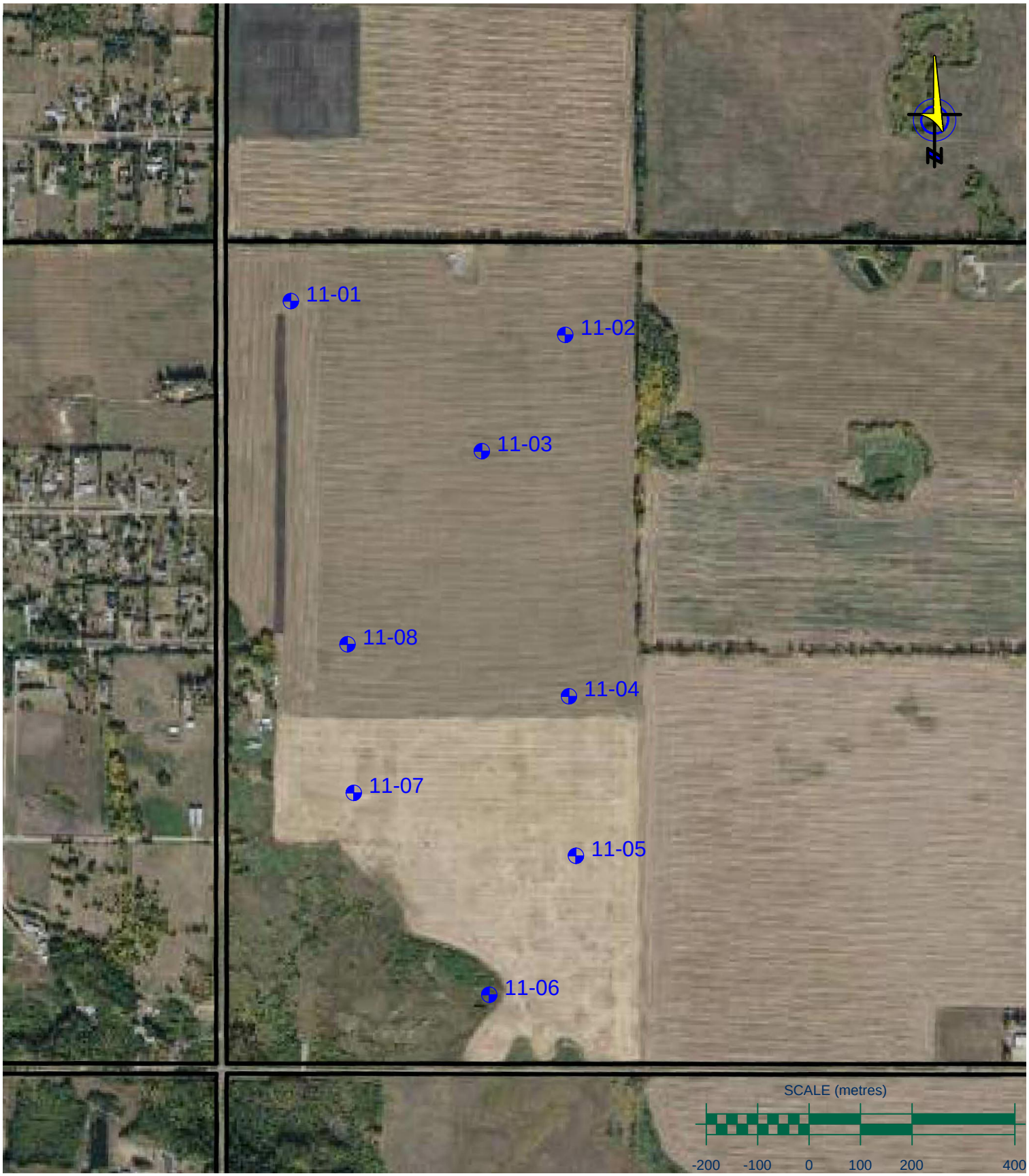
FIGURES



	CLIENT:	AREA PLAN
ParklandGEO	FOCUS CORPORATION	WOODLANDS SUBDIVISION W1/2 25-51-26 W4M, PARKLAND COUNTY, AB

DRAWN:	CHK'D.:	REV #:	DATE:
DGY	MMc	0	OCTOBER, 2011

SCALE:	JOB NO.	DRAWING NO.
NTS	ED1285	FIGURE 1



Note: borehole locations are approximate

ParklandGEO	CLIENT: FOCUS CORPORATION	SITE PLAN WOODLANDS SUBDIVISION W1/2 25-51-26 W4M, PARKLAND COUNTY, AB

DRAWN:	CHK'D.:	REV #:	DATE:
DGY	MMc	0	OCTOBER, 2011

SCALE:	JOB NO.	DRAWING NO.
1:10,000	ED1285	FIGURE 2

Photograph 1: Viewing southwest of borehole 11-03.

Photograph 2: Directly north of borehole 11-03, the derrick and supporting equipment on the north edge of the property.

Photograph 3: Viewing the buildings on site, northwest of borehole 11-07.

Photograph 4: Viewing the west side of the property in the uncleared, wet area of the southwest from borehole 11-06.

APPENDIX A

BOREHOLE LOGS
EXPLANATION SHEETS
LABORATORY RESULTS
WATER WELL RECORDS
YIELD ANALYSIS RESULTS

BOREHOLE NO.: 11-01

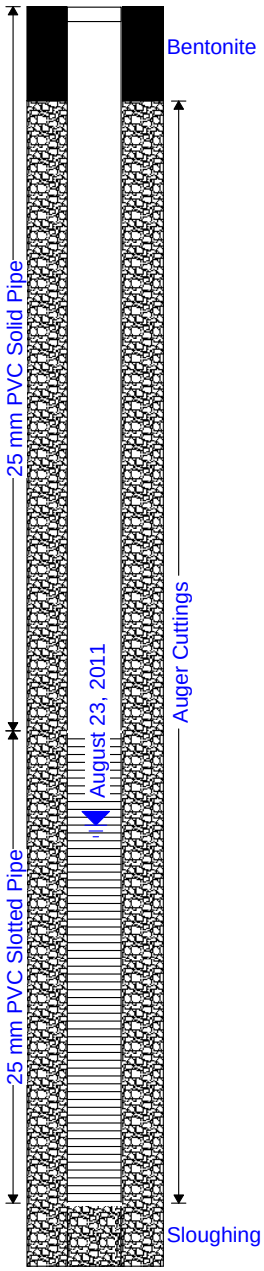
CLIENT: Focus Corporation

SITE: W1/2-25-51-26-W4M

PROJECT NO.: ED1285

BH LOCATION: North half, northwest corner

Depth (m)	Description	Elev.	Sample No.	Type	SPT (N)	Atterberg Limits Moisture Content (%) (Wp |-----x-----| Wl) 25 50 75	Comments
0	GROUND SURFACE	0.00					
	Topsoil Trace rootlets, organic, black	-0.40					
1	***Clay*** Some silt, firm, medium plastic, massive, occasional rust staining, dry to damp, dark brown					24 28	BH 11-01-A @ 0.9 m PP = 86.4 kPa
	- Very firm at 0.6 m						
		-1.90	1D1		8		Atterburg Limit @ 1.5 m W_L = 47.6 % W_P = 15.7% P_I = 31.9 %
2	***Silt and Clay*** Some silt soft to firm, medium plastic, occasional rust staining, damp, brown/grey					28	
3	- Moist at 3.0 m					31	Grain Size Analysis @ 3.0 m Clay = 16.2 % Silt = 73.0 % Sand = 10.8 % Gravel = 0.0 %
	- Soft, moist to wet at 3.2 m		1D2		4		
4						38	
			1D3		2		
5	- Very soft, mostly grey at 4.8 m					40	
6						39	
			1D4		0		
	- No rust at 6.6 m						
7						41	
			1D5		1		
		-8.00				37	
8	END OF BOREHOLE						



LOGGED BY: MK

CONTRACTOR: Beck Drilling and Environmental Services Ltd.

RIG/METHOD: Truck-Mount Rig

DATE: August 17, 2011

GROUND ELEVATION:

NORTHING: 5924466

EASTING: 0319838

BOREHOLE NO.: 11-02

CLIENT: Focus Corporation
SITE: W1/2-25-51-26-W4M
BH LOCATION: North half, northeast

PROJECT NO.: ED1285

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elev.
0		GROUND SURFACE	0.00
		Topsoil Organic, black	
		Silt and Clay Trace sand, stiff, medium plastic, occasional rust staining, dry, light brown with grey	
		- Some sand (in thin layers) at 1.4 m	
8		END OF BOREHOLE	-8.00

SAMPLE

Sample No.	Type	SPT (N)
2D1		14
2D2		8
2D3		7
2D4		1
2D5		0

Atterberg Limits Moisture Content (%)

(Wp |-----x-----| Wl)

25 50 75

25
21
30
33
38
40
39
38
39

Comments

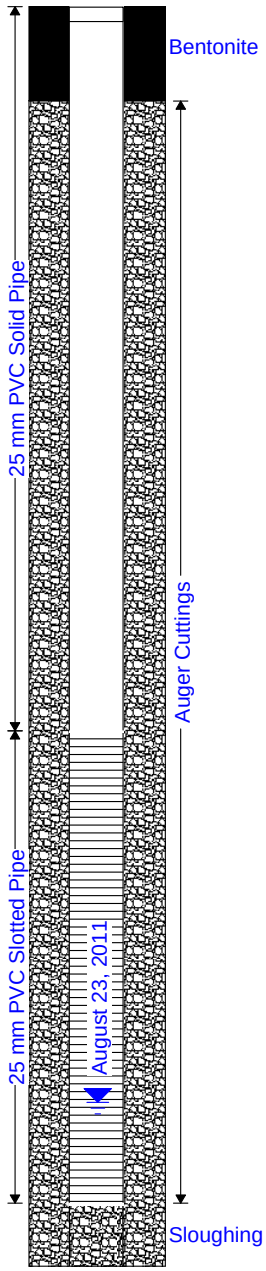
BH 11-02-A
@ 0.9 m
PP = 139.2 kPa

Sulphate Analysis
@ 1.5 m
0.0076%

Grain Size Analysis @ 1.5 m
Clay = 58.6 %
Silt = 40.1 %
Sand = 1.3 %
Gravel = 0.0 %

Atterburg Limit @ 4.5 m
W_L = 37.3 %
W_P = 18.6 %
P_I = 18.8 %

Well Completion Details



LOGGED BY: MK
CONTRACTOR: Beck Drilling and Environmental Services Ltd.
RIG/METHOD: Truck-Mount Rig
DATE: August 17, 2011

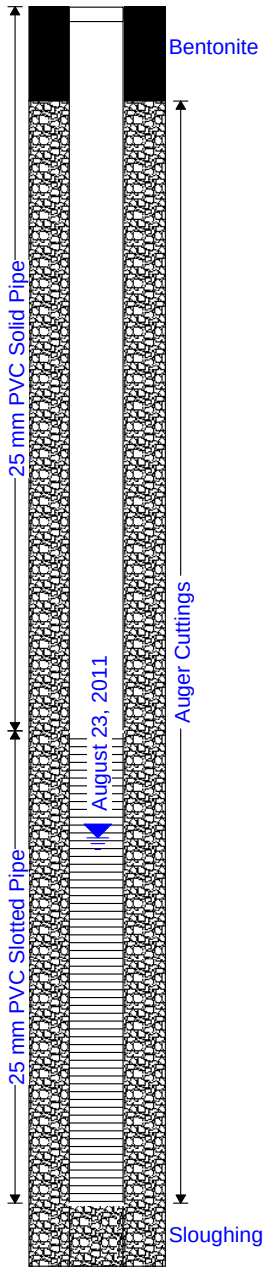
GROUND ELEVATION:
NORTHING: 5924400
EASTING: 0320371

BOREHOLE NO.: 11-03

CLIENT: Focus Corporation
SITE: W1/2-25-51-26-W4M
BH LOCATION: North half, north-centre

PROJECT NO.: ED1285

Depth (m)	Description	Elev.	Sample No.	Type	SPT (N)	Atterberg Limits Moisture Content (%) (Wp |-----x-----| Wl) 25 50 75	Comments
0	GROUND SURFACE	0.00					
	Topsoil Organic, dry, dark brown	-0.20					
1	***Clay Till*** Silty, occasional sand, stiff, medium plastic, occasional rust staining, moist to wet, light brown with grey					28 27	BH 11-03-A @ 0.9 m PP = 67.2 kPa
			3U1				
2	- Occasional gravel at 2.0 m		3D1		11	27	Atterburg Limit @ 1.5 m W_L = 53.6 % W_P = 22.8 % P_I = 30.8 %
3		-3.20				33	
			3D2		3		Density @ 1.5 m Wet = 1.4 kg/m³ Dry = 1.08 kg/m³
4	***Silt and Clay*** Trace sand, low to medium plastic, soft to very soft, occasional rust staining, moist, medium brown					34	
	- Moist to damp, soft, dark grey at 4.1 m						
	- Moist to wet at 4.5 m		3D3		0		Grain Size Analysis @ 4.5 m Clay = 19.0 % Silt = 77.0 % Sand = 4.0 % Gravel = 0.0 %
5	- Wet at 5.0 m					37	
6			3D4		0	37	
7	- Very soft at 6.9 m					34	
			3D5		0		
8		-8.00				39	
	END OF BOREHOLE						



LOGGED BY: MK
CONTRACTOR: Beck Drilling and Environmental Services Ltd.
RIG/METHOD: Truck-Mount Rig
DATE: August 17, 2011

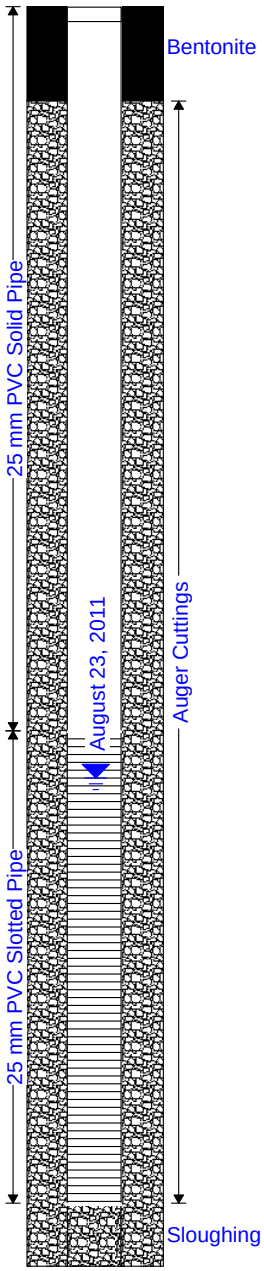
GROUND ELEVATION:
NORTHING: 5924174
EASTING: 0320209

BOREHOLE NO.: 11-04

CLIENT: Focus Corporation
SITE: W1/2-25-51-26-W4M
BH LOCATION: Center, west side

PROJECT NO.: ED1285

Depth (m)	Description	Elev.	Sample No.	Type	SPT (N)	Atterberg Limits Moisture Content (%) (Wp |-----x-----| Wl) 25 50 75	Comments	Well Completion Details
0	GROUND SURFACE	0.00						
	Topsoil Organic, dry, black							
	Clay and Silt Some sand, trace gravel, stiff, medium to high plastic, dry, medium brown					14 16	Grain Size Analysis @ 1.0 m Clay = 50.9 % Silt = 42.0 % Sand = 7.1 % Gravel = 0.0 %	
1			4D1		10	16		
2	- Trace sand at 2.4 m							
	- Occasional rust staining and coal inclusions at 2.5 m					25	Sulphate Analysis @ 1.5 m 0.0052%	
3			4D2		10		@ 3.0 m PP = 108 kPa	
	- Very stiff at 4.0 m					29	Atterburg Limit @ 3.0 m W_L = 45.5 % W_P = 19.2 % P_I = 26.3 %	
4	- Trace gravel at 4.1 m							
			4D3		8	33		
5	- Firm to stiff, moist at 4.9 m							
	- Soft to firm, wet at 5.2 m						@ 4.0 m PP = 132 kPa	
						35	Atterburg Limit @ 4.5 m W_L = 62.9 % W_P = 23.7 % P_I = 39.2 %	
6	- Wet to free water at 6.0 m, very soft to bottom		4D4		0			
7						15		
			4D5		0			
8		-8.00				22		
	END OF BOREHOLE							



LOGGED BY: MK
CONTRACTOR: Beck Drilling and Environmental Services Ltd.
RIG/METHOD: Truck-Mount Rig
DATE: August 17, 2011

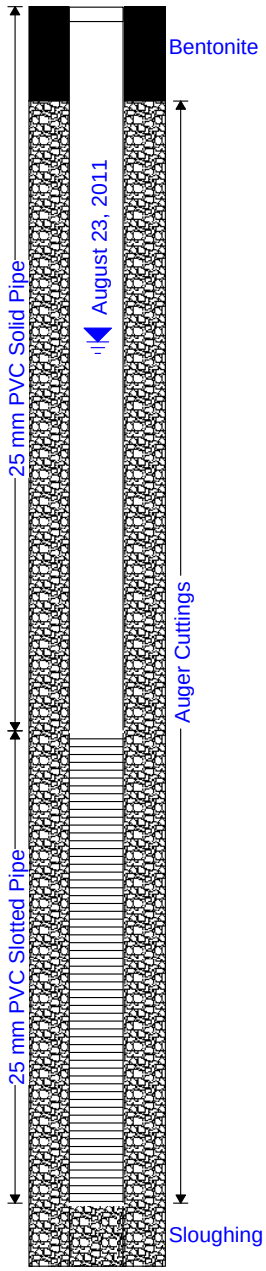
GROUND ELEVATION:
NORTHING: 5924046
EASTING: 0320191

BOREHOLE NO.: 11-05

CLIENT: Focus Corporation
SITE: W1/2-25-51-26-W4M
BH LOCATION: South half, east side

