SCATLIFF + MILLER + MURRAY Inc

Red River Community Centre
Proposed Playground and Skatepark
Geotechnical Investigation and Evaluation

FINAL REPORT

February 2010

Prepared By

Neil Privat, EIT.
Geotechnical Designer

Approved By

Mark Jamieson, P.Eng.
Senior Geotechnical Engineer

KGS Group
Winnipeg, Manitoba

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February 8, 2010

File No. 09-0109-04

Scatliff + Miller + Murray
136 Market Avenue
8th Floor
Winnipeg, Manitoba
R3B 0P4

ATTENTION: Ms. Jennifer Wagner

RE: Red River Community Centre
Proposed Playground and Skatepark
Geotechnical Investigation and Evaluation
Final Report

Dear Ms. Wagner:

KGS Group is pleased to submit our final report summarizing the geotechnical investigation and evaluation of the proposed playground and skatepark at the Red River Community Centre.

Included in the final report are the site plan and summary soil logs completed as part of the investigation.

We thank you for the opportunity to provide geotechnical engineering services for this project. Please call the undersigned if you have any questions on the enclosed.

Yours truly,

Mark Jamieson, P.Eng.
Senior Geotechnical Engineer

NCP/jr
Enclosure

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1.0 INTRODUCTION

KGS Group was authorized by Scatliff + Miller + Murray Inc. to undertake a geotechnical investigation and evaluation, as well as a topographic survey, of the proposed playground and skate park development at the Red River Community Centre. This report provides a summary of the field investigation results performed to date, as well as geotechnical considerations that should be incorporated into the design of the proposed works.

The geotechnical engineering services provided for this project are outlined below:

- ***Geotechnical Investigation –*** A subsurface drilling investigation program consisting of power auger drilling at the proposed playground and skate park area to determine the subsurface stratigraphy and foundation conditions. Representative soil samples were collected for material identification and laboratory testing.
- ***Topographic Survey –*** A topographic survey of existing facilities, trees/vegetation and existing ground elevations.
- ***Laboratory Testing –*** Diagnostic laboratory index testing on select soil samples to identify engineering soil properties relevant to the assessment.
- ***Geotechnical Evaluation –*** A geotechnical engineering evaluation of the site conditions at the proposed skate park for consideration in the design.
- ***Summary Report –*** A comprehensive report outlining the work conducted, laboratory test results and geotechnical considerations for incorporation into the proposed design and construction.

2.0 BACKGROUND

The development of a playground and skate park has been proposed for the northeast corner of the Red River Community Centre on Main Street between Murray and Ridgecrest Avenues in Winnipeg, Manitoba, as shown on Figure 1. The site is currently a green space, but was previously the location of the Red River School and parking lot. The site was leveled with fill as part of the demolition of the school, and turn into soccer fields. In general, the proposed playground will be located within and around the footprint of the removed school. The skate park will be located west of the demolished school, close to Main Street. The travel surface and features of the skate park will generally consist of cast-in-place concrete.

The existing community centre and parking lot to the south and west of the proposed skate park (see Figure 1) was recently constructed (2006). An investigation by M. Block and Associates Ltd. conducted in 2004 titled “Geotechnical Investigation for the Proposed Red River Community Centre Redevelopment Project”, reported the drilling of six test holes within the footprints of the community centre building and parking lot. In addition, the report made recommendations for pile, slab on grade and pavement designs.

3.0 INVESTIGATION PROGRAM

Site Survey

A topographic site survey was performed by KGS Group in August 2009 to determine ground elevations and locate the existing infrastructure and trees on the site. The existing site conditions and proposed works overlaid on an air photo background are included on Figure 1. This information was provided electronically to Scatliff+Miller+Murray separately.

Drilling Program

A drilling and sampling program consisting of eight test holes was completed on August 5, 2009, with drilling services performed by Paddock Drilling Ltd. of Brandon, Manitoba, with on-site supervision and sampling by KGS Group. The locations of the test holes are shown on Figure 1. The test holes were completed using a truck mounted Canterra 250 drill rig, equipped with 125 mm diameter solid stem augers. Soil samples were recovered from the auger flights, with all soils visually inspected in the field for material type and classification according to the Unified Soil Classification System (USCS). Detailed test hole logs incorporating field observations and subsequent laboratory test data are included in Appendix A.

Laboratory Testing

Laboratory testing was performed on select soil samples to determine the relevant engineering properties of the subsurface soils. The laboratory testing was completed by National Testing Laboratories Ltd., and included 46 moisture content analyses and 2 Atterberg Limits tests. The results of the testing are shown on the summary logs in Appendix A.

Stratigraphy

In general, the stratigraphy at the site has been interpreted by KGS Group to consist of topsoil/clay fill at surface over high plasticity silty clay with a silt layer, occurring within the upper few metres from ground surface, and silt till at depth.

Topsoil was encountered in 2 test holes, with clay fill observed in the other 6 test holes; the topsoil and clay fill supported grass vegetation. The topsoil was of high plasticity and contained organic matter. The clay fill typically contained trace sand and gravel and was of high plasticity. The thickness of both materials was typically less than 0.5 m from ground level. The topsoil and fill was underlain by a deposit of high plasticity silty clay of glaciolacustrine origin. The upper portion of the silty clay was generally stiff and moist, and contained a trace of organic matter. The silty clay was typically soft to firm in consistency with depth, and moist. From the M. Block and Associates Ltd. report, the silty clay extended to an approximate depth of 17.5 m below ground where it was underlain by silt till. The silt layer within the silty clay varied in depth from 1.5 to 2.3 m below ground surface, and was typically moist, soft, of low plasticity and up to 1.5 m in thickness. Minor groundwater infiltration from the silt was observed in 5 of the 8 test holes.

Two key considerations of the encountered soils relative to the skatepark and playground development include:

- The silt layer may be susceptible to frost action / heave and ice lensing.
- The high plasticity silty clay is typically compressible, and susceptible to swelling and shrinking with changes to moisture content.

4.0 DESIGN CONSIDERATIONS

This section is intended to identify general geotechnical considerations for incorporation into the design and construction of the proposed playground and skateboard park. The final design of the proposed works should be reviewed by a qualified geotechnical engineer familiar with the local soil conditions and behavior to ensure that the geotechnical considerations relative to structure performance are effectively incorporated into the design.

4.1 GEOTECHNICAL

Structural Design

Although the details of the design have not been finalized, it is understood by KGS that the proposed playground and skate park will include several concrete features and travel surfaces including stairs and ramps at different levels. If the structures are supported on shallow foundations, which is typical for other skate parks in Winnipeg, there will be variable loading applied to the foundation soil. This variable loading may induce differential settlements, potentially causing cracking of the cast-in-place concrete with resulting movements that could affect the serviceability of the proposed works. Structural design of the features to allow for this potential cracking at preferred locations is prudent to minimize their potential impacts on the structure performance and serviceability.

Subgrade Preparation

Preparation of the subgrade is necessary to provide a suitable and stable surface for the various structures. The subgrade preparation should include excavation to intact mineral soil, and disposal of topsoil and organic-rich material. The stripped surface should then be compacted to a minimum of 95% of the Standard Proctor Maximum Dry Density (SPMDD). The typical depth of stripping is estimated to be approximately 0.5 m, based on the test hole drill results. Where additional unsuitable subgrade material is encountered (e.g. wet silt, soft clay, organic material, etc.), additional sub-excavation to a minimum depth of 0.6 m should be performed and backfilled with compacted granular fill.

To further improve foundation conditions, a layer of woven geotextile could be placed overtop of the stripped and compacted subgrade. This will help distribute the applied load more uniformly, and bridge over any potential weaker zones. Installation should follow manufacturer's guidelines, with care to protect against tears, folds or wrinkles in the fabric.

The silt layer found across the site will typically be susceptible to frost action, potentially causing heaving and ice lensing during winter below the structures. Typical local practice is to excavate and replace the silt with crushed rockfill, while providing improved subsurface drainage. However, it is likely impractical and cost prohibitive to remove all the silt material, given the observed depth and thickness. An alternative to excavation and replacement would be to reduce the risk of frost penetration into the silt below the concrete structures. This could be achieved by either building up the ground surface around and below the skate park to increase the depth of burial, or by placement of a rigid thermal insulation to reduce the depth of frost penetration. If insulation is used, it would have to be designed for the overlying structure loading.

The foundation preparation below the concrete features should include placement and compaction of at least 600 mm of granular sub-base material. The sub-base should be placed in lifts not exceeding 150 mm compacted. The sub-base material should consist of durable, free draining sand and gravel. All granular material used as sub-base should be compacted to a minimum of 98% SPMDD.

Subsurface Drainage Control

Changes to the moisture content of the silty clay foundation soil can lead to shrinkage (drying) or swelling (wetting), which could affect the performance of the structures. Construction practices used in the design of the skate park should include methods to control subsurface drainage, and in particular excessive water that could lead to swelling. This will also reduce excess free water that could be available for ice lensing during winter. The following measures should be incorporated into the design to help control the subsurface drainage:

- The excavated subgrade should be positively sloped to promote runoff and minimize ponding below the structures.

- A granular sub-drainage system should be installed below the structures, consisting of a free draining granular fill. To improve subsurface water collection perforated drains could be installed within the granular fill or within excavated trenches.
- The drainage system should be sloped such that all collected water can be removed from the site. The water can be drained either into the municipal drainage system, or to a sump for pump discharge.

4.2 CONCRETE

The concrete travel surface and skate features of the skate park should be constructed with control joints and articulation at locations that could tolerate minor movements. This will reduce the risk of potential cracking of the cast-in-place concrete at undesirable locations. All concrete should be designed in accordance with CSA A23.1 and A23.2.

5.0 CONCLUSIONS

The stratigraphy at the site consisted of topsoil and clay fill overlying high plasticity silty clay and silt till. A silt layer was encountered within the upper few metres of ground surface, from which water infiltration was observed entering some test holes. This stratigraphy could pose some general concerns related to shallow foundation support for the proposed skate park structures, primarily related to swelling of the silty clay and frost heave / ice lensing associated with the wet silt layer.