PROJECT NO.: ED1285

Depth (m)	Symbol	Description	Elev.	Sample No.	Type	SPT (N)	Atterberg Limits Moisture Content (%) (Wp |-----x-----| Wl) 25 50 75	Comments	Well Completion Details
0		GROUND SURFACE	0.00						
0		***Topsoil*** Organic, damp, black							
0		***Clay and Silt*** Trace sand, firm, medium plastic, occasional ruststaining and coal inclusions, damp, medium brown with grey					18 26	BH 11-05-A @ 0.9 m PP = 124.8 kPa	
1				5D1		6			
2							27	Sulphate Analysis @ 1.5 m 0.0065%	
3		- Firm to stiff, damp to moist at 2.8 m					32	Density @ 3.0 m Wet = 1.92 kg/m^3 Dry = 1.48 kg/m^3	
3				5U1					
3				5D2		9			
4		- Stiff at 3.8 m					27	Atterburg Limit @ 4.5 m W_L = 46.1 % W_P = 15.7 % P_I = 30.3 %	
5				5D3		5	29	Grain Size Analysis @ 4.5 m Clay = 51.0 % Silt = 47.1 % Sand = 1.9 % Gravel = 0.0 %	
6							39		
6				5D4		4			
6		- Firm, dark grey, no rust staining or coal inclusions at 6.7 m							
7		- Soft at 6.9 m					35		
8				5D5		0	35		
8		END OF BOREHOLE	-8.00						



LOGGED BY: MK
CONTRACTOR: Beck Drilling and Environmental Services Ltd.
RIG/METHOD: Truck-Mount Rig
DATE: August 17, 2011

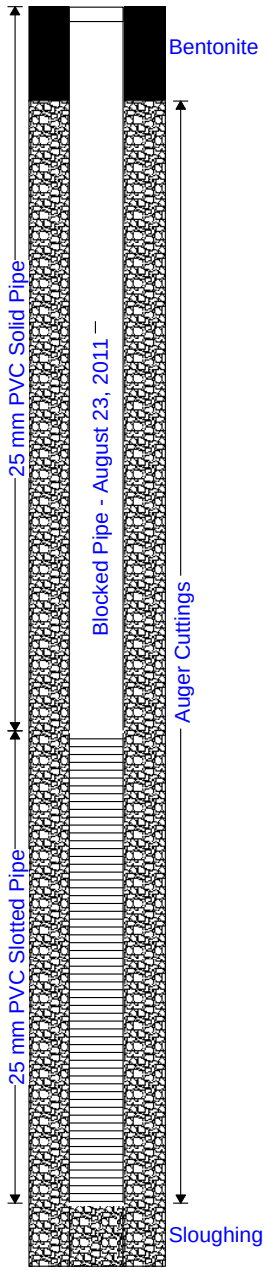
GROUND ELEVATION:
NORTHING: 5923316
EASTING: 0320434

BOREHOLE NO.: 11-06

CLIENT: Focus Corporation
SITE: W1/2-25-51-26-W4M
BH LOCATION: South half, south center

PROJECT NO.: ED1285

Depth (m)	Symbol	Description	Elev.	Sample No.	Type	SPT (N)	Atterberg Limits Moisture Content (%) (Wp |-----x-----| Wl) 25 50 75	Comments	Well Completion Details
0		GROUND SURFACE	0.00						
		Topsoil Organic, damp, black	-0.40						
1		***Clay and Silt*** Some sand, firm, occasional rust staining, damp to moist, light grey and brown					20 26	BH 11-06-A @ 0.9 m PP = 48 kPa	
		- Soft, moist at 1.1 m							
		- Firm at 1.5 m							
		- Soft, moist to wet at 1.7 m		6D1		7			
2		- Firm, moist at 1.75 m					29	Sulphate Analysis @ 1.5 m 0.0034%	
3				6D2		13	28	Atterburg Limit @ 3.0 m W_L = 49.0 % W_P = 17.3 % P_I = 31.7 %	
4		- Soft at 4.2 m					27		
		- Stiff at 4.5 m		6D3		11		Grain Size Analysis @ 3.0 m Clay = 63.0 % Silt = 36.2 % Sand = 0.8 % Gravel = 0.0 %	
5							28		
6		- Firm at 6.0 m		6D4		6	36		
7		- Moist to wet at 7.0 m					36		
		- Soft, wet to free water at 7.3 m		6D5		7			
8		END OF BOREHOLE	-8.00				41		



LOGGED BY: MK
CONTRACTOR: Beck Drilling and Environmental Services Ltd.
RIG/METHOD: Truck-Mount Rig
DATE: August 17, 2011

GROUND ELEVATION:
NORTHING: 5923100
EASTING: 0320256

BOREHOLE NO.: 11-07

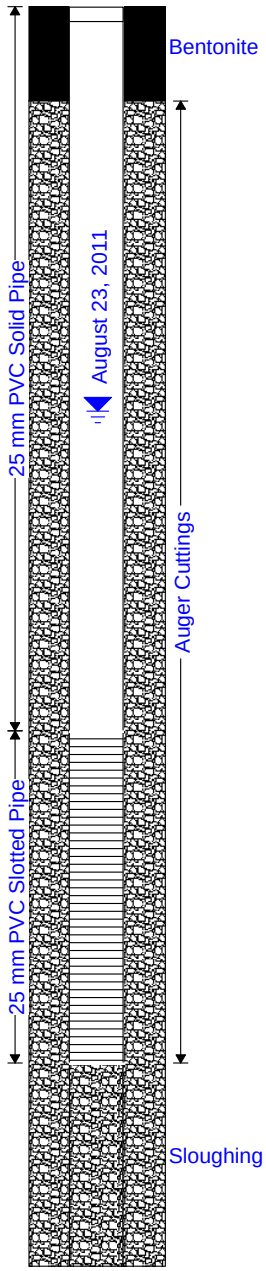
CLIENT: Focus Corporation
SITE: W1/2-25-51-26-W4M
BH LOCATION: South half, northwest

PROJECT NO.: ED1285

SUBSURFACE PROFILE / SAMPLE

Depth (m)	Description	Elev.	Sample No.	Type	SPT (N)	Atterberg Limits Moisture Content (%) (Wp |-----x-----| Wl) 25 50 75	Comments
0	GROUND SURFACE	0.00					
	Topsoil Organic, dry to damp, black						
	Silt and Clay Some sand, firm, occasional rust and coal inclusions, dry to damp, grey and medium brown					22 23	BH 11-07-A @ 0.9 m PP = 12 kPa
1			7D1		7		
2						29	Grain Size Analysis @ 1.5 m Clay = 35.2 % Silt = 54.8 % Sand = 10.0 % Gravel = 0.0 %
3			7D2		7	27	
4						28	@ 4.0 m PP = 36 kPa
			7D3		8		
5	- Soft, moist at 5.5 m					41	
6	- Wet at 6.0 m		7D4		3	36	Atterburg Limit @ 6.0 m NON-PLASTIC
7						35	
			7D5		3		
8		-8.00				34	
	END OF BOREHOLE						

Well Completion Details



LOGGED BY: MK
CONTRACTOR: Beck Drilling and Environmental Services Ltd.
RIG/METHOD: Truck-Mount Rig
DATE: August 17, 2011

GROUND ELEVATION:
NORTHING: 5923510
EASTING: 0319960

BOREHOLE NO.: 11-08

CLIENT: Focus Corporation
SITE: W1/2-25-51-26-W4M
BH LOCATION: North half, southwest

PROJECT NO.: ED1285

SUBSURFACE PROFILE

Depth (m)	Symbol	Description	Elev.
0		GROUND SURFACE	0.00
		Topsoil Organic, dry to damp, black	-0.15
		Clay and Silt Some sand, firm to stiff, low to medium plastic, occasional rust staining and coal inclusions, dry to damp, light grey and medium brown	
1		- Little sand/silt, stiff, dark grey at 1.5 m	
2			
3		- Medium brown, firm at 3.5 m - Very soft to soft at 3.7 m	
4		- Moist to wet at 4.2 m	
5			
6			
7			
8		END OF BOREHOLE	-8.00

SAMPLE

Sample No.	Type	SPT (N)
8D1		11
8D2		6
8D3		3
8D4		0
8D5		0

Atterberg Limits Moisture Content (%)

(Wp |-----x-----| Wl)

25 50 75

18 37 26 39 35 36 32 37

Comments

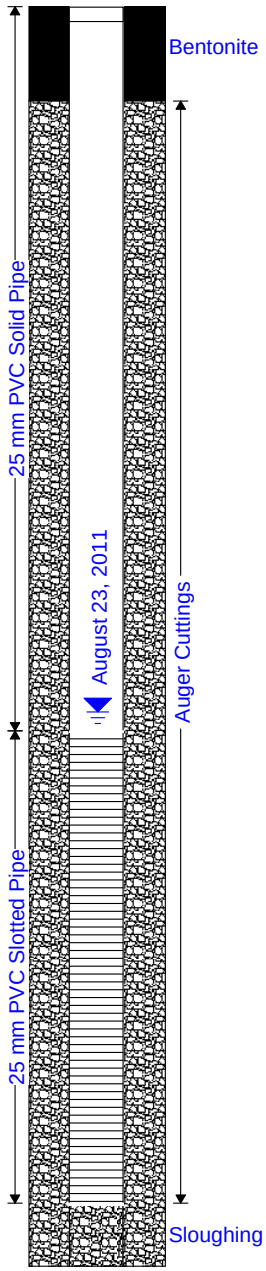
BH 11-08-A
@ 0.9 m
PP = 91.2 kPa

Sulphate Analysis
@ 1.5 m
0.0034%

Grain Size
Analysis @ 3.0 m
Clay = 69.1%
Silt = 17.9 %
Sand = 12.8 %
Gravel = 0.2 %

Atterburg Limit @
4.5 m
NON-PLASTIC

Well Completion Details

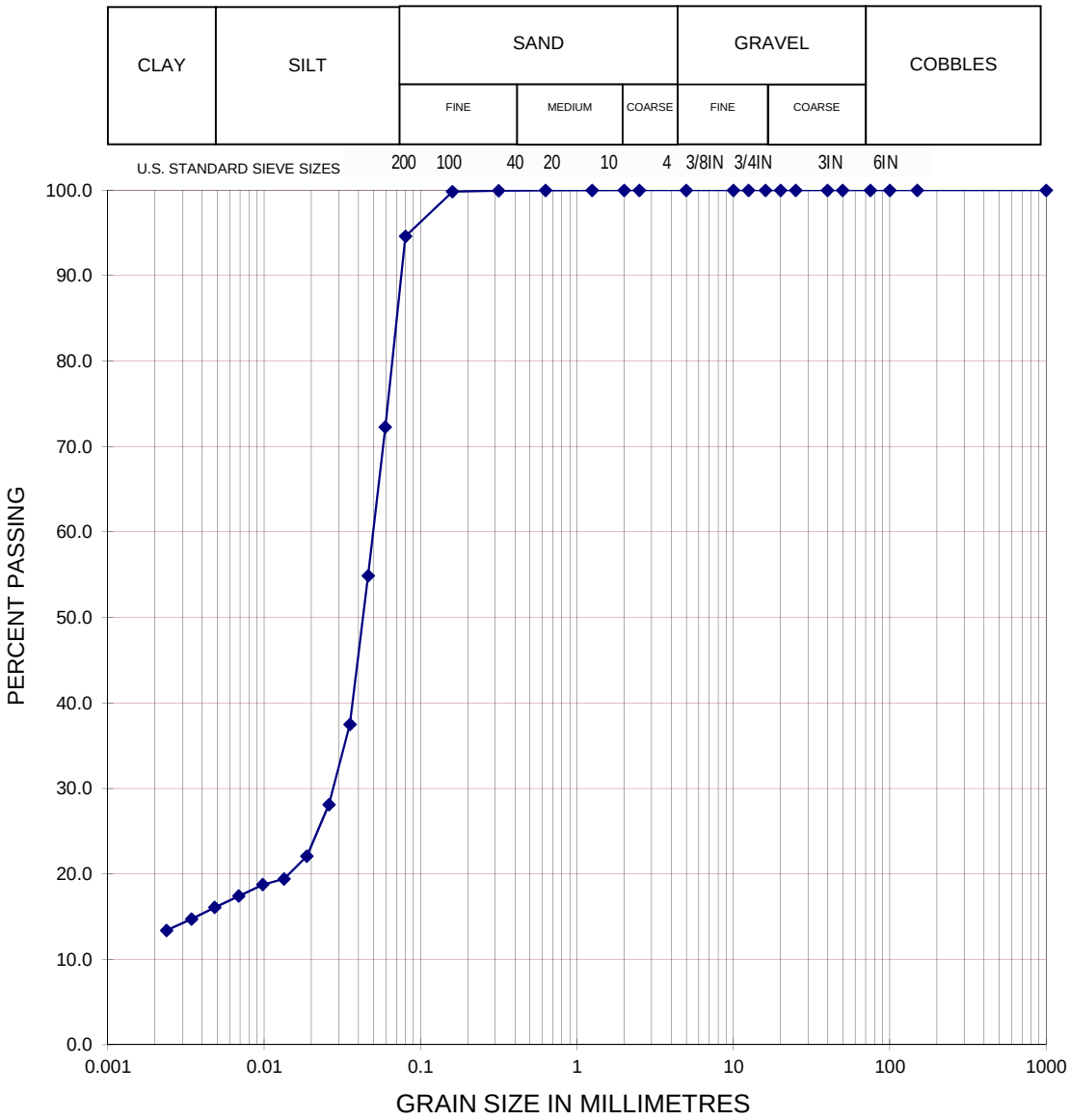


LOGGED BY: MK
CONTRACTOR: Beck Drilling and Environmental Services Ltd.
RIG/METHOD: Truck-Mount Rig
DATE: August 17, 2011

GROUND ELEVATION:
NORTHING: 5923915
EASTING: 0319948

PROJECT	Focus ASP		
PROJECT #	ED1285		
BOREHOLE #	11-01	**DATE**	26-Aug-11
DEPTH	3	**TECH**	MK
SAMPLE #	1D2		
LOCATION			

GRAIN SIZE DISTRIBUTION



COMMENTS:

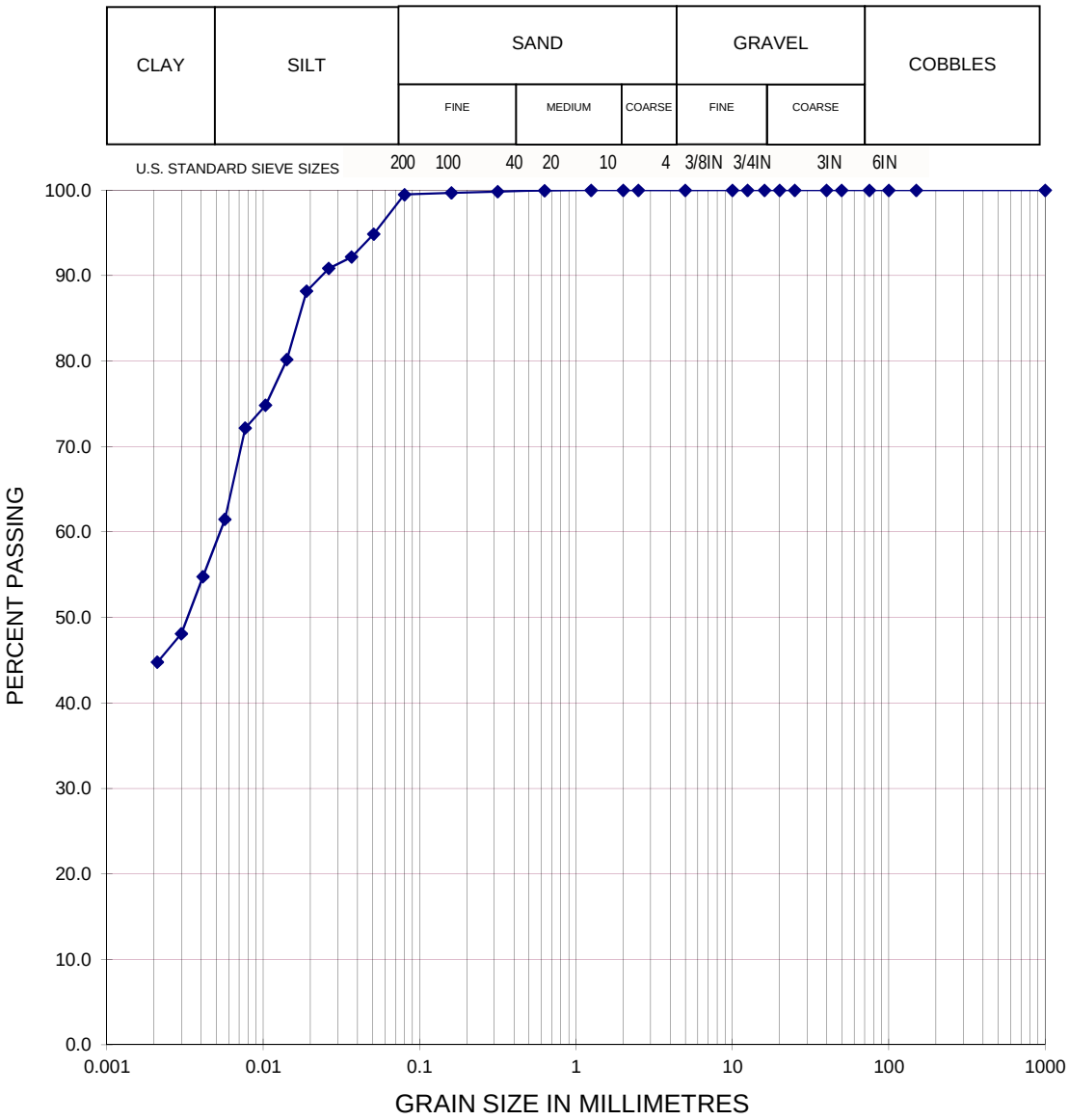
% Retained on 2 mm seive	0.00%
Soil Type	

SUMMARY

D10	=	GRAVEL	0.00%
D30	=	SAND	10.82%
D60	=	SILT	73.00%
CU	=	CLAY	16.17%
CC	=		

PROJECT	Focus ASP		
PROJECT #	ED1285		
BOREHOLE #	11-02	**DATE**	25-Aug-11
DEPTH	1.5	**TECH**	MK
SAMPLE #	2D1		
LOCATION			

GRAIN SIZE DISTRIBUTION



COMMENTS:

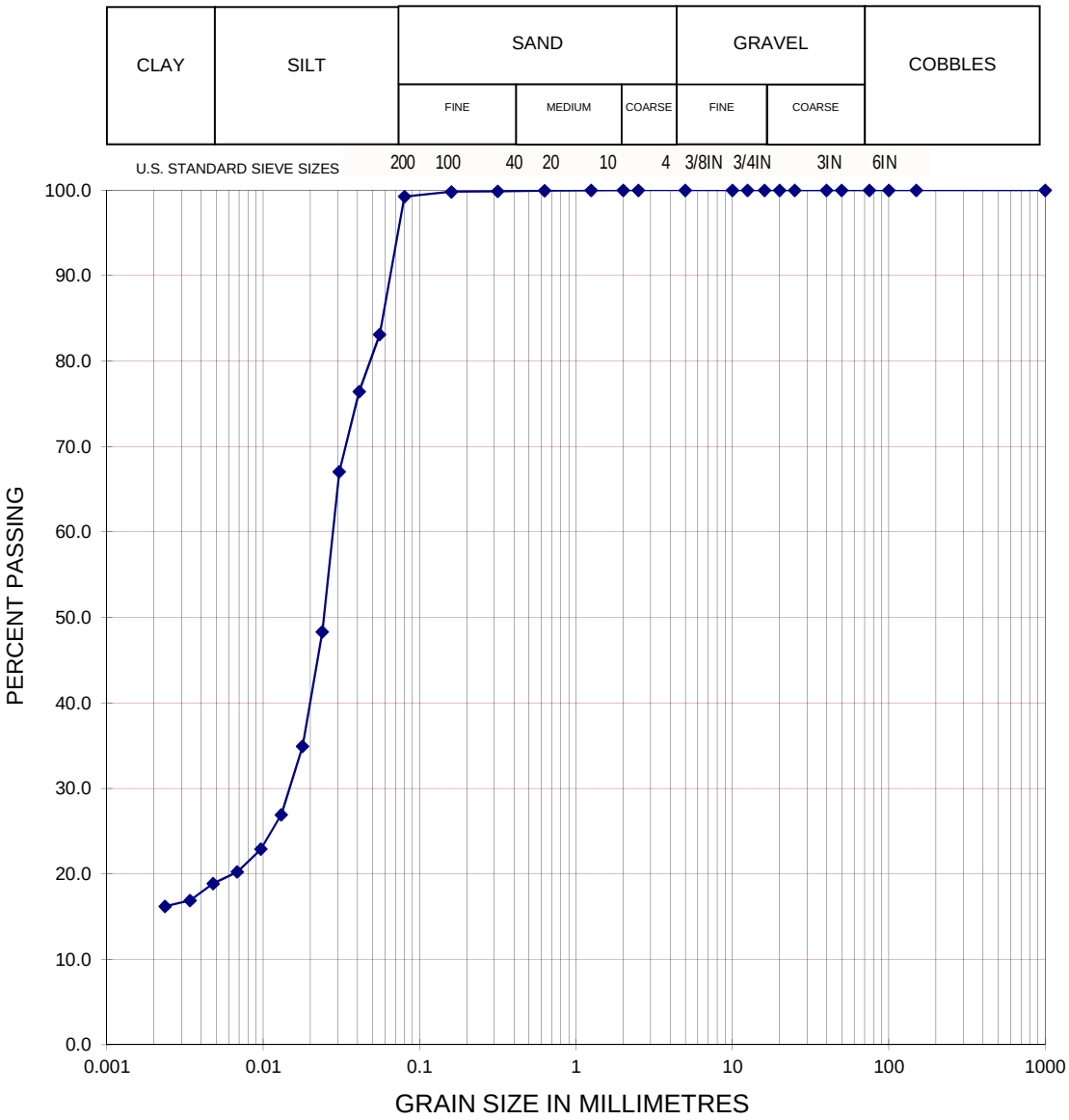
% Retained on 2 mm seive	0.00%
Soil Type	

SUMMARY

D10	=	GRAVEL	0.00%
D30	=	SAND	1.30%
D60	=	SILT	40.14%
CU	=	CLAY	58.56%
CC	=		

PROJECT	Focus ASP		
PROJECT #	ED1285		
BOREHOLE #	11-03	**DATE**	26-Aug-11
DEPTH	4.5	**TECH**	MK
SAMPLE #	3D3		
LOCATION			

GRAIN SIZE DISTRIBUTION



COMMENTS:

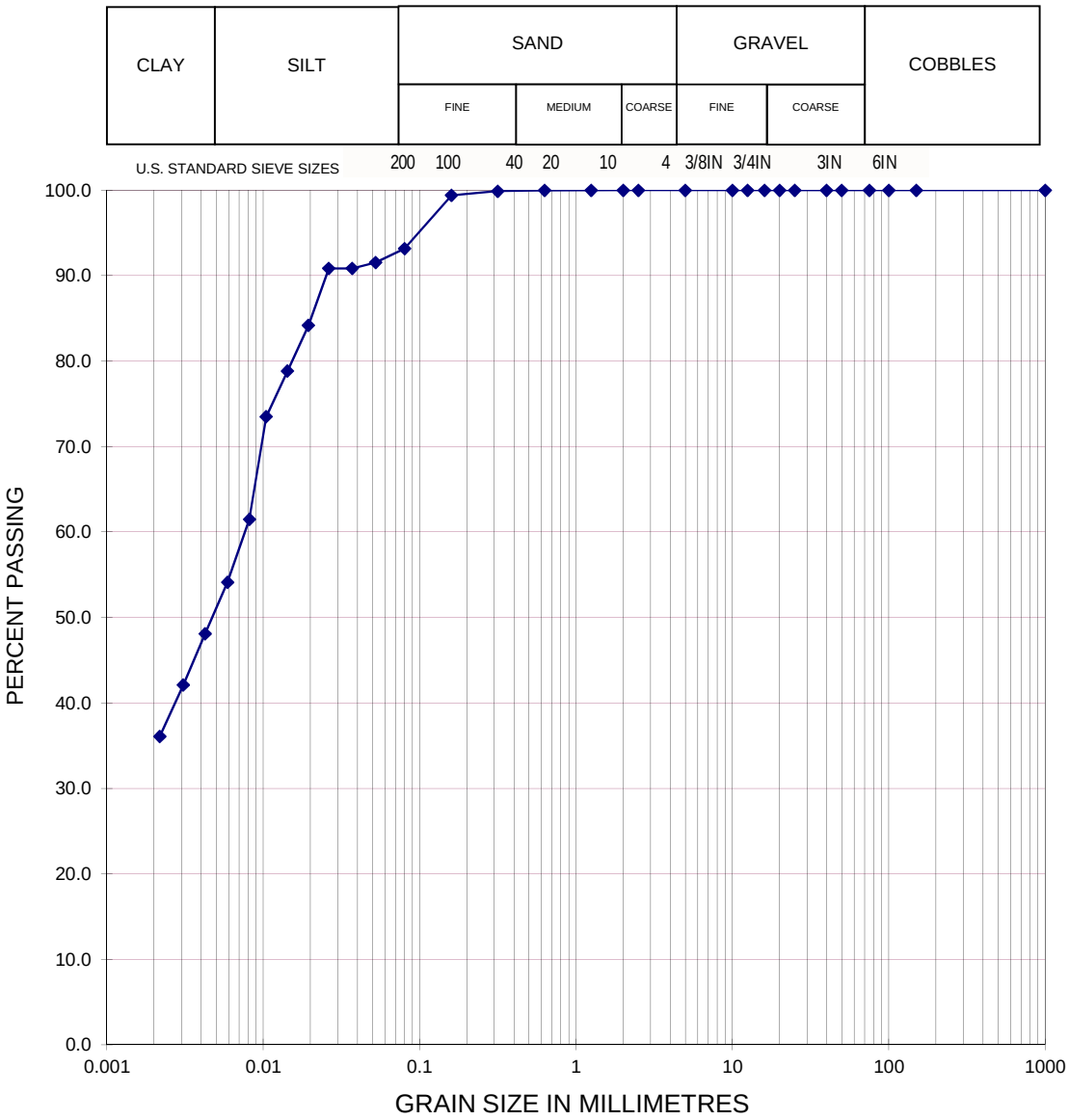
% Retained on 2 mm seive	0.00%
Soil Type	

SUMMARY

D10	=	GRAVEL	0.00%
D30	=	SAND	4.04%
D60	=	SILT	76.94%
CU	=	CLAY	19.02%
CC	=		

PROJECT	Focus ASP		
PROJECT #	ED1285		
BOREHOLE #	11-04	**DATE**	26-Aug-11
DEPTH	1	**TECH**	MK
SAMPLE #	4 MC-1		
LOCATION			

GRAIN SIZE DISTRIBUTION



COMMENTS:

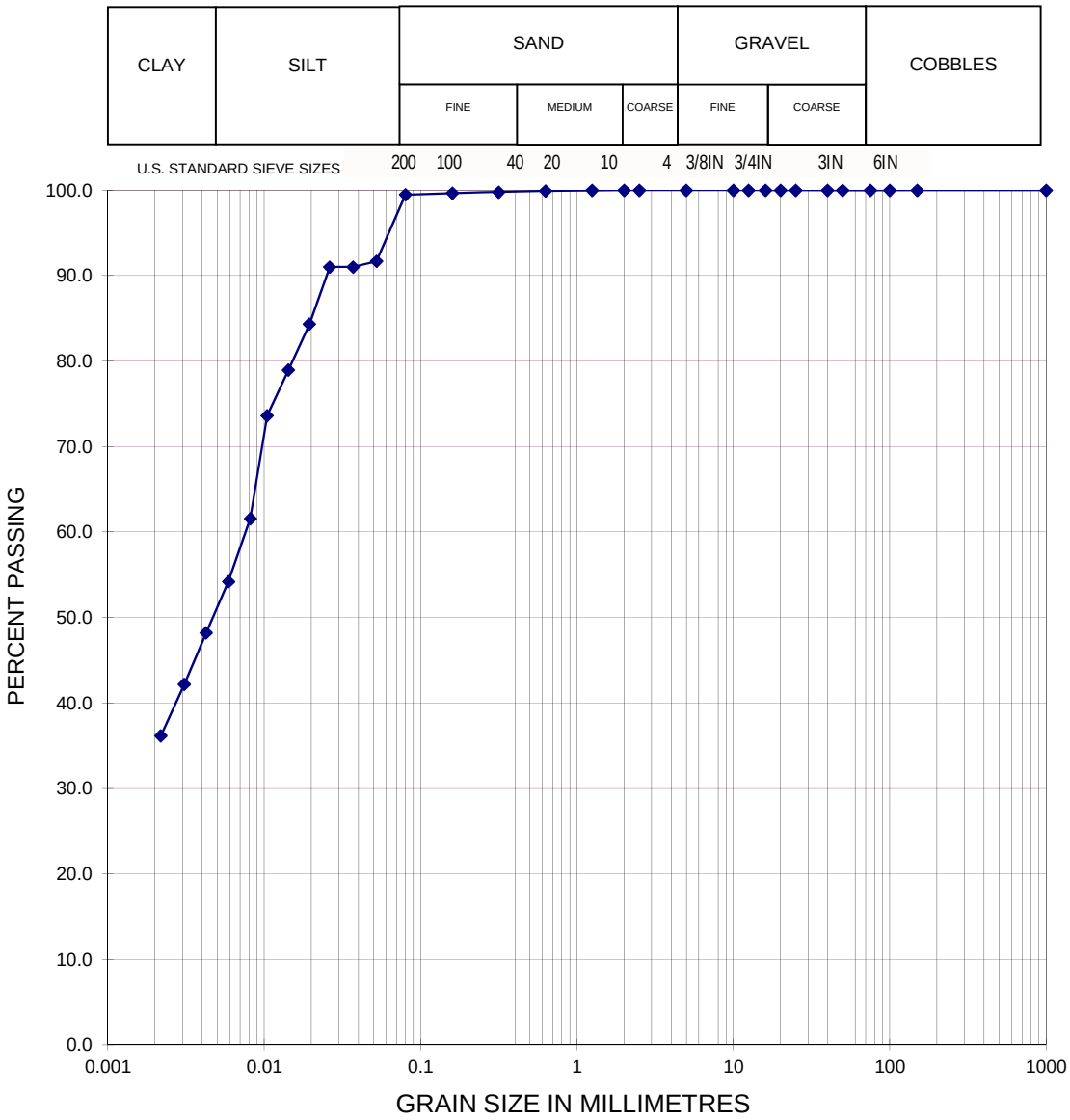
% Retained on 2 mm seive	0.00%
Soil Type	

SUMMARY

D10	=	GRAVEL	0.00%
D30	=	SAND	7.14%
D60	=	SILT	42.01%
CU	=	CLAY	50.85%
CC	=		

PROJECT	Focus ASP		
PROJECT #	ED1285		
BOREHOLE #	11-05	**DATE**	25-Aug-11
DEPTH	4.5	**TECH**	MK
SAMPLE #	5D3		
LOCATION			

GRAIN SIZE DISTRIBUTION



COMMENTS:

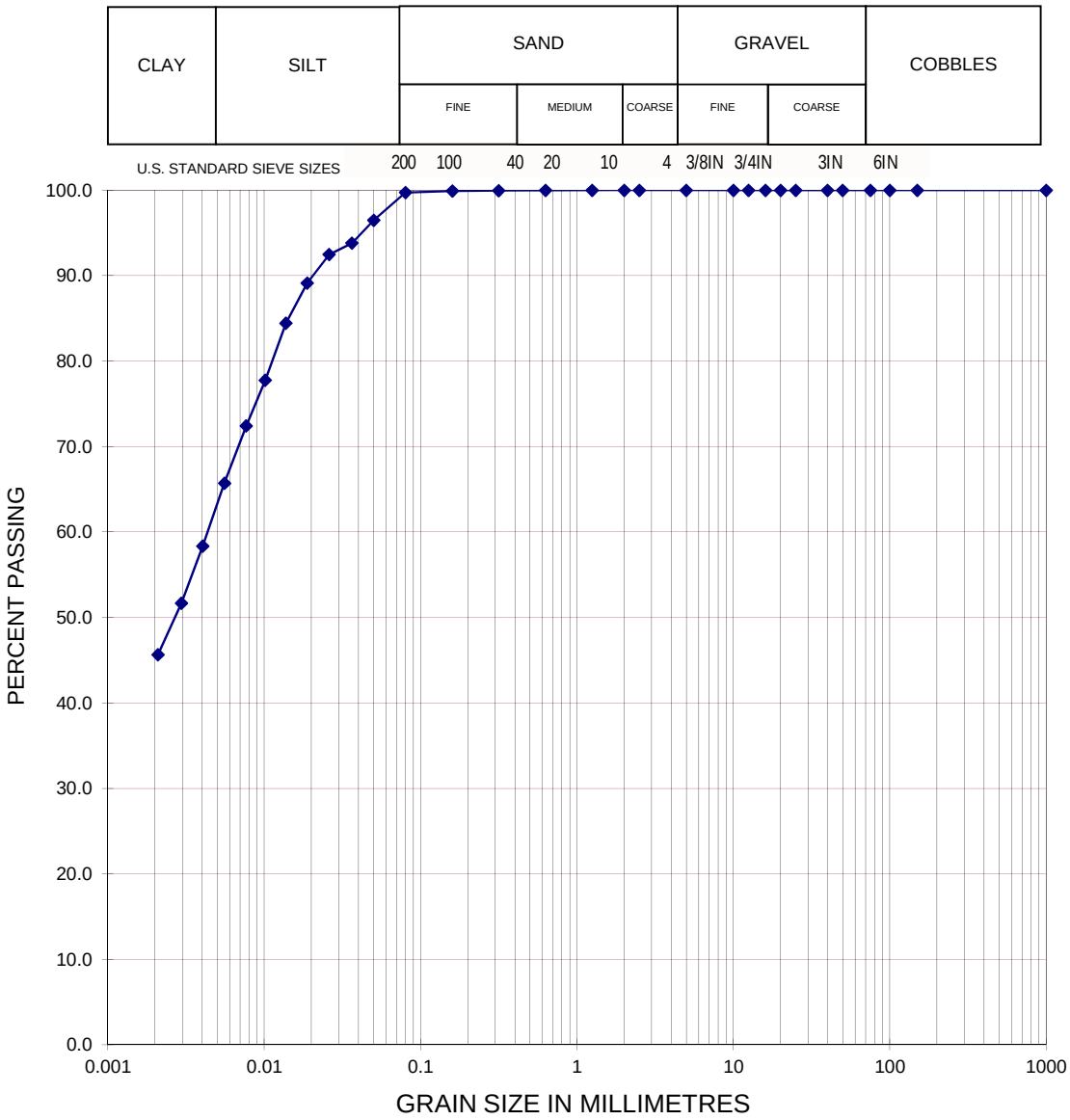
% Retained on 2 mm seive	0.00%
Soil Type	

SUMMARY

D10	=	GRAVEL	0.00%
D30	=	SAND	1.93%
D60	=	SILT	47.13%
CU	=	CLAY	50.94%
CC	=		

PROJECT	Focus ASP		
PROJECT #	ED1285		
BOREHOLE #	11-06	**DATE**	26-Aug-11
DEPTH	3	**TECH**	MK
SAMPLE #	6D2		
LOCATION			

GRAIN SIZE DISTRIBUTION



COMMENTS:

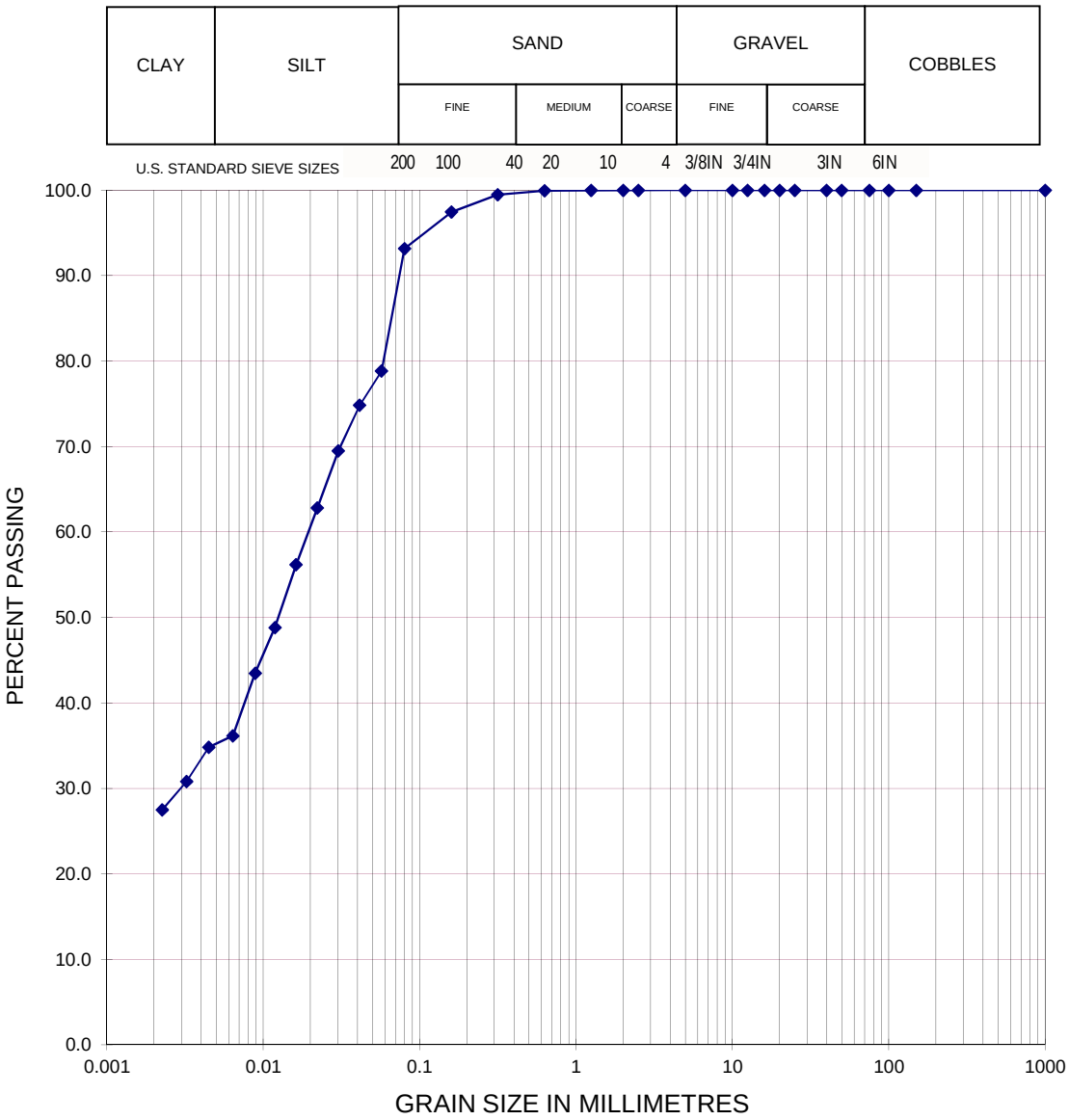
% Retained on 2 mm seive	0.00%
Soil Type	

SUMMARY

D10	=	GRAVEL	0.00%
D30	=	SAND	0.82%
D60	=	SILT	36.19%
CU	=	CLAY	62.99%
CC	=		

PROJECT	Focus ASP		
PROJECT #	ED1285		
BOREHOLE #	11-07	**DATE**	26-Aug-11
DEPTH	1.5	**TECH**	MK
SAMPLE #	7D1		
LOCATION			

GRAIN SIZE DISTRIBUTION



COMMENTS:

% Retained on 2 mm seive 0.00%
Soil Type

SUMMARY

D10	=	GRAVEL	0.00%
D30	=	SAND	9.96%
D60	=	SILT	54.87%
CU	=	CLAY	35.17%
CC	=		

GEOTECHNICAL INVESTIGATION

EXPLANATION OF TERMS AND SYMBOLS

The terms and symbols used on the borehole logs to summarize the results of field investigation and subsequent laboratory testing are described in these parts.

It should be noted that materials, boundaries and conditions have been established only at the borehole locations at the time of investigation and are not necessarily representative of subsurface conditions elsewhere across the site.

SOIL CLASSIFICATION AND DESCRIPTION

Soils are classified and described according to their engineering properties and behaviour.

The soil of each stratum is described using the United Soil Classification System[1] modified slightly so that an inorganic clay of "medium plasticity" is recognized.

The use of modifying adjectives may be employed to define the actual or estimated percentage range by weight of minor components. This is similar to a system developed by D.M. Burnmister.[2] The soil classification system is shown in greater detail on page 2.

Cohesionless Soils

Relative Density	SPT (N) Value
Very Loose	0 - 4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	>50

Cohesive Soils

Consistency	Unconfined Strength (kPa)
Very Soft	0 - 10
Soft	10 - 25
Firm	25 - 50
Stiff	50 - 100
Very Stiff	100 - 200
Hard	>200

Standard Penetration Resistance ("N" value)

The number of blows by a 63.6 kg hammer dropped 760 mm to drive a 50 mm diameter open sampler attached to "A" size drill rods for a distance of 300 mm.

TEST DATA

Data obtained during the field investigation and from laboratory testing are shown at the appropriate depth interval.

Abbreviations, graphic symbols, and relevant test method designations are as follows:

*C	Consolidation Test	*ST	Swelling Test
D_R	Relative Density	TV	Torvane Shear Strength
Fines	Percentage by weight smaller than #200 sieve	VS	Vane shear strength (undistured-remolded)
k	Hydraulic Conductivity	w	Natural moisture content (ASTM D 2216)
*MA	Mechanical grain size analysis & hydormeter test	w_L	Liquid limit (ASTM D 423)
N	Standard penetration test (CSA A119.1-60)	w_p	Plastic limit (ASTM D 424)
N_d	Dynamic cone penetration test	ε_f	Unit strain at failure
NP	Non Plastic soil	γ	Unit weight of soil or rock
pp	Pocket penetrometer strength	γ_d	Dry unit weight of soil or rock
*q	Triaxial compression test	ρ	Density of soil or rock
q_u	Unconfined compressive strength	ρ_d	Dry Density of soil or rock
*SB	Shearbox test	ρ_w	Wet Density of soil or rock
SO_4	Concentration of water-soluble sulphate	▼	Observed water level
C_u	Undrained shear strength	→	Seepage

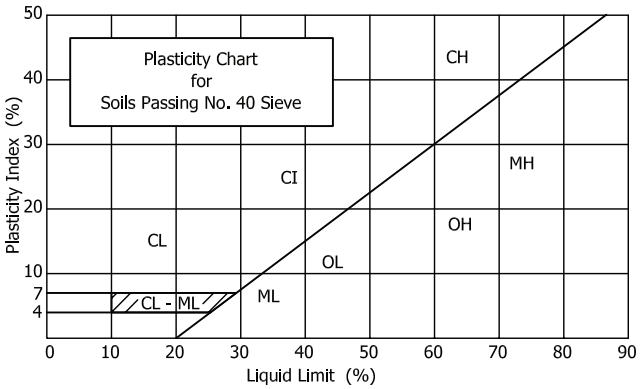
**The results of these tests usually are reported separately*

1. "Unified Soil Classification System", Technical Memorandum 3-357 prepared for Office, Chief of Engineering, by Waterways Experiment Station, Vicksburg, Missippi, Corps of Engineers, U.S. Army. Vol 1, March 1953
2. American Society for Testing and Materials, Procedures for Testing Soils, "Suggested Methods of Testing for identification of Soils", 4th Ed: pp 221-233, Dec. 1964

MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS

SOIL COMPONENTS

FRACTION	US STANDARD SIEVE SIZE	DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
	PASSING/RETAINED	PERCENT	DESCRIPTOR
GRAVEL coarse	76mm 19mm	50 - 35	and
fine	19mm No 4	35 - 20	some
SAND coarse	4.75mm 2.00mm	20 - 10	little
medium	2.00mm 425μm	10 - 1	trace
fine	425μm 75μm		
SILT (non-plastic) or CLAY (plastic)	75 μm		



OVERSIZE MATERIAL

Rounded or Subrounded	Not Rounded
COBBLES 75mm to 200mm	ROCK FRAGMENTS 76mm
BOULDERS >200mm	ROCKS > 0.76 cubic metre in volume

1. All sieve sizes mentioned on this chart are US STANDARD, A.S.T.M.
2. Boundary classifications possessing characteristics of two groups are given combined group symbols. E.G. GW-GC is a well graded gravel/sand mixture with clay binder between 5% and 12%

MAJOR DIVISION			GROUP SYMBOL	GRAPH SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
COARSE-GRAINED SOILS (More than Half by Weight Larger than 200 Sieve)	GRAVELS More Than Half Coarse Grained Larger Than No. 4 Sieve	CLEAN GRAVELS (Little or No Fines)	GW		Well Graded Gravels, Little or No Fines	$C_u = \frac{D60}{D10} > 4$ $C_c = \frac{(D30)^2}{D10 \times D60} = 1$ to 3	
			GP		Poorly Graded Gravels, and Gravel/Sand Mixtures, Little or No Fines	Not Meeting Above Requirements	
		DIRTY GRAVELS (With Some Fines)	GM		Silty Gravels, Gravel/Sand/Silt Mixtures	Content of Fines Exceeds 12%	Atterberg Limits Below "A" Line or P.I. Less Than 4
			GC		Clayey Gravels, Gravel/Sand/Clay Mixtures		Atterberg Limits Above "A" Line P.I. More Than 7
	SANDS More Than Half Fine Grains Smaller Than No. 4 Sieve	CLEAN SANDS (Little or No Fines)	SW		Well Graded Sands, Gravelly Sands, Little or No Fines	$C_u = \frac{D60}{D10} > 4$ $C_c = \frac{(D30)^2}{D10 \times D60} = 1$ to 3	
			SP		Poorly Graded Sands, Little or No Fines	Not Meeting Above Requirements	
		DIRTY SANDS (With Some Fines)	SM		Silty Sands, Sand/Silt Mixtures	Content of Fines Exceeds 12%	Atterberg Limits Below "A" Line P.I. Less Than 4
			SC		Clayey Sands, Sand/Clay Mixtures		Atterberg Limits Above "A" Line P.I. More Than 7
FINE-GRAINED SOILS (More than Half by Weight Passes 200 Sieve)	SILTS Below "A" Line Negligible Organic Content	$W_L < 50\%$	ML		Inorganic Silts and Very Fine Sands, Rock Flour, Silty Sands of Slight Plasticity	Classification Is Based Upon Plasticity Chart (see above)	
		$W_L > 50\%$	MH		Inorganic Silts, Micaceous or Diatomaceous, Fine Sandy or Silty Soils		
	CLAY Above "A" Line on Plasticity Chart Negligible Organic Content	$W_L < 30\%$	CL		Inorganic Clays of Low Plasticity, Gravelly, Sandy, or Silty Clays. Lean Clays.		
		$30\% < W_L < 50\%$	CI		Inorganic Clays of Medium Plasticity. Silty Clays.		
		$W_L > 50\%$	CH		Inorganic Clays of High Plasticity. Fat Clays.		
	ORGANIC SILTS & CLAYS Below Line "A" Line on Chart	$W_L < 50\%$	OL		Organic Silts and Organic Silty Clays of Low Plasticity.	Whenever the Nature of the Fine Content Has Not Been Determined. SF is a Mixture of Sand with Silt or Clay.	
		$W_L > 50\%$	OH		Organic Clays of High Plasticity		
HIGHLY ORGANIC SOILS			Pt		Peat and Other Highly Organic Soils	Strong Color or Odor, and often Fibrous Texture	

SPECIAL SYMBOLS

BEDROCK

VOLCANIC ASH

ParklandGEO

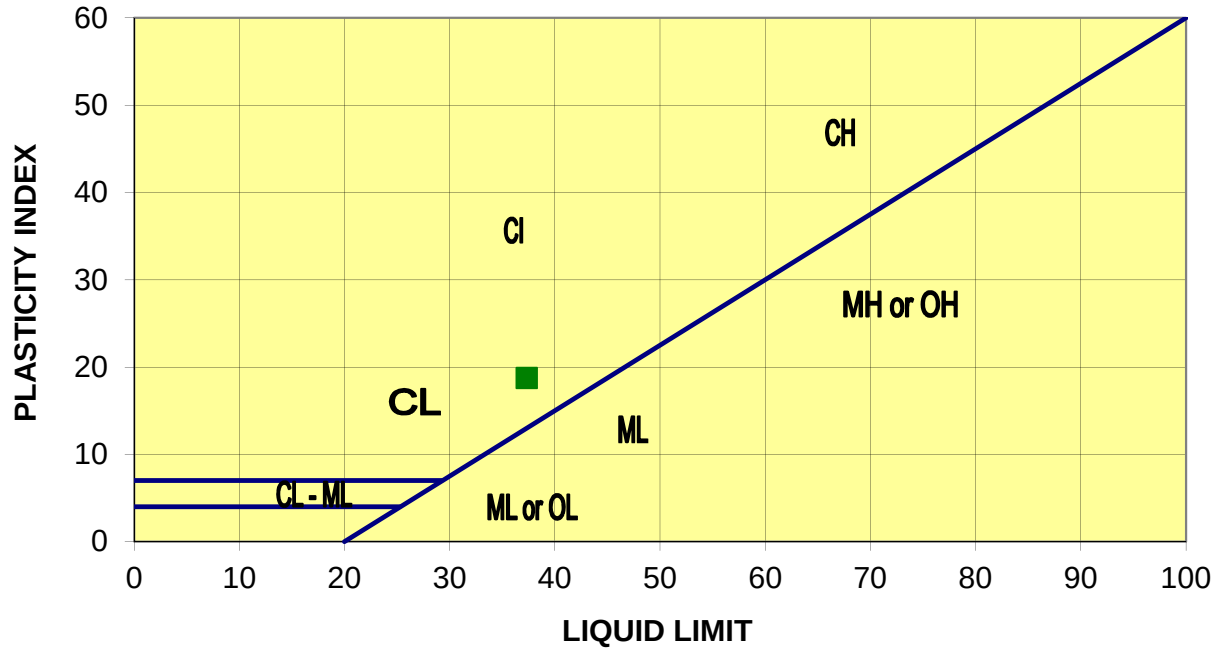
PROJECT#	**ED1285**
PROJECT	**Focus ASP**
BOREHOLE	**11-02**
DEPTH	**4.5**
SAMPLE #	**2D3**
DATE	**24-Aug-11**
TECH	**MK**

SOIL PLASTICITY SUMMARY

LIQUID LIMIT (LL)		
Trial No.	1	2
No. Blows	30	28
Wt. Sample Wet + Tare	59.198	51.666
Wt. Sample Dry + Tare	51.231	45.600
Wt. Water	7.967	6.066
Tare Container	29.083	29.359
Wt. Dry Soil	22.148	16.241
Moisture Content	35.972	37.350
Corrected for Blow Count	36.774	37.866
Liquid Limit Average	**37.3**	

PLASTIC LIMIT (PL)			
Trial No.	1	2	3
Wt. Wet Sample + Tare	13.103	12.433	13.173
Wt. Dry Sample+ Tare	12.788	12.244	12.837
Wt. Water	0.315	0.189	0.336
Tare Container	11.152	11.162	11.067
Wt. Dry Sample	1.636	1.082	1.770
Moisture Content	19.254	17.468	18.983
Plastic Limit Average		**18.6**	

PLASTICITY INDEX (PI) = LL-PL	**18.8**



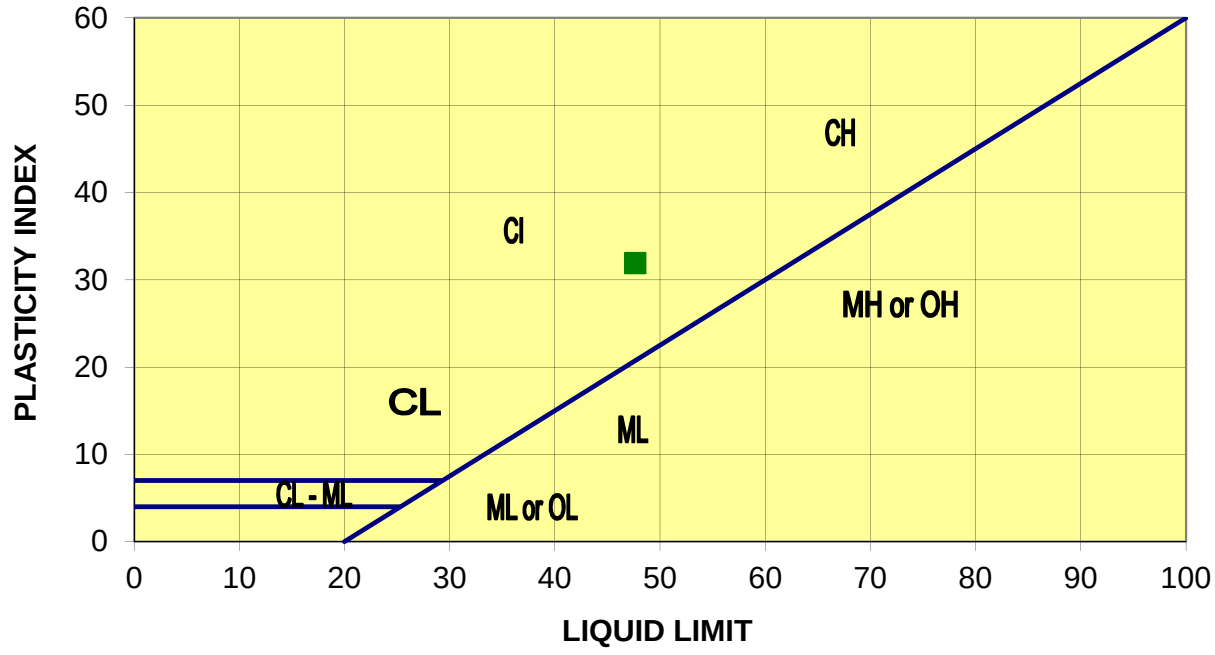
PROJECT#	**ED1285**
PROJECT	**Focus ASP**
BOREHOLE	**11-01**
DEPTH	**1.5**
SAMPLE #	**1D1**
DATE	**26-Aug-11**
TECH	**MK**

SOIL PLASTICITY SUMMARY

LIQUID LIMIT (LL)		
Trial No.	1	2
No. Blows	20	26
Wt. Sample Wet + Tare	42.018	39.721
Wt. Sample Dry + Tare	37.753	36.280
Wt. Water	4.265	3.441
Tare Container	28.968	29.082
Wt. Dry Soil	8.785	7.198
Moisture Content	48.549	47.805
Corrected for Blow Count	47.255	48.032
Liquid Limit Average	**47.6**	