The design and construction of the proposed skate park should include features to minimize the risk of adverse movement causing unacceptable performance of the structures associated with the geotechnical conditions at the site. This includes subgrade preparation, placement and compaction of granular fill over the prepared subgrade, and control of subsurface drainage underneath the skate park and playground structures. In addition, measures to minimize the risk of frost action should be considered, including placement of insulation or additional fill to limit frost penetration into the silt layer.

6.0 STATEMENT OF LIMITATIONS AND CONDITIONS

Third Party Use of Report

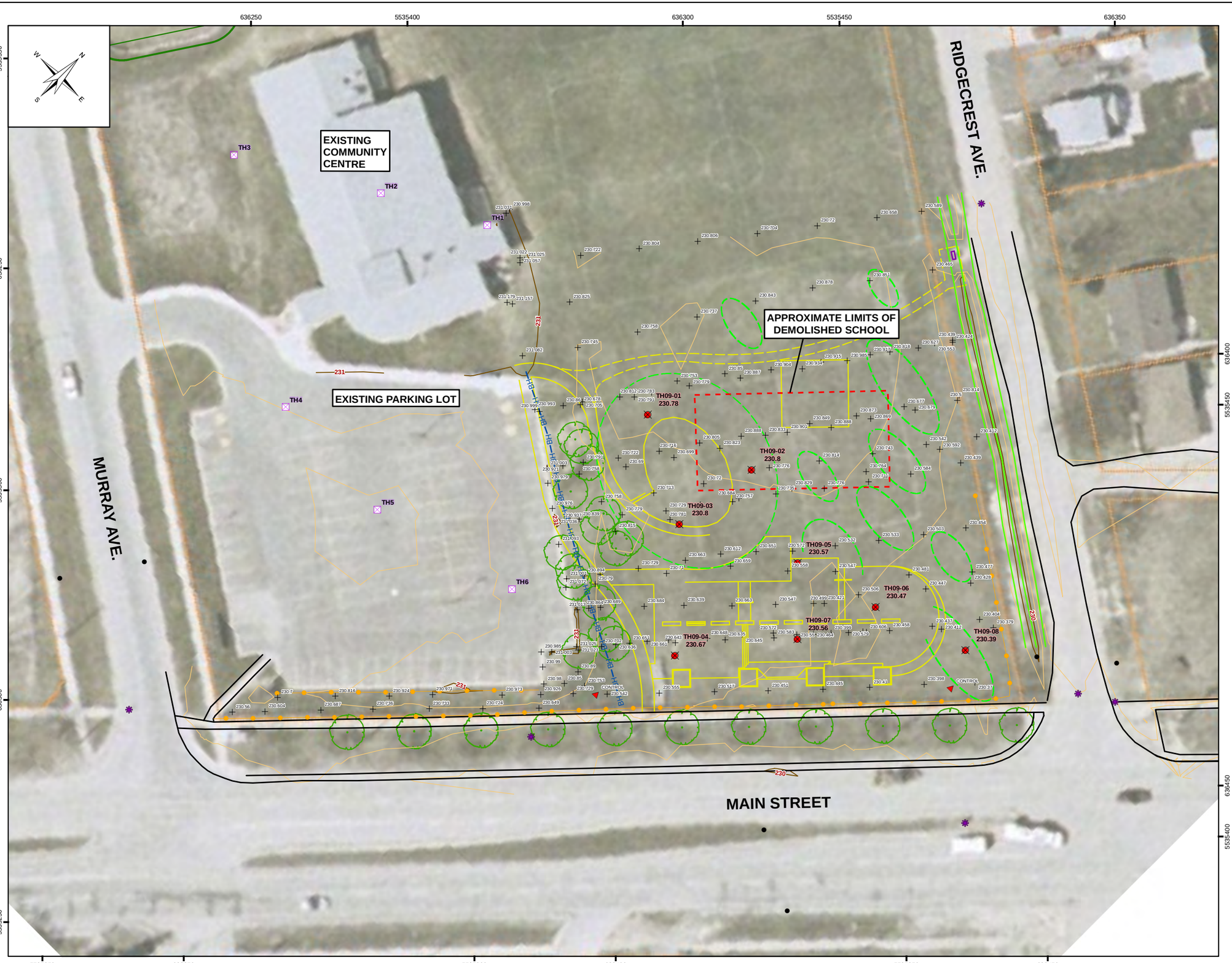
This report has been prepared for Skatliff + Miller + Murray Inc. and any use a third party make of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

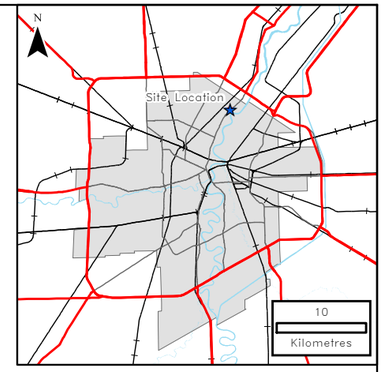
Statement of Limitations

The geotechnical investigation findings and recommendations of this report were prepared in accordance with generally accepted professional engineering principles and practice. The findings and recommendations are based on the results of field and laboratory investigations, combined with an interpolation of soil and groundwater conditions found at and within the depth of the test holes drilled by KGS at this site. If conditions encountered during construction appear to be different from those shown by the test holes drilled by KGS or if the assumptions stated herein are not in keeping with the design, this office should be notified in order that the recommendations can be reviewed and modified if necessary.

KGS Group makes no representation concerning the legal significance of its finding or the value of the property investigated.

FIGURE





LEGEND:

- CATCH BASIN
- MANHOLE
- TH09-01 TEST HOLE (KGS GROUP, 2009)
- TH1 TEST HOLE (M. BLOCK, 2004)
- SURVEY CONTROL POINT (TEMPORARY)
- GROUND ELEVATION (m)
- FENCE LINE
- BH—BH— BURIED HYDRO LINE
- DITCH
- MAILBOX
- 1 m INDEX CONTOUR
- 0.25 m CONTOUR
- PROPOSED CONTOUR
- PROPOSED CONCRETE
- TREE, EXISTING

10 0 10 20
Metres

SCALE: 1:600 METRIC 11"x17"

NOTES:

1. ALL UNITS ARE METRIC AND IN METRES UNLESS OTHERWISE SPECIFIED.
2. TRANSVERSE MERCATOR PROJECTION, NAD 1983, ZONE 14, CSRS. ELEVATIONS ARE IN METRES ABOVE SEA LEVEL (MSL), (CGVD 28).
3. SURVEY COMPLETED BY KGS GROUP AUG 07/2009.
4. AIRPHOTO SUPPLIED BY SCATLIFF + MILLER + MURRAY.
5. PROPOSED SKATE PARK OUTLINE PROVIDED BY SCATLIFF + MILLER + MURRAY.