PLASTIC LIMIT (PL)			
Trial No.	1	2	3
Wt. Wet Sample + Tare	14.151	14.770	13.943
Wt. Dry Sample+ Tare	13.715	14.278	13.563
Wt. Water	0.436	0.492	0.380
Tare Container	11.058	11.181	11.013
Wt. Dry Sample	2.657	3.097	2.550
Moisture Content	16.409	15.886	14.902
Plastic Limit Average		**15.7**	

PLASTICITY INDEX (PI) = LL-PL **31.9**



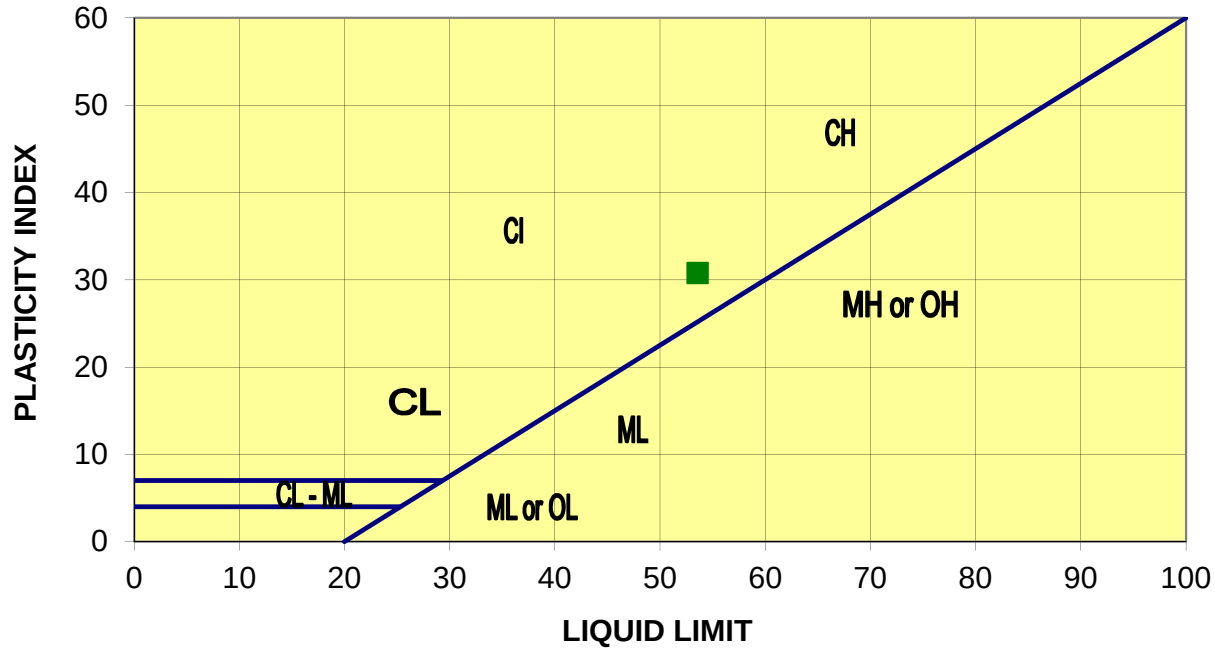
PROJECT#	**ED1285**
PROJECT	**Focus ASP**
BOREHOLE	**11-03**
DEPTH	**1.5**
SAMPLE #	**3D1**
DATE	**26-Aug-11**
TECH	**MK**

SOIL PLASTICITY SUMMARY

LIQUID LIMIT (LL)		
Trial No.	1	2
No. Blows	28	30
Wt. Sample Wet + Tare	37.642	43.038
Wt. Sample Dry + Tare	34.567	38.234
Wt. Water	3.075	4.804
Tare Container	28.719	29.114
Wt. Dry Soil	5.848	9.120
Moisture Content	52.582	52.675
Corrected for Blow Count	53.308	53.850
Liquid Limit Average	**53.6**	

PLASTIC LIMIT (PL)			
Trial No.	1	2	3
Wt. Wet Sample + Tare	12.678	12.263	12.869
Wt. Dry Sample+ Tare	12.349	12.051	12.541
Wt. Water	0.329	0.212	0.328
Tare Container	11.032	11.040	11.083
Wt. Dry Sample	1.317	1.011	1.458
Moisture Content	24.981	20.969	22.497
Plastic Limit Average		**22.8**	

PLASTICITY INDEX (PI) = LL-PL **30.8**



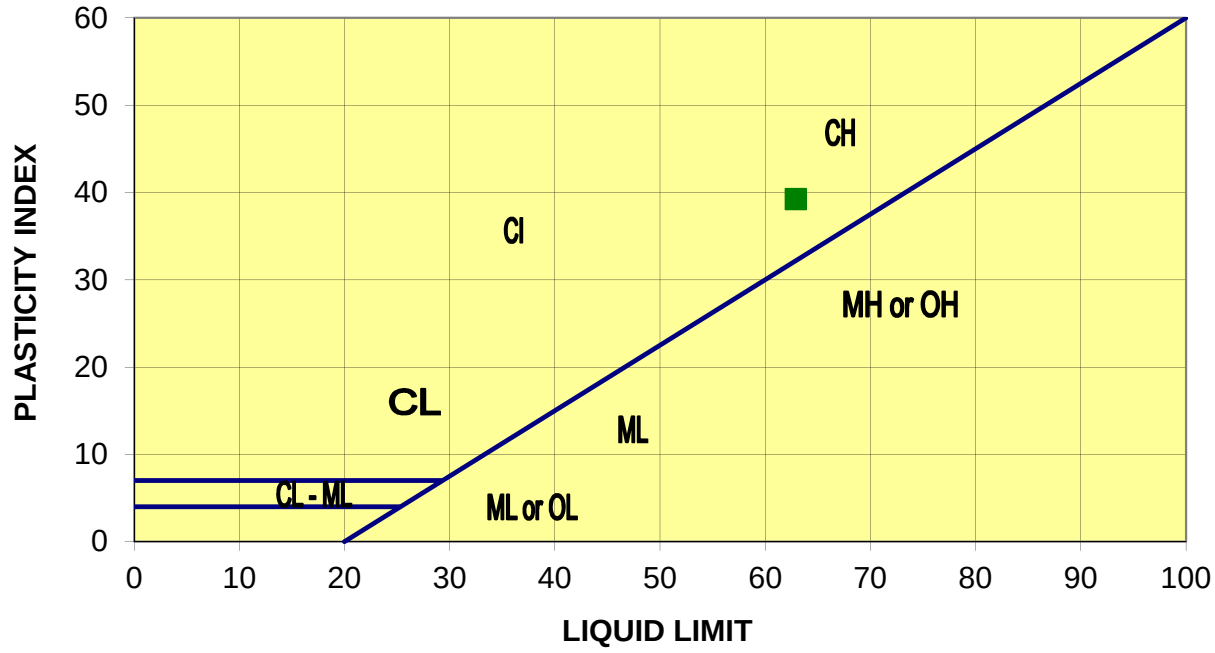
PROJECT#	**ED1285**
PROJECT	**Focus ASP**
BOREHOLE	**11-04**
DEPTH	**4.5**
SAMPLE #	**4D3**
DATE	**26-Aug-11**
TECH	**MK**

SOIL PLASTICITY SUMMARY

LIQUID LIMIT (LL)		
Trial No.	1	2
No. Blows	30	24
Wt. Sample Wet + Tare	41.387	40.888
Wt. Sample Dry + Tare	36.691	36.255
Wt. Water	4.696	4.633
Tare Container	29.115	28.871
Wt. Dry Soil	7.576	7.384
Moisture Content	61.985	62.744
Corrected for Blow Count	63.368	62.435
Liquid Limit Average	**62.9**	

PLASTIC LIMIT (PL)			
Trial No.	1	2	3
Wt. Wet Sample + Tare	12.078	11.927	12.507
Wt. Dry Sample+ Tare	11.874	11.804	12.252
Wt. Water	0.204	0.123	0.255
Tare Container	11.024	11.264	11.201
Wt. Dry Sample	0.850	0.540	1.051
Moisture Content	24.000	22.778	24.263
Plastic Limit Average		**23.7**	

PLASTICITY INDEX (PI) = LL-PL **39.2**



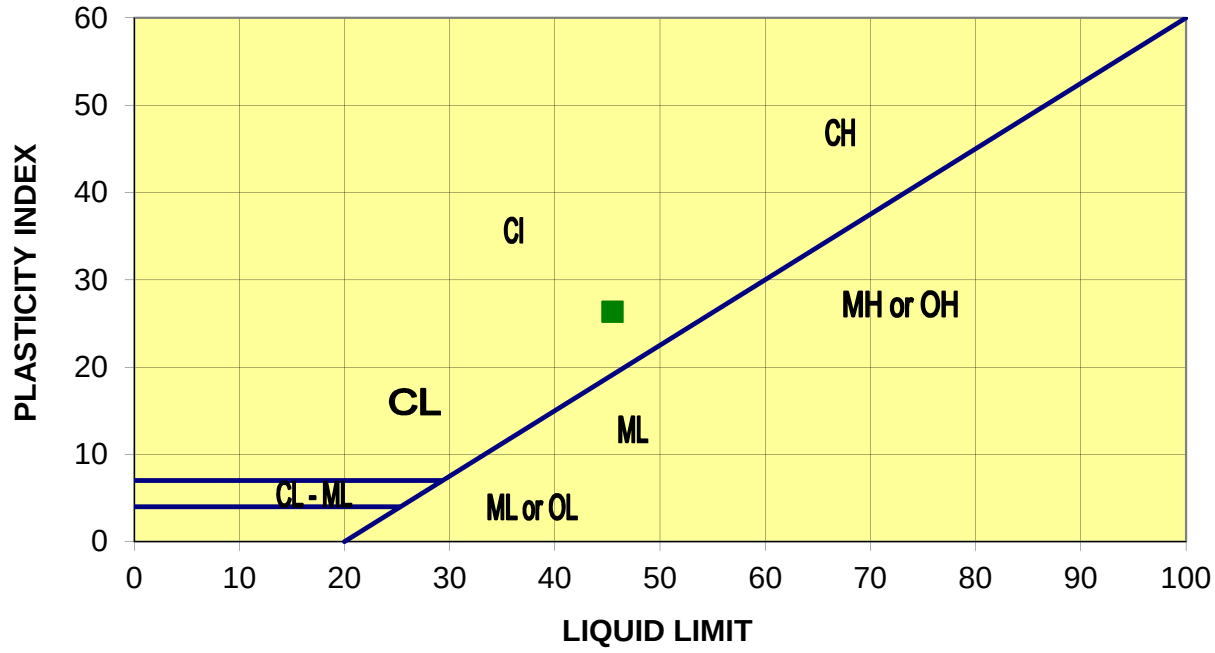
PROJECT#	**ED1285**
PROJECT	**Focus ASP**
BOREHOLE	**11-04**
DEPTH	**3**
SAMPLE #	**4D2**
DATE	**Aug 31/11**
TECH	**MK**

SOIL PLASTICITY SUMMARY

LIQUID LIMIT (LL)		
Trial No.	1	2
No. Blows	29	27
Wt. Sample Wet + Tare	46.657	50.338
Wt. Sample Dry + Tare	41.332	43.702
Wt. Water	5.325	6.636
Tare Container	29.221	29.203
Wt. Dry Soil	12.111	14.499
Moisture Content	43.968	45.769
Corrected for Blow Count	44.765	46.197
Liquid Limit Average	**45.5**	

PLASTIC LIMIT (PL)			
Trial No.	1	2	3
Wt. Wet Sample + Tare	12.365	12.478	12.528
Wt. Dry Sample+ Tare	12.156	12.282	12.296
Wt. Water	0.209	0.196	0.232
Tare Container	11.078	11.232	11.101
Wt. Dry Sample	1.078	1.050	1.195
Moisture Content	19.388	18.667	19.414
Plastic Limit Average		**19.2**	

PLASTICITY INDEX (PI) = LL-PL **26.3**



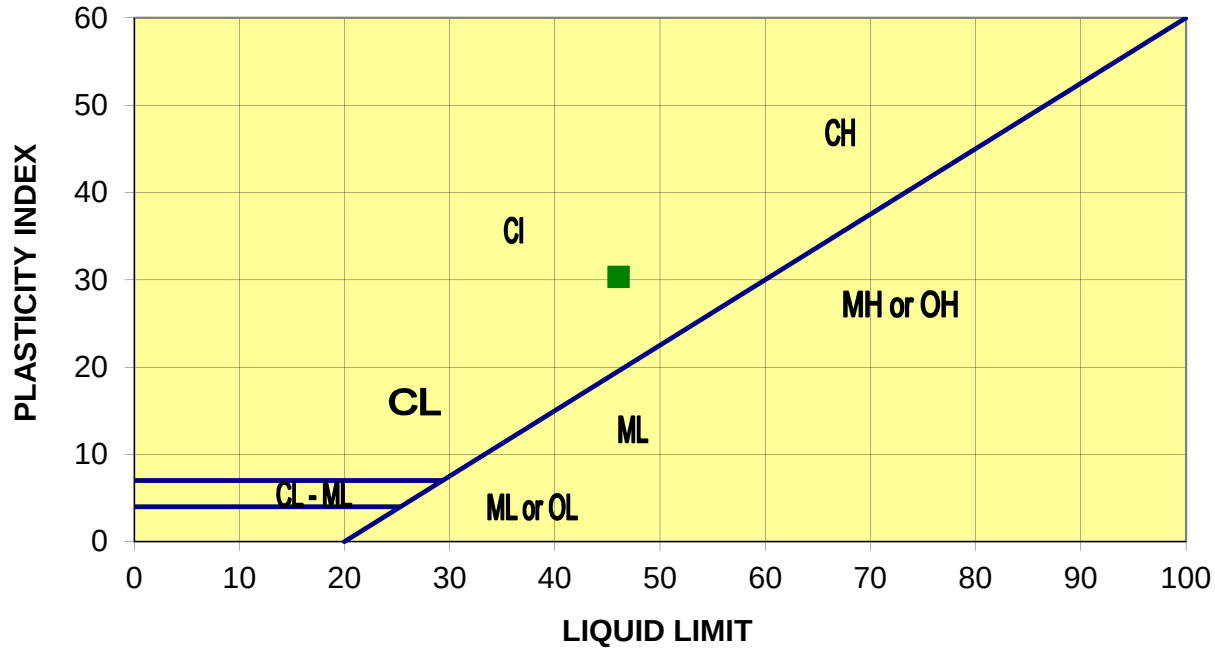
PROJECT#	**ED1285**
PROJECT	**Focus ASP**
BOREHOLE	**11-05**
DEPTH	**4.5**
SAMPLE #	**5D3**
DATE	**26-Aug-11**
TECH	**MK**

SOIL PLASTICITY SUMMARY

LIQUID LIMIT (LL)		
Trial No.	1	2
No. Blows	17	28
Wt. Sample Wet + Tare	44.873	41.993
Wt. Sample Dry + Tare	39.699	38.044
Wt. Water	5.174	3.949
Tare Container	29.106	29.247
Wt. Dry Soil	10.593	8.797
Moisture Content	48.844	44.890
Corrected for Blow Count	46.617	45.510
Liquid Limit Average	**46.1**	

PLASTIC LIMIT (PL)			
Trial No.	1	2	3
Wt. Wet Sample + Tare	14.151	14.770	13.943
Wt. Dry Sample+ Tare	13.715	14.278	13.563
Wt. Water	0.436	0.492	0.380
Tare Container	11.058	11.181	11.013
Wt. Dry Sample	2.657	3.097	2.550
Moisture Content	16.409	15.886	14.902
Plastic Limit Average		**15.7**	

PLASTICITY INDEX (PI) = LL-PL	**30.3**



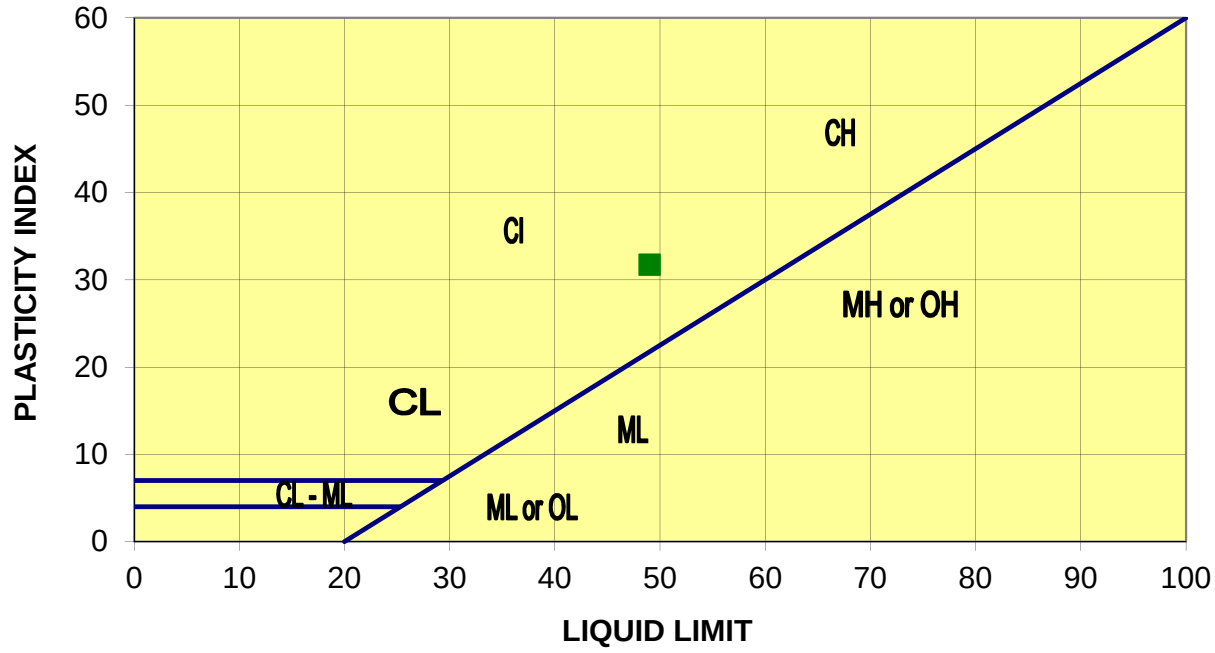
PROJECT#	**ED1285**
PROJECT	**Focus ASP**
BOREHOLE	**11-06**
DEPTH	**3**
SAMPLE #	**6D2**
DATE	**26-Aug-11**
TECH	**MK**