NO.	YY/MM/DD	DESCRIPTION	BY
A	10/02/09	ISSUED WITH FINAL REPORT	MRJ

REVISIONS / ISSUE

KGS GROUP CONSULTING ENGINEERS

SCATLIFF+MILLER+MURRAY

RED RIVER COMMUNITY CENTRE
PROPOSED SKATE PARK
DEVELOPMENT

SITE PLAN

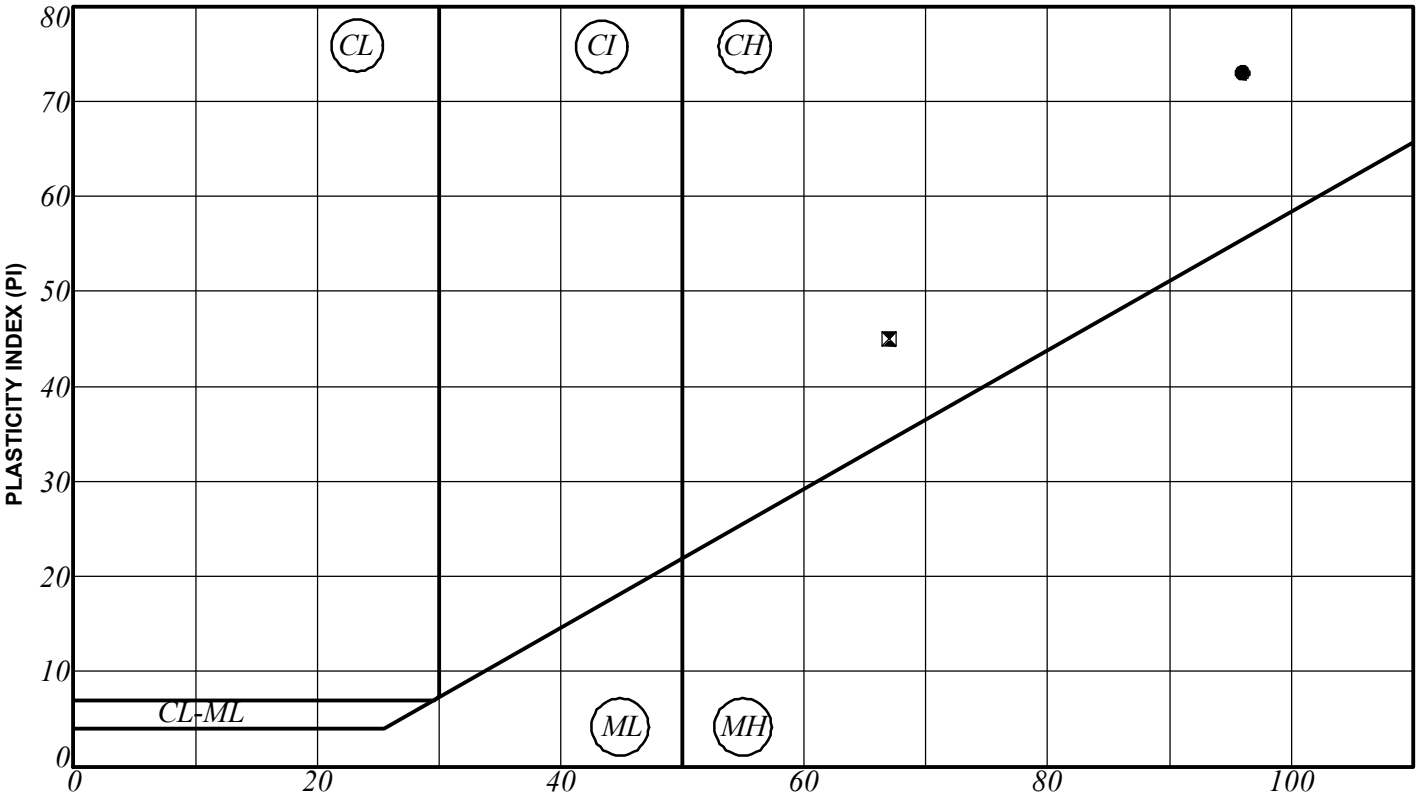
FEBRUARY 2010 | FIGURE 01 | 0

FileName: P:\Projects\2009\09-0109-04\Dwg\GIS\MXDs\REV0\09-0109-04_F01_REV0.mxd
11"x17" PLOT SCALE 1:1

APPENDICES

APPENDIX A

TEST HOLE LOGS



SYMBOL	HOLE	DEPTH (m)	SAMPLE #	LL	PL	PI	% SAND	% SILT	% CLAY	% MC	CLASSIFICATION
●	TH09-05	1.2		96	23	73				33.9	CH
⊠	TH09-05	4.7		67	22	45				42.4	CH

Notes:
ML - Low Plasticity Silt
MH - High Plasticity Silt
CL-ML - Silty Clay
CL - Low Plasticity Clay
CI - Intermediate Plasticity Clay
CH - High Plasticity Clay
LL - Liquid Limit
PL - Plastic Limit
PI - Plasticity Index
MC - Moisture Content
NP - Non-Plastic

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SCATLIFF+MILLER+MURRAY

Red River Community Centre Proposed Skate Park Development

A-LINE PLOT

Feb 2010	Figure A	Page 1 of 1

A-LINE PLOT (MAY 2004) P:\PROJECTS\2009\09-0109-04\DESIGN\GEO\LOGS\RRCC SKATE PARK (5-AUG-09).GPJ

KGS GROUP

SUMMARY LOG

HOLE NO. **TH09-01**

SHEET 1 of 1

CLIENT SCATLIFF+MILLER+MURRAY

PROJECT Red River Community Centre Proposed Skate Park Development

SITE NE corner of Main St. & Ridgecrest Ave.

LOCATION 58 m South of Ridgecrest Ave., 58 m West of Main St. (See Figure 1)

DRILLING METHOD 125 mm ø Solid Stem Auger, CT 250 Canterra

JOB NO. 09-0109-04
GROUND ELEV. 230.8 m
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 8/5/2009
UTM (m) N 5,535,380
E 636,340

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲ / DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ / Cu TORVANE (kPa) ◆ / PL MC LL / %
230.3				**TOPSOIL** - Black, moist, firm, high plasticity, trace rootlets. - Trace silt from 0 m to 0.30 m.		S1			
230	1	5		**SILTY CLAY (CH)** - Brownish grey, moist, stiff, high plasticity. - Trace silt lenses (3 mm diameter) below 1.52 m.		S2			
229						S3			
228.6	2			**SILT (ML)** - Tan, moist, soft, low plasticity. - Water infiltration below 2.29 m.		S4			
228	3	10		- 50 mm clay layer at 2.74 m. - Trace clay below 3.05 m. - Increased moisture content between 3.05 m and 3.35 m.		S5			
227.1				**SILTY CLAY (CH)** - Grey, moist, firm, high plasticity.					
227	4	15		- Trace silt nodules below 4.42 m.		S6			
226	5					S7			
225									
224.7	6	20		**END OF HOLE AT 6.10 m**					
224	7			Notes: 1. 0.61 m of bentonite at the bottom and 0.61 m bentonite at surface. Testhole backfilled with auger cuttings. 2. Testhole collapsed at 2.44 m below ground surface. 3. Ground elevation was taken from survey data.					
223	8	25							
222	9	30							
221									

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.

INSPECTOR O.Wang

APPROVED MRD. DATE 2/8/10

SPT & TORVANE 2 P:\PROJECTS\2009\09-0109-04\DESIGN\GEO\LOGS\RRCC SKATE PARK (5-AUG-09).GPJ

KGS GROUP

SUMMARY LOG

HOLE NO. **TH09-02**

CLIENT SCATLIFF+MILLER+MURRAY

PROJECT Red River Community Centre Proposed Skate Park Development

SITE NE corner of Main St. & Ridgecrest Ave.

LOCATION 43 m South of Ridgecrest Ave., 41 m West of Main St. (See Figure 1)

DRILLING METHOD 125 mm ø Solid Stem Auger, CT 250 Canterra

JOB NO. 09-0109-04
GROUND ELEV. 230.8 m
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 8/5/2009
UTM (m) N 5,535,392
E 636,359

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %
230.2				**CLAY FILL (CH)** - Brown/black, moist, firm, high plasticity, trace medium grained to coarse grained sand, trace fine gravel.			
				- Trace organics from 0 m to 0.15 m.		S1	
230	1	5		**SILTY CLAY (CH)** - Black, moist, stiff, high plasticity, trace silt nodules (1 mm diameter).			
				- Brown below 1.14 m.		S2	
229.0						S3	
	2			**SILT (ML)** - Tan, moist, soft, low plasticity, trace clay nodules (25 mm diameter).			
				- 50 mm clay layer at 2.29 m.			
228	3	10				S4	
227.4				**SILTY CLAY (CH)** - Mottled brown/grey, moist, firm, high plasticity, trace silt nodules (1-3 mm diameter).			
227	4	15				S5	
226	5						
225						S6	
224.7	6	20		**END OF HOLE AT 6.10 m**			
224	7						
		25					
223	8						
222	9	30					
221							

SPT (N) blows/0.15 m ▲
DYNAMIC CONE (N) blows/ft △
20 40 60

Cu POCKET PEN (kPa) ★
Cu TORVANE (kPa) ◆
20 40 60 80
PL MC LL
%
20 40 60 80

Notes:
1. 0.61 m of bentonite at the bottom and 0.61 m of bentonite at surface. Testhole backfilled with auger cuttings.
2. No water in testhole at end of drilling.
3. Testhole stayed open to bottom depth of 6.10 m at end of drilling.
4. Ground elevation was taken from survey data.

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.
INSPECTOR O.Wang
APPROVED MRT DATE 2/8/10

SPT & TORVANE 2 P:\PROJECTS\2009\09-0109-04\DESIGN\GEOLOGS\RRCC SKATE PARK (5-AUG-09).GPJ

KGS GROUP

SUMMARY LOG

HOLE NO. **TH09-03**

CLIENT SCATLIFF+MILLER+MURRAY

PROJECT Red River Community Centre Proposed Skate Park Development

SITE NE corner of Main St. & Ridgecrest Ave.

LOCATION 57 m South of Ridgecrest Ave., 30 m West of Main St. (See Figure 1)

DRILLING METHOD 125 mm ø Solid Stem Auger, CT 250 Canterra

JOB NO. 09-0109-04
GROUND ELEV. 230.8 m
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 8/5/2009
UTM (m) N 5,535,373
E 636,356

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %
230.3	0		**TOPSOIL** - Black, moist, firm, crumbly, high plasticity, trace fine to coarse grained sand.		S1	
230	1	5	**SILTY CLAY (CH)** - Brown, moist, stiff, high plasticity, trace silt nodules (1 - 5 mm diameter).		S2	
229						
228.8	2		**SILT (ML)** - Tan, moist, soft, low plasticity.		S3	
228			- Firm, trace clay below 2.74 m.			
227.6	3	10	**SILTY CLAY (CH)** - Mottled brown/grey, moist, firm, high plasticity, trace silt nodules (1-5 mm diameter).		S4	
227	4					
226	5	15			S5	
225					S6	
224.7	6	20	**END OF HOLE AT 6.10 m**			
224	7					
223	8	25				
222	9	30				
221						

SPT (N) blows/0.15 m ▲
DYNAMIC CONE (N) blows/ft △
20 40 60

Cu POCKET PEN (kPa) ★
Cu TORVANE (kPa) ◆
20 40 60 80
PL MC LL
%
20 40 60 80

Notes:
1. 0.61 m of bentonite at the bottom, 0.61 m of bentonite at surface. Testhole backfilled with auger cuttings.
2. Water level measured at 5.49 m below ground at end of drilling.
3. Testhole stayed open to bottom depth of 6.10 m at end of drilling.
4. Ground elevation was taken from survey data.

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.
INSPECTOR O.Wang
APPROVED MRT DATE 2/8/10

SPT & TORVANE 2 P:\PROJECTS\2009\09-0109-04\DESIGN\GEO\LOGS\RRCC SKATE PARK (5-AUG-09).GPJ

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SUMMARY LOG

HOLE NO. **TH09-04**

CLIENT SCATLIFF+MILLER+MURRAY

PROJECT Red River Community Centre Proposed Skate Park Development

SITE NE corner of Main St. & Ridgecrest Ave.