SOIL PLASTICITY SUMMARY

LIQUID LIMIT (LL)		
Trial No.	1	2
No. Blows	20	26
Wt. Sample Wet + Tare	41.099	39.614
Wt. Sample Dry + Tare	36.948	36.068
Wt. Water	4.151	3.546
Tare Container	28.597	28.887
Wt. Dry Soil	8.351	7.181
Moisture Content	49.707	49.380
Corrected for Blow Count	48.382	49.615
Liquid Limit Average	**49.0**	

PLASTIC LIMIT (PL)			
Trial No.	1	2	3
Wt. Wet Sample + Tare	12.456	12.888	12.348
Wt. Dry Sample+ Tare	12.271	12.621	12.169
Wt. Water	0.185	0.267	0.179
Tare Container	11.164	11.136	11.121
Wt. Dry Sample	1.107	1.485	1.048
Moisture Content	16.712	17.980	17.080
Plastic Limit Average		**17.3**	

PLASTICITY INDEX (PI) = LL-PL	**31.7**



Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID 1715072
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
SOUMAKO, ROB & CHERYL	# 5 25507 TWP RD 512A	SPRUCE GROVE	AB	T7Y 1A8

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	16	25	051	26	4	1	1	8522152	

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.437710 Longitude -113.693190
How Location Obtained
Map

Elevation ft
How Elevation Obtained
Not Obtained

2. Drilling Information

Method of Drilling	Type of Work	Proposed Well Use
Bored	New Well	Domestic

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description
12.00		Silty Sand
36.00		Blue Silt
42.00		Blue Clay
50.00		Silty Sand
70.00		Clay

4. Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
70.00 ft		2002/06/12	2002/06/12

Borehole

Diameter (in)	From (ft)	To (ft)
30.00	0.00	70.00

Surface Casing (if applicable)
Galvanized Steel
Size OD : 24.00 in
Wall Thickness : 0.063 in
Bottom at : 70.00 ft

Well Casing/Liner
Unknown
Size OD : in
Wall Thickness : in
Top at : ft
Bottom at : ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by Unknown

Annular Seal Bentonite Chips/Tablets
Placed from 0.00 ft to 30.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type Steel
Size OD : 24.00 in

From (ft)	To (ft)	Slot Size (in)
42.00	44.00	0.010

Attachment Attached To Casing
Top Fittings Coupler Bottom Fittings Other

Pack
Type Artificial Grain Size COARSE
Amount 9.00 Yards

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
DAVE SUMMERS

Certification No
5286Q

Company Name
SUMMERS DRILLING LTD.

Copy of Well report provided to owner Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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GIC Well ID 1715072
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
SOUMAKO, ROB & CHERYL	# 5 25507 TWP RD 512A	SPRUCE GROVE	AB	T7Y 1A8

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	16	25	051	26	4	1	1	8522152	

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.437710 Longitude -113.693190
How Location Obtained
Map

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level 12.00 in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate 3.00 igpm
Recommended Pump Intake Depth (From TOC) 60.00 ft
Pump Installed Yes
Type SUB @ 55 FT
Depth ft
Model
H.P.

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Gas
Depth ft
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to GIC

Additional Comments on Well
SCREEN TYPE : LOW CARBON STEEL, FITTING BOTTOM : COUPLER

Sample Collected for Potability
Result Attached

5. Yield Test

Measurement in Imperial
Taken From Ground Level

Test Date	Start Time	Static Water Level
2002/06/12	12:00 AM	12.00 ft

Method of Water Removal

Type Bailer
Removal Rate 60.00 igpm
Depth Withdrawn From 60.00 ft

If water removal period was < 2 hours, explain why

Depth to water level

Drawdown (ft)	Elapsed Time Minutes:Sec	Recovery (ft)
	0:00	60.00
	1:00	59.50
	2:00	59.00
	3:00	58.50
	4:00	58.00
	5:00	57.50
	6:00	57.00
	7:00	56.50
	8:00	56.00
	9:00	55.75
	10:00	55.25
	12:00	54.08
	14:00	54.42
	16:00	53.50
	20:00	53.00
	25:00	52.33
	30:00	51.67
	35:00	51.00
	40:00	50.67
	50:00	50.00
	60:00	48.67
	75:00	48.00
	90:00	49.00
	105:00	48.25
	120:00	48.00

6. Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
DAVE SUMMERS

Certification No
5286Q

Company Name
SUMMERS DRILLING LTD.

Copy of Well report provided to owner
Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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GIC Well ID 1495278
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
FORNARA, BERNARD	#36, 51514 RANGE RD. 261	SPRUCE GROVE	AB	T7Y 1B3

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	35	051	26	4				#36 FLEMING PARK

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.443100 Longitude -113.720000
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

2. Drilling Information

Method of Drilling	Type of Work	Proposed Well Use
Rotary	New Well	Domestic

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description
17.00		Brown Clay
112.00		Gray Clay
160.00		Gray Medium Grained Sand
161.00		Gray Sandstone

4. Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
161.00 ft		2006/10/06	2006/10/06

Borehole

Diameter (in)	From (ft)	To (ft)
7.88	0.00	161.00

Surface Casing (if applicable)
Plastic
Size OD : 6.00 in
Wall Thickness : 0.500 in
Bottom at : 155.00 ft

Well Casing/Liner
Unknown
Size OD : in
Wall Thickness : in
Top at : ft
Bottom at : ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by Unknown

Annular Seal Bentonite Chips/Tablets
Placed from 0.00 ft to 112.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type Stainless Steel
Size OD : 5.00 in

From (ft)	To (ft)	Slot Size (in)
155.00	160.00	0.100

Attachment Attached To Casing
Top Fittings Coupler
Bottom Fittings Plug

Pack
Type Washed Sand
Grain Size GRIT 3
Amount 650.00 Pounds

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
TERRY BERGSTREISER

Certification No
41955A

Company Name
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.

Copy of Well report provided to owner

Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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GIC Well ID 1495278
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
FORNARA, BERNARD	#36, 51514 RANGE RD. 261	SPRUCE GROVE	AB	T7Y 1B3

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	35	051	26	4				#36 FLEMING PARK

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.443100 Longitude -113.720000
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level 17.72 in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate 19.00 igpm
Recommended Pump Intake Depth (From TOC) 144.36 ft
Pump Installed
Type
Depth ft
Model
H.P.

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Gas
Depth ft
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to GIC
Additional Comments on Well
Sample Collected for Potability
Result Attached

5. Yield Test

Measurement in Imperial
Taken From Ground Level

Test Date	Start Time	Static Water Level
2006/10/06	12:00 AM	66.80 ft

Method of Water Removal

Type Air
Removal Rate 19.00 igpm
Depth Withdrawn From 157.48 ft

If water removal period was < 2 hours, explain why

Depth to water level

Drawdown (ft)	Elapsed Time Minutes:Sec	Recovery (ft)
66.80	0:00	111.55
	1:00	87.96
	2:00	78.08
	3:00	73.13
	4:00	70.80
	5:00	69.62
	6:00	68.96
	7:00	68.60
	8:00	68.41
	9:00	68.27
	10:00	68.18
	12:00	68.08
	14:00	68.08
	16:00	68.08
	20:00	68.08
	25:00	68.08
	30:00	68.08
	35:00	68.08
	40:00	68.08
	50:00	68.08
	60:00	68.08
	75:00	68.08
	90:00	68.08
	105:00	68.08
	120:00	68.08

6. Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
TERRY BERGSTREISER

Certification No
41955A

Company Name
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.

Copy of Well report provided to owner
Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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GIC Well ID 1495257
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
LEENTVAAR, HUGO	#31-51514 RANGE RD 261	SPRUCE GROVE	AB	T7Y 1B3

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	35	051	26	4	31	3	1891TR	

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.443100 Longitude -113.720000
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

2. Drilling Information

Method of Drilling	Type of Work	Proposed Well Use
Rotary	New Well	Domestic

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description
12.00		Brown Clay
90.00		Gray Silty Clay
130.00		Gray Till
143.00		Clay & Sand
157.00		Gray Clay
172.00		Sand
173.00		Shale

4. Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
173.00 ft		2006/05/29	2006/05/29

Borehole

Diameter (in)	From (ft)	To (ft)
7.88	0.00	173.00

Surface Casing (if applicable)
Plastic
Size OD : 6.00 in
Wall Thickness : 0.500 in
Bottom at : 165.00 ft

Well Casing/Liner
Unknown
Size OD : in
Wall Thickness : in
Top at : ft
Bottom at : ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by Unknown

Annular Seal Bentonite Chips/Tablets
Placed from 0.00 ft to 140.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type Stainless Steel
Size OD : 5.00 in

From (ft)	To (ft)	Slot Size (in)
165.00	170.00	0.010

Attachment Attached To Casing
Top Fittings Coupler
Bottom Fittings Plug

Pack
Type Artificial
Grain Size 0.275
Amount 400.00 Pounds

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
TERRY BERGSTREISER

Certification No
41955A

Company Name
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.

Copy of Well report provided to owner

Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy.
The information on this report will be retained in a public database.

GIC Well ID 1495257
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
LEENTVAAR, HUGO	#31-51514 RANGE RD 261	SPRUCE GROVE	AB	T7Y 1B3

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	35	051	26	4	31	3	1891TR	

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.443100 Longitude -113.720000
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level 15.75 in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate 20.00 igpm
Recommended Pump Intake Depth (From TOC) 137.79 ft
Pump Installed
Type
Depth ft
Model
H.P.

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Gas
Depth ft
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to GIC

Additional Comments on Well
FILTER PACK WASHED,
WELL LOCATION FLEMING PARK

Sample Collected for Potability
Result Attached

5. Yield Test

Measurement in Imperial
Taken From Ground Level

Test Date	Start Time	Static Water Level
2006/05/29	12:00 AM	72.18 ft

Method of Water Removal
Type Air
Removal Rate 20.00 igpm
Depth Withdrawn From 167.32 ft

If water removal period was < 2 hours, explain why

Depth to water level

Drawdown (ft)	Elapsed Time Minutes:Sec	Recovery (ft)
	0:00	111.55
	1:00	91.57
	2:00	78.77
	3:00	77.46
	4:00	76.05
	5:00	75.53
	6:00	75.43
	7:00	75.36
	8:00	75.36
	9:00	75.33
	10:00	75.33
	12:00	75.30

6. Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
TERRY BERGSTREISER

Certification No
41955A

Company Name
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.

Copy of Well report provided to owner
Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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The information on this report will be retained in a public database.

GIC Well ID 296997
GoA Well Tag No.
Date Report Received 2001/08/14

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
OSWALD, SHAWN	2308 8 ST, NISKU			T9E 7Z2

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	35	051	26	4	32			

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.443092 Longitude -113.719670
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

2. Drilling Information

Method of Drilling	Type of Work	Proposed Well Use
Rotary	New Well	Domestic

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description
19.00		Brown Clay
69.00		Gray Silty Clay
122.00		Gray Sandy Clay
154.00		Clay & Sand
190.00		Gray Coarse Grained Sand
195.00		Sand
196.00		Gravel

4. Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
196.00 ft		2001/06/21	2001/06/21

Borehole

Diameter (in)	From (ft)	To (ft)
0.00	0.00	196.00

Surface Casing (if applicable)
Plastic
Size OD : 6.00 in
Wall Thickness : 0.500 in
Bottom at : 190.00 ft

Well Casing/Liner
Size OD : 0.00 in
Wall Thickness : 0.000 in
Top at : 0.00 ft
Bottom at : 0.00 ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by

Annular Seal Bentonite Chips/Tablets
Placed from 0.00 ft to 122.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type Stainless Steel
Size OD : 4.00 in

From (ft)	To (ft)	Slot Size (in)
190.00	195.00	0.010

Attachment Attached To Casing
Top Fittings Coupler
Bottom Fittings Plug

Pack
Type Washed Sand
Grain Size .275
Amount 900.00 Pounds

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.

Copy of Well report provided to owner

Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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The information on this report will be retained in a public database.

GIC Well ID 296997
GoA Well Tag No.
Date Report Received 2001/08/14

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
OSWALD, SHAWN	2308 8 ST, NISKU			T9E 7Z2

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	35	051	26	4	32			

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.443092 Longitude -113.719670
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate 20.00 igpm
Recommended Pump Intake Depth (From TOC) 115.00 ft
Pump Installed Yes
Type SUB
Depth ft
Model
H.P. .75

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Gas
Depth ft
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to GIC

Additional Comments on Well
Sample Collected for Potability
Result Attached

DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 35 CMS. FLEMING PARK EST.

5. Yield Test

Measurement in Imperial
Taken From Ground Level

Test Date	Start Time	Static Water Level
2001/06/21	12:00 AM	67.00 ft

Method of Water Removal

Type Air
Removal Rate 21.00 igpm
Depth Withdrawn From 0.00 ft

If water removal period was < 2 hours, explain why

Depth to water level

Drawdown (ft)	Elapsed Time Minutes:Sec	Recovery (ft)
	0:00	91.90
	1:00	81.04
	2:00	71.72
	3:00	69.42
	4:00	68.44
	5:00	68.18
	6:00	68.04
	7:00	67.91
	8:00	67.91
	9:00	67.91
	10:00	67.88
	12:00	67.85
	14:00	67.85

6. Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
MAR-WAYNE WATER WELL DRILLING SERVICES LTD.

Copy of Well report provided to owner
Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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The information on this report will be retained in a public database.

GIC Well ID 289029
GoA Well Tag No.
Date Report Received 1998/05/28

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
HAARSMA, GARY	8711 199 ST, EDMONTON			T5T 6E8

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NE	25	051	26	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.435847 Longitude -113.695224
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

2. Drilling Information

Method of Drilling	Type of Work	Proposed Well Use
Rotary	New Well	Domestic

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description
18.00		Yellow Sandy Clay
104.00		Blue Sandy Clay
162.00		Sand
170.00		Gray Shale

4. Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
170.00 ft		1998/04/21	1998/04/21

Borehole

Diameter (in)	From (ft)	To (ft)
0.00	0.00	170.00

Surface Casing (if applicable)
Plastic
Size OD : 6.00 in
Wall Thickness : 0.390 in
Bottom at : 158.00 ft

Well Casing/Liner
Size OD : 0.00 in
Wall Thickness : 0.000 in
Top at : 0.00 ft
Bottom at : 0.00 ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by

Annular Seal Bentonite Chips/Tablets
Placed from 0.00 ft to 102.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type Stainless Steel
Size OD : 5.00 in

From (ft)	To (ft)	Slot Size (in)
158.00	163.00	0.010

Attachment Attached To Casing
Top Fittings Coupler
Bottom Fittings Plug

Pack
Type Washed Sand
Grain Size
Amount 2500.00 Pounds

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
D&D WATER WELL DRILLING & SERVICING LTD.

Copy of Well report provided to owner

Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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The information on this report will be retained in a public database.

GIC Well ID 289029
GoA Well Tag No.
Date Report Received 1998/05/28

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
HAARSMA, GARY	8711 199 ST, EDMONTON			T5T 6E8

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	NE	25	051	26	4				

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.435847 Longitude -113.695224
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate 5.00 igpm
Recommended Pump Intake Depth (From TOC) 140.00 ft
Pump Installed
Type
Depth ft
Model
H.P.

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Gas
Depth ft
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to GIC

Additional Comments on Well
DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 30 CM.

Sample Collected for Potability
Result Attached

5. Yield Test

Measurement in Imperial
Taken From Ground Level

Test Date	Start Time	Static Water Level
1998/04/21	12:00 AM	89.00 ft

Method of Water Removal

Type Air
Removal Rate igpm
Depth Withdrawn From 163.00 ft

If water removal period was < 2 hours, explain why

Depth to water level

Drawdown (ft)	Elapsed Time Minutes:Sec	Recovery (ft)
	0:00	116.57
	1:00	98.00
	2:00	92.52
	3:00	90.68
	4:00	89.99
	6:00	89.57
	8:00	89.44
	10:00	89.40

6. Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
D&D WATER WELL DRILLING & SERVICING LTD.

Copy of Well report provided to owner
Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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GIC Well ID 286934
GoA Well Tag No.
Date Report Received 1997/03/20

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
FINDLAY, ED	3 51514 RNG 261, SPRUCE GROVE			T7Y 1B3

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	35	051	26	4	2			

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.443092 Longitude -113.719670
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

2. Drilling Information

Method of Drilling	Type of Work	Proposed Well Use
Rotary	New Well	Domestic

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description
11.00		Yellow Clay
79.00		Blue Sandy Clay
89.00		Sand
111.00		Blue Sandy Clay
124.00		Fine Grained Sand
127.00		Blue Sandy Clay
142.00		Coarse Grained Sand
146.00		Blue Clay
150.00		Gray Shale

4. Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
150.00 ft		1997/02/13	1997/02/13

Borehole

Diameter (in)	From (ft)	To (ft)
0.00	0.00	150.00

Surface Casing (if applicable)
Plastic
Size OD : 6.00 in
Wall Thickness : 0.395 in
Bottom at : 137.00 ft

Well Casing/Liner
Size OD : 0.00 in
Wall Thickness : 0.000 in
Top at : 0.00 ft
Bottom at : 0.00 ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by

Annular Seal Bentonite Chips/Tablets
Placed from 0.00 ft to 127.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type Stainless Steel
Size OD : 5.00 in

From (ft)	To (ft)	Slot Size (in)
137.00	142.00	0.012

Attachment Attached To Casing
Top Fittings Coupler
Bottom Fittings Plug

Pack
Type Washed Sand
Grain Size
Amount 1400.00 Pounds

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
D&D WATER WELL DRILLING & SERVICING LTD.

Copy of Well report provided to owner

Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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The information on this report will be retained in a public database.

GIC Well ID 286934
GoA Well Tag No.
Date Report Received 1997/03/20

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
FINDLAY, ED	3 51514 RNG 261, SPRUCE GROVE			T7Y 1B3

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	35	051	26	4	2			

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.443092 Longitude -113.719670
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate 5.00 igpm
Recommended Pump Intake Depth (From TOC) 90.00 ft
Pump Installed
Type
Depth ft
Model
H.P.

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Gas
Depth ft
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to GIC

Additional Comments on Well
DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 30 CM.

Sample Collected for Potability
Result Attached

5. Yield Test

Measurement in Imperial
Taken From Ground Level

Test Date	Start Time	Static Water Level
1997/02/13	12:00 AM	63.00 ft

Method of Water Removal

Type Air
Removal Rate igpm
Depth Withdrawn From 142.00 ft

If water removal period was < 2 hours, explain why

Depth to water level

Drawdown (ft)	Elapsed Time Minutes:Sec	Recovery (ft)
	0:00	105.15
	1:00	90.65
	2:00	81.30
	3:00	74.64
	4:00	70.01
	5:00	67.19
	6:00	65.49
	7:00	64.47
	8:00	63.91
	9:00	63.58
	10:00	63.42
	120:00	62.99

6. Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
UNKNOWN NA DRILLER

Certification No
1

Company Name
D&D WATER WELL DRILLING & SERVICING LTD.

Copy of Well report provided to owner
Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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The information on this report will be retained in a public database.

GIC Well ID 1715074
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
WOLOSHYN, PETE	51413 - RGE RD 262	SPRUCE GROVE	AB	T7Y 1B4

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	26	051	26	4	2		5661RS	

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.428600 Longitude -113.720000
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

2. Drilling Information

Method of Drilling	Type of Work	Proposed Well Use
Rotary	New Well	Domestic

3. Formation Log

Measurement in Imperial

Depth from ground level (ft)	Water Bearing	Lithology Description
12.00		Silt
86.00		Clay & Silt
140.00		Sand
167.00		Coarse Grained Sand

4. Well Completion

Measurement in Imperial

Total Depth Drilled	Finished Well Depth	Start Date	End Date
167.00 ft		2002/03/22	2002/03/23

Borehole

Diameter (in)	From (ft)	To (ft)
7.88	0.00	167.00

Surface Casing (if applicable)
Plastic
Size OD : 6.00 in
Wall Thickness : 0.390 in
Bottom at : 162.00 ft

Well Casing/Liner
Unknown
Size OD : in
Wall Thickness : in
Top at : ft
Bottom at : ft

Perforations

From (ft)	To (ft)	Diameter (in)	Interval (in)

Perforated by Unknown

Annular Seal Bentonite Chips/Tablets
Placed from 0.00 ft to 150.00 ft
Amount

Other Seals

Type	At (ft)

Screen Type Stainless Steel
Size OD : 4.00 in

From (ft)	To (ft)	Slot Size (in)
162.00	167.00	0.012

Attachment Attached To Casing
Top Fittings Coupler
Bottom Fittings Plug

Pack
Type Artificial
Grain Size COARSE
Amount 3000.00 Pounds

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
DAVE SUMMERS

Certification No
5286Q

Company Name
SUMMERS DRILLING LTD.

Copy of Well report provided to owner
Date approval holder signed

Government of Alberta

Water Well Drilling Report

View in Metric

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The information on this report will be retained in a public database.

GIC Well ID 1715074
GoA Well Tag No.
Date Report Received

1. Well Identification and Location

Measurement in Imperial

Owner Name	Address	Town	Province	Postal Code
WOLOSHYN, PETE	51413 - RGE RD 262	SPRUCE GROVE	AB	T7Y 1B4

Location	1/4 or LSD	SEC	TWP	RGE	W of MER	Lot	Block	Plan	Additional Description
	SE	26	051	26	4	2		5661RS	

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 53.428600 Longitude -113.720000
How Location Obtained
Not Verified

Elevation ft
How Elevation Obtained
Not Obtained

Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level 12.00 in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate 10.00 igpm
Recommended Pump Intake Depth (From TOC) 120.00 ft
Pump Installed Yes
Type SUB @ 120'
Depth ft
Model
H.P.

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Gas
Depth ft
Well Disinfected Upon Completion
Geophysical Log Taken
Submitted to GIC

Additional Comments on Well
TESTED @ +50 GPM
Sample Collected for Potability
Result Attached

5. Yield Test

Measurement in Imperial
Taken From Ground Level

Test Date	Start Time	Static Water Level
2002/03/23	12:00 AM	26.00 ft

Method of Water Removal

Type Air
Removal Rate 50.00 igpm
Depth Withdrawn From 120.00 ft

If water removal period was < 2 hours, explain why

Depth to water level

Drawdown (ft)	Elapsed Time Minutes:Sec	Recovery (ft)
	0:00	120.00
	1:00	76.00
	2:00	56.00
	3:00	47.00
	4:00	36.00
	5:00	32.00
	6:00	27.00
	7:00	26.00

6. Water Diverted for Drilling

Water Source	Amount Taken	Diversion Date & Time
	ig	

7. Contractor Certification

Name of Journeyman responsible for drilling/construction of well
DAVE SUMMERS

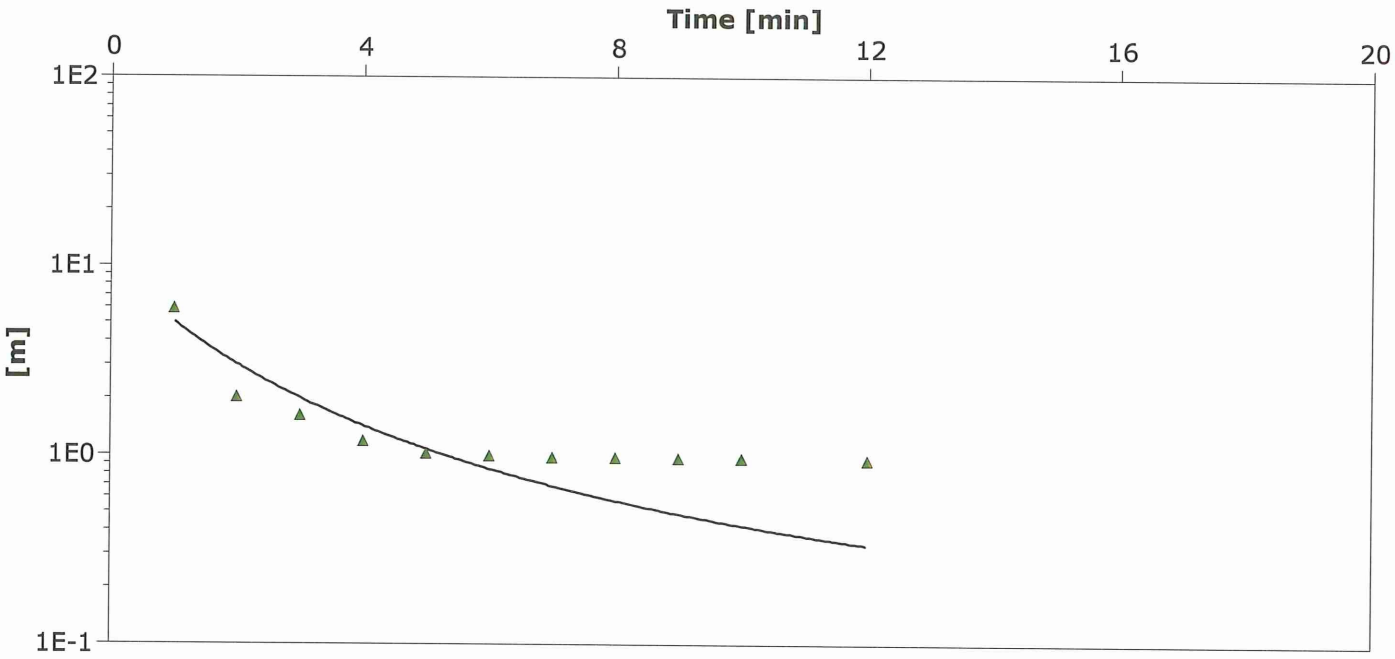
Certification No
5286Q

Company Name
SUMMERS DRILLING LTD.

Copy of Well report provided to owner
Date approval holder signed

ParklandGEO 189 Pembina Road Sherwood Park, AB T8H 2W8	Slug Test Analysis Report
	Project: Focus ASP
	Number: ED1285
	Client: 1285827 Alberta Ltd.

Location: Near Devon, AB	Slug Test: Well 1495257	Test Well: Well 3
Test Conducted by:		Test Date: 8/11/2011
Analysis Performed by:	New analysis 1	Analysis Date: 8/11/2011
Aquifer Thickness: 4.58 m		

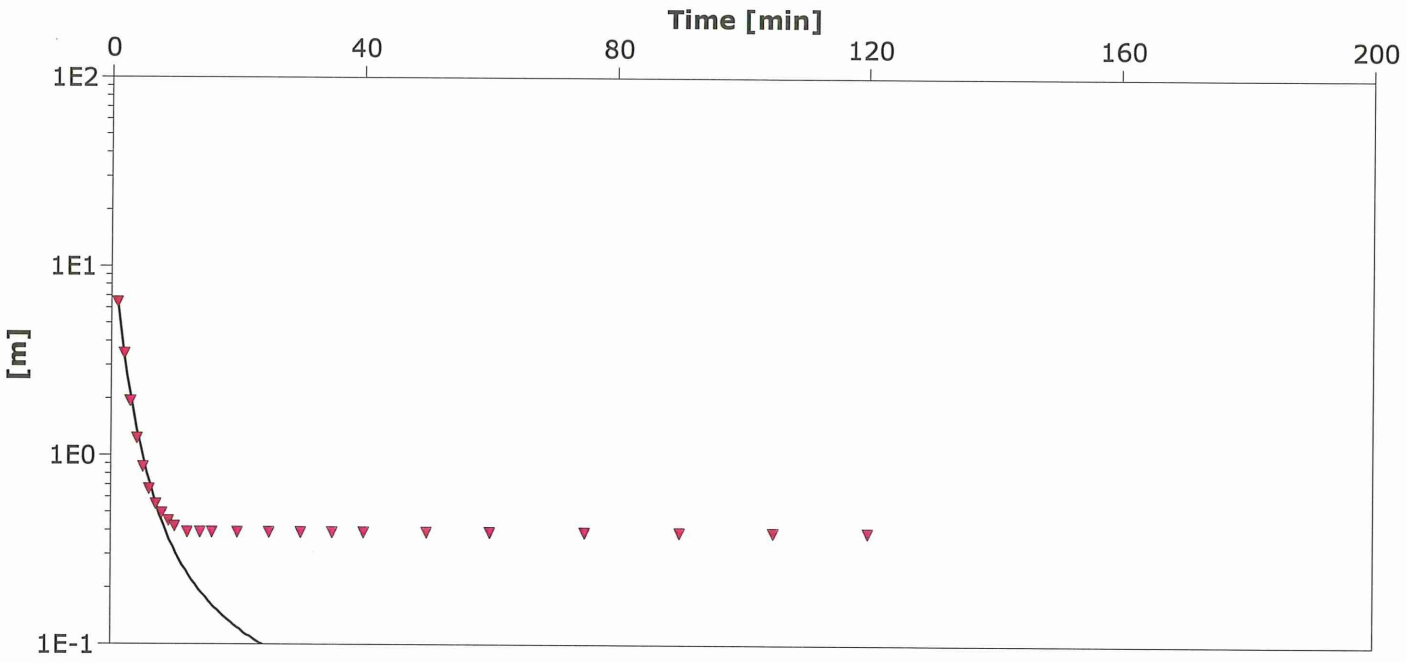


Calculation after Cooper-Bredehoeft-Papadopulos

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Well-bore storage coefficient	
Well 3	8.36×10^{0}	1.83×10^{0}	2.64×10^{-2}	

ParklandGEO 189 Pembina Road Sherwood Park, AB T8H 2W8	Slug Test Analysis Report
	Project: Focus ASP
	Number: ED1285
	Client: 1285827 Alberta Ltd.

Location: Near Devon, AB	Slug Test: Well 1495278	Test Well: Well 4
Test Conducted by:		Test Date: 8/11/2011
Analysis Performed by:	New analysis 1	Analysis Date: 8/11/2011
Aquifer Thickness: 14.63 m		



Calculation after Cooper-Bredehoeft-Papadopulos

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Well-bore storage coefficient	
Well 4	9.53×10^{0}	6.51×10^{-1}	5.64×10^{-4}	

ParklandGEO
189 Pembina Road
Sherwood Park, AB
T8H 2W8

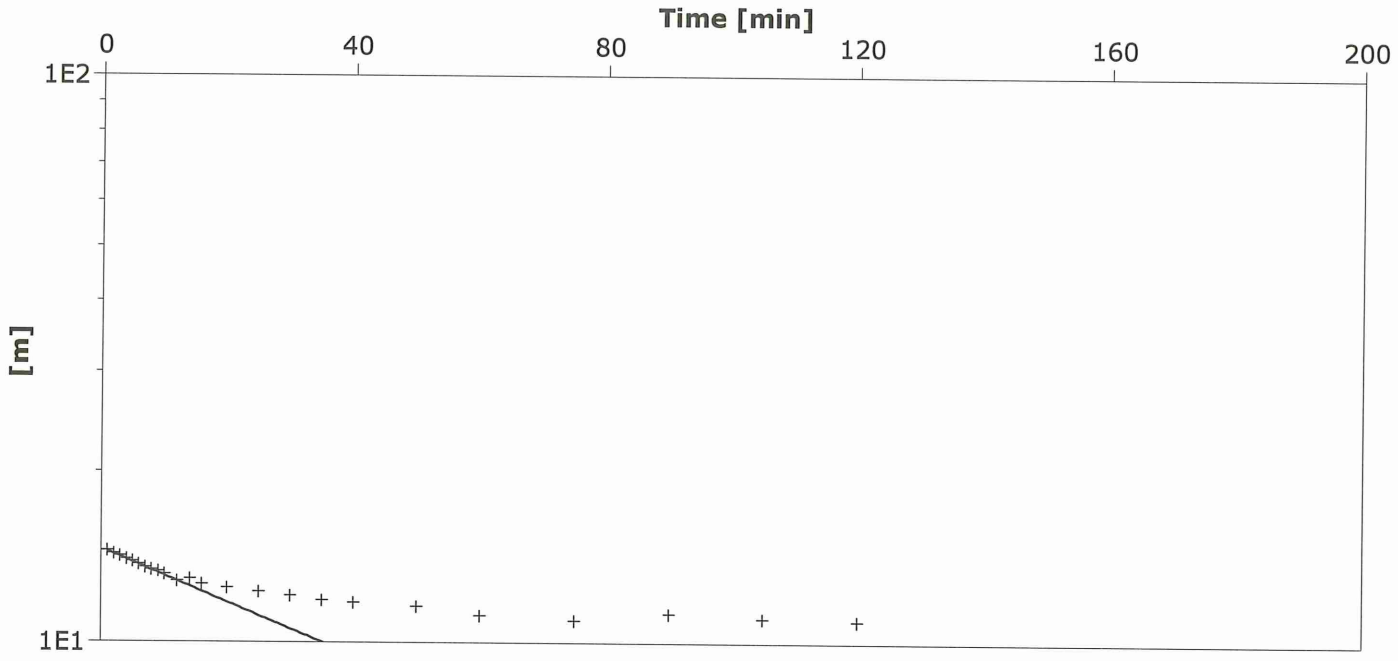
Slug Test Analysis Report

Project: Focus ASP

Number: ED1285

Client: 1285827 Alberta Ltd.

Location: Near Devon, AB	Slug Test: Well 1715072	Test Well: Well 5
Test Conducted by:		Test Date: 8/11/2011
Analysis Performed by:	New analysis 1	Analysis Date: 8/11/2011
Aquifer Thickness: 2.44 m		

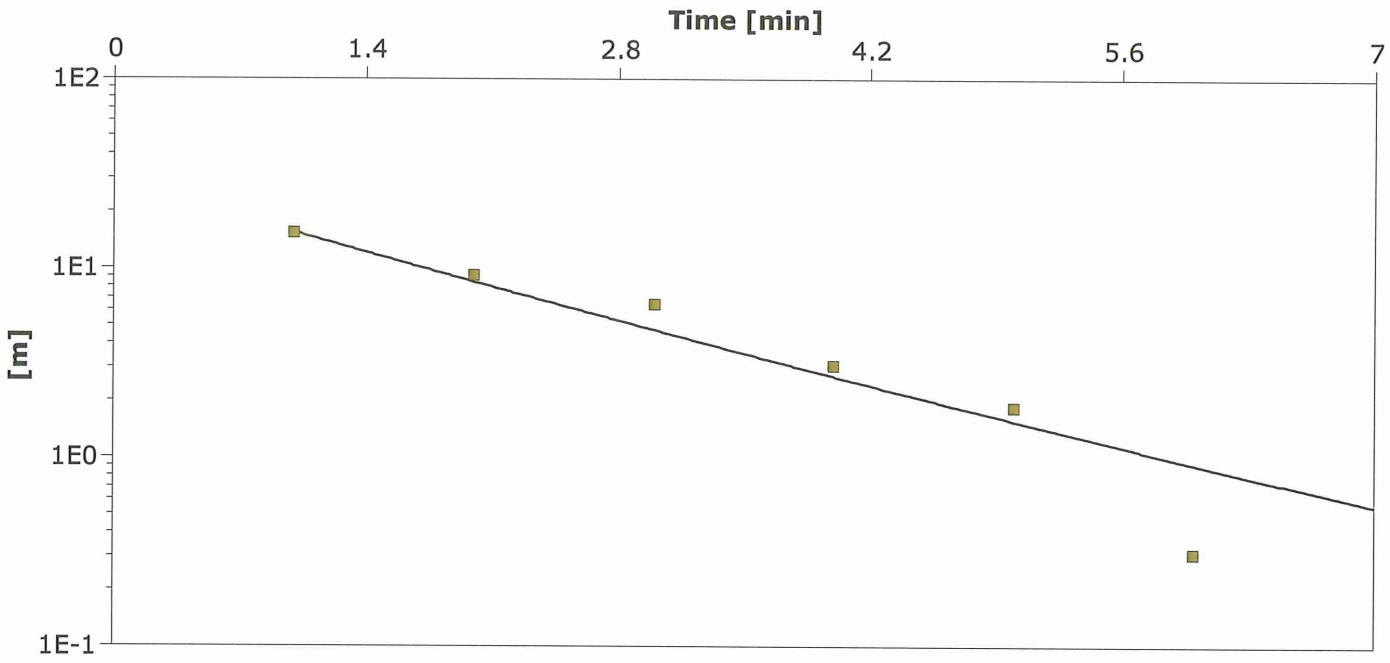


Calculation after Cooper-Bredehoeft-Papadopulos

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Well-bore storage coefficient	
Well 5	2.44×10^{1}	9.98×10^{0}	3.43×10^{-29}	

ParklandGEO 189 Pembina Road Sherwood Park, AB T8H 2W8	Slug Test Analysis Report
	Project: Focus ASP
	Number: ED1285
	Client: 1285827 Alberta Ltd.