LOCATION 61 m South of Ridgecrest Ave., 11 m West of Main St. (See Figure 1)

DRILLING METHOD 125 mm ø Solid Stem Auger, CT 250 Canterra

JOB NO. 09-0109-04
GROUND ELEV. 230.7 m
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 8/5/2009
UTM (m) N 5,535,358
E 636,372

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲ / DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ / Cu TORVANE (kPa) ◆ / PL MC LL / %
230.4				**CLAY FILL (CH)** - Black, moist, firm, crumbly, high plasticity, trace fine to coarse grained sand, trace fine grained gravel.		S1			
230	1	5		**SILTY CLAY (CH)** - Black, moist, stiff, high plasticity. - Brown below 0.76 m.		S2			
229	2			- Trace sand layers (1 mm thick), trace silt layers (1 mm thick) below 1.52 m. - Trace oxidation below 2.13 m.		S3			
228.4				**SILT (ML)** - Tan, moist to wet, soft, low plasticity, trace oxidiation. - Water infiltration below 2.44 m. - No oxidation below 2.74 m.		S4			
228									
227.7	3	10		**SILTY CLAY (CH)** - Mottled brown/grey, moist, firm, high plasticity, trace of silt nodules (1-3 mm diameter), trace silt lenses (1 mm thick).		S5			
227	4								
226	5	15							
225									
224.6	6	20		**END OF HOLE AT 6.10 m**		S6			
224	7			Notes: 1. 0.61 m of bentonite at the bottom, 0.61 m of bentonite at surface. Testhole backfilled with auger cuttings. 2. Testhole stayed open to bottom depth of 6.10 m at end of drilling. 3. Ground elevation was taken from survey data.					
223	8	25							
222	9	30							
221									

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.

INSPECTOR O.Wang

APPROVED MRT. DATE 2/8/10

KGS GROUP

SUMMARY LOG

HOLE NO. **TH09-05**

CLIENT SCATLIFF+MILLER+MURRAY

PROJECT Red River Community Centre Proposed Skate Park Development

SITE NE corner of Main St. & Ridgecrest Ave.

LOCATION 39 m South of Ridgecrest Ave., 25 m West of Main St. (See Figure 1)

DRILLING METHOD 125 mm ø Solid Stem Auger, CT 250 Canterra

JOB NO. 09-0109-04
GROUND ELEV. 230.6 m
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 8/5/2009
UTM (m) N 5,535,384
E 636,375

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %
230.3				**CLAY FILL (CH)** - Dark brown, moist, firm, high plasticity, trace fine to coarse grained sand, trace fine grained gravel.		S1	
230				**SILTY CLAY (CH)** - Black, moist, stiff, high plasticity, trace medium grained sand.		S2	
	1			- Brown below 1.07 m.		S3	
229.1		5		**SILT (ML)** - Tan, moist to wet, soft, low to no plasticity.			
229	2			- Water infiltration below 1.83 m.		S4	
228							
227.9				**SILTY CLAY (CH)** - Brown, moist, stiff, high plasticity.		S5	
	3	10		- Firm below 3.05 m.			
227				- Trace oxidation between 3.66 m and 3.75 m.			
	4					S6	
226		15		- Grey, trace silt nodules (1-3 mm diameter) below 4.57 m.		S7	
	5			- Increased silt content between 4.57 m and 4.72 m.			
225							
	6	20				S8	
224							
	7					S9	
223		25					
	8						
222						S10	
	9	30		- Trace fine grained gravel below 9.14 m.			
221							

SPT (N) blows/0.15 m ▲
DYNAMIC CONE (N) blows/ft △
20 40 60

Cu POCKET PEN (kPa) ★
Cu TORVANE (kPa) ◆
20 40 60 80
PL MC LL
%
20 40 60 80

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.
INSPECTOR O.Wang
APPROVED MRJ DATE 2/8/10

SPT & TORVANE 2 P:\PROJECTS\2009\09-0109-04\DESIGN\GEO\LOGS\RRCC SKATE PARK (5-AUG-09).GPJ

KGS GROUP

SUMMARY LOG

HOLE NO. **TH09-05**

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲ / DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ / Cu TORVANE (kPa) ◆ / PL MC LL %
220	11	35				S11			
219									
218.4	12	40		END OF HOLE AT 12.19 m		S12			
218									
217	13	45							
216	14								
215	15	50							
214	16								
213	17	55							
212	18	60							
211	19								
210	20	65							
209	21	70							

Notes:
1. 0.61 m of bentonite at the bottom, 0.61 m at surface. Testhole backfilled with auger cuttings.
2. Testhole collapsed at 11.28 m below ground.
3. Ground elevation was taken from survey data.

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.

INSPECTOR O.Wang

APPROVED MRJ. DATE 2/8/10

SPT & TORVANE 2 P:\PROJECTS\2009\09-0109-04\DESIGN\GEO\LOGS\RRCC SKATE PARK (5-AUG-09).GPJ

KGS GROUP

SUMMARY LOG

HOLE NO. **TH09-06**

SHEET 1 of 1

CLIENT SCATLIFF+MILLER+MURRAY

PROJECT Red River Community Centre Proposed Skate Park Development

SITE NE corner of Main St. & Ridgecrest Ave.