Location: Near Devon, AB	Slug Test: Well 1715074	Test Well: Well 6
Test Conducted by:		Test Date: 8/11/2011
Analysis Performed by:	New analysis 1	Analysis Date: 8/11/2011
Aquifer Thickness: 24.69 m		

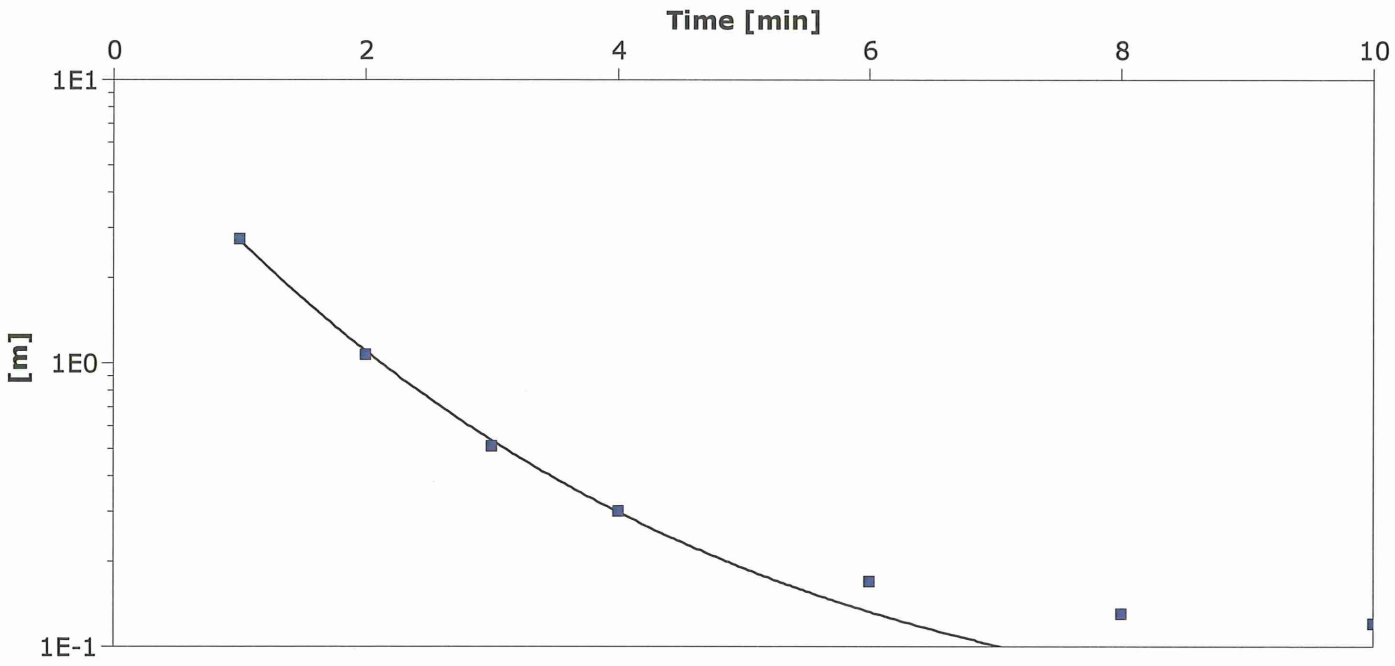


Calculation after Cooper-Bredehoeft-Papadopulos

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Well-bore storage coefficient	
Well 6	1.09×10^{2}	4.41×10^{0}	1.00×10^{-35}	

ParklandGEO 189 Pembina Road Sherwood Park, AB T8H 2W8	Slug Test Analysis Report
	Project: Focus ASP
	Number: ED1285
	Client: 1285827 Alberta Ltd.

Location: Near Devon, AB	Slug Test: well 289029	Test Well: Well 1
Test Conducted by:		Test Date: 8/11/2011
Analysis Performed by:	New analysis 1	Analysis Date: 8/11/2011
Aquifer Thickness: 17.68 m		

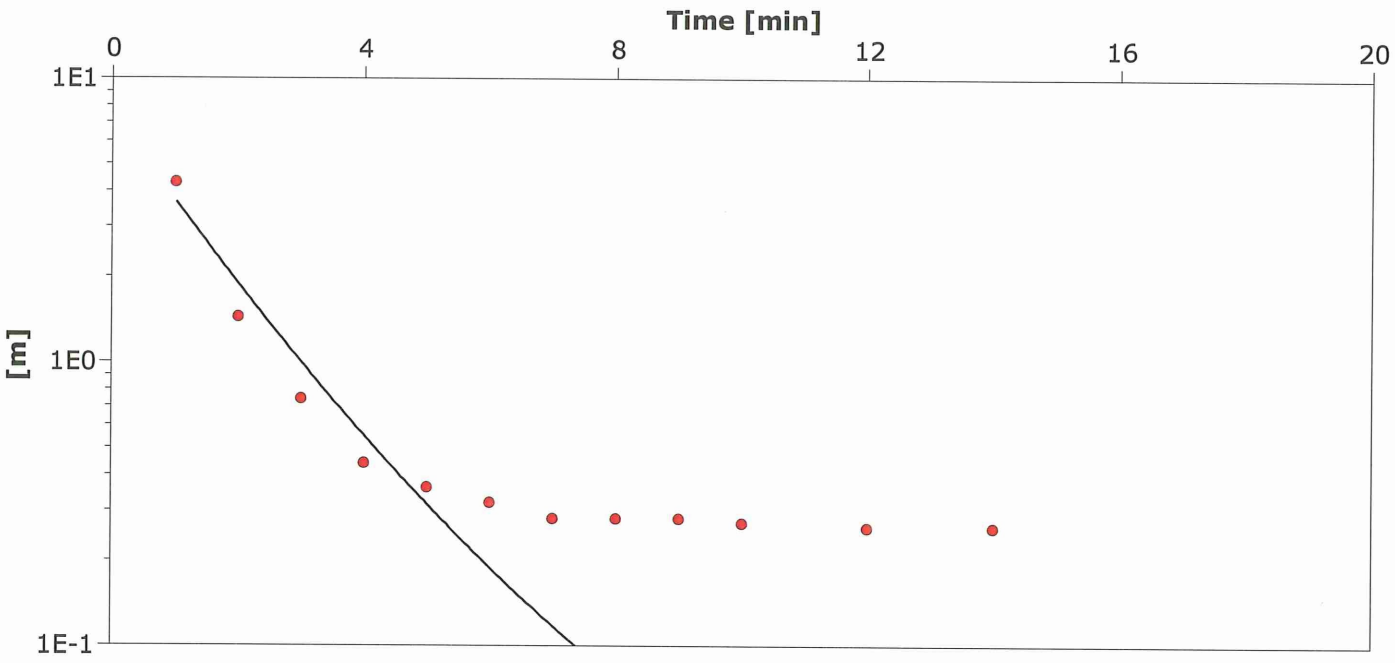


Calculation after Cooper-Bredehoeft-Papadopulos

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Well-bore storage coefficient	
Well 1	3.53×10^{1}	1.99×10^{0}	3.67×10^{-6}	

ParklandGEO 189 Pembina Road Sherwood Park, AB T8H 2W8	Slug Test Analysis Report
	Project: Focus ASP
	Number: ED1285
	Client: 1285827 Alberta Ltd.

Location: Near Devon, AB	Slug Test: Well 296997	Test Well: Well 2
Test Conducted by:		Test Date: 8/11/2011
Analysis Performed by:	New analysis 1	Analysis Date: 8/11/2011
Aquifer Thickness: 12.80 m		

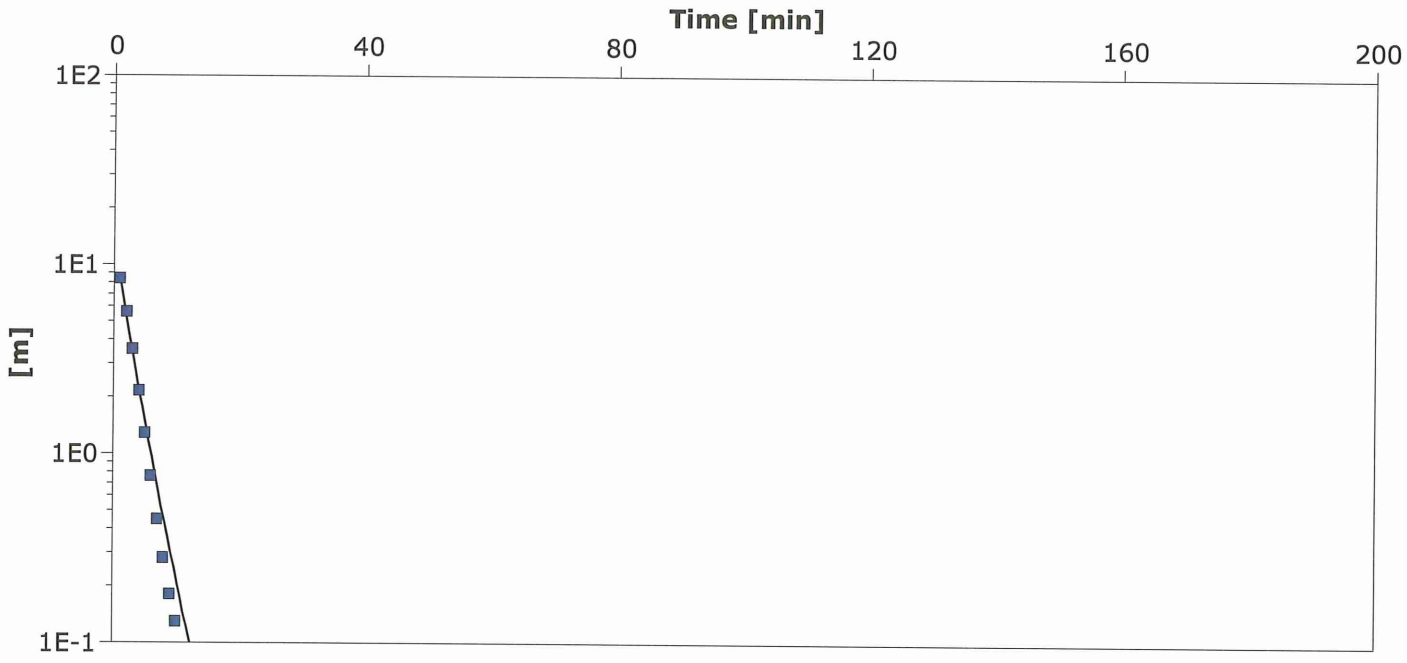


Calculation after Cooper-Bredehoeft-Papadopulos

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Well-bore storage coefficient	
Well 2	6.35×10^{1}	4.96×10^{0}	7.07×10^{-18}	

ParklandGEO 189 Pembina Road Sherwood Park, AB T8H 2W8	Slug Test Analysis Report
	Project:
	Number:
	Client:

Location:	Slug Test: Well 286934	Test Well: Well 1
Test Conducted by:		Test Date: 8/11/2011
Analysis Performed by:	New analysis 1	Analysis Date: 8/11/2011
Aquifer Thickness: 5.48 m		



Calculation after Cooper-Bredehoeft-Papadopulos

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Well-bore storage coefficient	
Well 1	7.76×10^{1}	1.42×10^{1}	1.00×10^{-35}	

LIMITATIONS

REPORT LIMITATIONS AND USAGE

The use of this attached report is subject to acceptance of the following general terms and conditions.

1. STANDARD OF CARE - In the performance of professional services, ParklandGEO will use that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession practicing in the same or similar localities. No other warranty expressed or implied is made or intended by this agreement or by furnishing oral or written reports of the findings made. ParklandGEO is to be liable only for damage directly caused by the negligence of ParklandGEO.

2. INTERPRETATION OF THE REPORT - The CLIENT recognizes that subsurface conditions will vary from those encountered at the location where borings, surveys, or explorations are made and that the data, interpretations and recommendation of ParklandGEO are based solely on the information available to him. Classification and identification of soils, rocks, geological units, contaminated materials and contaminant quantities will be based on commonly accepted practices in geotechnical or environmental consulting practice in this area. ParklandGEO will not be responsible for the interpretation by others of the information developed.

3. SITE INFORMATION - The CLIENT agrees to fully cooperate with ParklandGEO and provide all information with respect to the past, present and proposed conditions and use of the Site whether specifically requested or not. The CLIENT acknowledges that in order for ParklandGEO to properly advise and assist the CLIENT in respect of the investigation of the Site, ParklandGEO is relying upon full disclosure by the CLIENT of all matters pertinent to an investigation of the Site.

   Where specifically stated in the scope of work, ParklandGEO will perform a review of the historical information obtained or provided by the Client to assist in the investigation of the Site unless and except to the extent that such a review is limited or excluded from the scope of work.

4. COMPLETE REPORT - The Report is of a summary nature and is not intended to stand alone without reference to the instructions given to ParklandGEO by the CLIENT, communications between ParklandGEO and the CLIENT, and to any other reports, writings or documents prepared by ParklandGEO for the CLIENT relative to the specific Site, all of which constitute the Report. The word "Report" shall refer to any and all of the documents referred to herein. In order to properly understand the suggestions, recommendations and opinions expressed by ParklandGEO, reference must be made to the whole of the Report. ParklandGEO cannot be responsible for use of any part or portions of the report without reference to the whole report. The CLIENT agrees to the following statement:

   > "This report has been prepared for the exclusive use of the named CLIENT. 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. ParklandGEO accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report."

   The CLIENT agrees that in the event that any such report is released to a third party, such disclaimer shall not be obliterated or altered in any manner. The CLIENT further agrees that all such reports shall be used solely for the purposes of the CLIENT and shall not be released or used by others without the prior written permission of ParklandGEO.

5. LIMITATIONS ON SCOPE OF INVESTIGATION AND WARRANTY DISCLAIMER
   There is no warranty, expressed or implied, by ParklandGEO that:
   a) the investigation shall uncover all potential geo-hazards, contaminants or environmental liabilities on the Site; or
   b) the Site will be entirely free of all geo-hazards or contaminants as a result of any investigation or cleanup work undertaken on the Site, since it is not possible, even with exhaustive sampling, testing and analysis, to document all potential geo-hazards or contaminants on the Site.

   The CLIENT acknowledges that:
   a) the investigation findings are based solely on the information generated as a result of the specific scope of the investigation authorized by the CLIENT;

b) unless specifically stated in the agreed Scope of Work, the investigation will not, nor is it intended to assess or detect potential contaminants or environmental liabilities on the Site;

c) any assessment regarding geological conditions on the Site is based on the interpretation of conditions determined at specific sampling locations and depths and that conditions may vary between sampling locations, hence there can be no assurance that undetected geological conditions, including soils or groundwater are not located on the Site;

d) any assessment is also dependent on and limited by the accuracy of the analytical data generated by the sample analyses;

e) any assessment is also limited by the scientific possibility of determining the presence of unsuitable geological conditions for which scientific analyses have been conducted; and

f) the laboratory testing program and analytical parameters selected are limited to those outlined in the CLIENT's authorized scope of investigation; and

g) there are risks associated with the discovery of hazardous materials in and upon the lands and premises which may inadvertently discovered as part of the investigation. The CLIENT acknowledges that it may have a responsibility in law to inform the owner of any affected property of the existence or suspected existence of hazardous materials and in some cases the discovery of hazardous conditions and materials will require that certain regulatory bodies be informed. The CLIENT further acknowledges that any such discovery may result in the fair market value of the lands and premises and of any other lands and premises adjacent thereto to be adversely affected in a material respect.

6. CONTROL OF WORK SITE AND JOBSITE SAFETY - ParklandGEO is only responsible for the activities of its employees on the jobsite. The presence of ParklandGEO personnel on the Site shall not be construed in any way to relieve the CLIENT or any contractors on Site from their responsibilities for Site safety. The CLIENT undertakes to inform ParklandGEO of all hazardous conditions, or possible hazardous conditions which are known to him.

7. COST ESTIMATES - Estimates of remediation or construction costs can only be based on the specific information generated and the technical limitations of the investigation authorized by the CLIENT. Accordingly, estimated costs for construction or remediation are based on the known site conditions, which can vary as new information is discovered during construction. As some construction activities are an iterative exercise, ParklandGEO shall therefore not be liable for the accuracy of any estimates of remediation or construction costs provided.

8. LIMITATION OF LIABILITY - The CLIENT hereby agrees that to the fullest extent permitted by the law ParklandGEO's total liability to CLIENT for any and all injuries, claims, losses, expenses or damages whatsoever arising out of or in anyway relating to the Project, the Site, or this agreement from any cause or causes including but not limited to ParklandGEO 's negligence, errors, omissions, strict liability, breach of contract, or breach of warranty shall not exceed the total amount paid by the CLIENT for the services to ParklandGEO under this contract or $50,000, whichever is lessor, or as otherwise agreed to in writing.

9. NO SPECIAL OR CONSEQUENTIAL DAMAGES - The CLIENT and ParklandGEO agree that to the fullest extent permitted by law ParklandGEO shall not be liable to the CLIENT for any special, indirect or consequential damages whatsoever, whether caused by ParklandGEO's negligence, errors, omissions, strict liability, breach of contract, breach of warranty or other cause of causes whatsoever.

10. INDEMNIFICATION - To the fullest extent permitted by law, the CLIENT agrees to defend, indemnify and hold ParklandGEO, its directors, officers, employees, agents and subcontractors, harmless from and against any and all claims, defence costs, including legal fees on a full indemnity basis, damages, and other liabilities arising out of or in any way related to ParklandGEO 's reports or recommendations concerning this Agreement, ParklandGEO's work and presence on the project property, or the presence, release, or threatened release of hazardous substances or pollutants on or from the Site; provided that the CLIENT shall not indemnify ParklandGEO against liability for damages to the extent caused by the negligence or intentional misconduct of ParklandGEO, its agents or subcontractors.