LOCATION 27 m South of Ridgecrest Ave., 25 m West of Main St. (See Figure 1)

DRILLING METHOD 125 mm ø Solid Stem Auger, CT 250 Canterra

JOB NO. 09-0109-04
GROUND ELEV. 230.5 m
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 8/5/2009
UTM (m) N 5,535,387
E 636,387

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %
230.0	0	0		**CLAY FILL (CH)** - Brown/black, moist, firm, crumbly, high plasticity, trace fine to coarse grained sand, trace fine grained gravel, trace rootlets.		S1	
229.4	1	5		**SILTY CLAY (CH)** - Black, moist, stiff, high plasticity. - Brown below 1.10 m.		S2	
228.9	1.5			**SILT (ML)** - Tan, moist, soft, low to no plasticity.		S3	
228.5	2			**SILTY CLAY (CH)** - Mottled brown/grey, moist, firm, high plasticity, trace silt nodules. - Increased silt content between 2.13 m and 2.44 m.		S4	
227.9				**SILT (ML)** - Tan, moist, soft, low plasticity, trace clay nuggets (2-5 mm diameter).			
227.4	3	10		**SILTY CLAY (CH)** - Mottled brown/grey, moist, firm, high plasticity, trace silt nodules (2-5 mm diameter).		S5	
226	4	15					
225	5					S6	
224.4	6	20		**END OF HOLE AT 6.10 m**			
224							
223	7	25					
222	8						
221	9	30					

SPT (N) blows/0.15 m ▲
DYNAMIC CONE (N) blows/ft △
20 40 60

Cu POCKET PEN (kPa) ★
Cu TORVANE (kPa) ◆
20 40 60 80
PL MC LL
%
20 40 60 80

Notes:
1. 0.61 m of bentonite at bottom, 0.61 m at surface. Testhole backfilled with auger cuttings.
2. No water in testhole at end of drilling.
3. Testhole stayed open to bottom depth of 6.10 m at end of drilling.
4. Ground elevation was taken from survey data.

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.
INSPECTOR O.Wang
APPROVED MRT DATE 2/8/10

SPT & TORVANE 2 P:\PROJECTS\2009\09-0109-04\DESIGN\GEO\LOGS\RRCC SKATE PARK (5-AUG-09).GPJ

KGS GROUP

SUMMARY LOG

HOLE NO. **TH09-07**

CLIENT SCATLIFF+MILLER+MURRAY

PROJECT Red River Community Centre Proposed Skate Park Development

SITE NE corner of Main St. & Ridgecrest Ave.

LOCATION 41 m South of Ridgecrest Ave., 21 m West of Main St. (See Figure 1)

DRILLING METHOD 125 mm ø Solid Stem Auger, CT 250 Canterra

JOB NO. 09-0109-04
GROUND ELEV. 230.6 m
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 8/5/2009
UTM (m) N 5,535,376
E 636,381

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %
230.2				**CLAY FILL** - Black, dry, stiff, some fine to coarse grained sand, trace fine grained gravel.			
230	1			**SILTY CLAY (CH)** - Mottled black/brown, moist, stiff, high plasticity, trace silt nodules (1-3 mm diameter).		S1	
						S2	
229.0		5					
229				**SILT (ML)** - Tan, moist, soft, low to no plasticity.		S3	
228.7				**SILTY CLAY (CH)** - Mottled brown/grey, moist, stiff, high plasticity, trace silt nodules (1-2 mm diameter).		S4	
228.4	2			**SILT (ML)** - Tan, moist, soft, low to no plasticity.			
228							
227.7				**SILTY CLAY (CH)** - Mottled brown/grey, moist, stiff, high plasticity, trace silt nodules (1-2 mm diameter).			
	3	10		- Firm below 3.05 m.		S5	
227				- Increase silt content between 3.55 m and 3.66 m.			
	4						
226		15					
	5						
225							
224.5	6	20		**END OF HOLE AT 6.10 m**		S6	
224							
	7						
223		25					
	8						
222							
	9	30					
221							

SPT (N) blows/0.15 m ▲
DYNAMIC CONE (N) blows/ft △
20 40 60

Cu POCKET PEN (kPa) ★
Cu TORVANE (kPa) ◆
20 40 60 80
PL MC LL
%
20 40 60 80

Notes:
1. 0.61 m of bentonite at the bottom, 0.61 m at the surface. Testhole backfilled with auger cuttings.
2. Water level measured at 4.27 m below ground at end of drilling.
3. Testhole stayed open to bottom depth of 6.10 m at end of drilling.
4. Ground elevation was taken from survey data.

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.
INSPECTOR O.Wang
APPROVED MRT DATE 2/8/10

SPT & TORVANE 2 P:\PROJECTS\2009\09-0109-04\DESIGN\GEO\LOGS\RRCC SKATE PARK (5-AUG-09).GPJ

KGS GROUP

SUMMARY LOG

HOLE NO. **TH09-08**

CLIENT SCATLIFF+MILLER+MURRAY

PROJECT Red River Community Centre Proposed Skate Park Development

SITE NE corner of Main St. & Ridgecrest Ave.

LOCATION 15 m South of Ridgecrest Ave., 19 m West of Main St. (See Figure 1)

DRILLING METHOD 125 mm ø Solid Stem Auger, CT 250 Canterra

JOB NO. 09-0109-04
GROUND ELEV. 230.4 m
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 8/5/2009
UTM (m) N 5,535,394
E 636,401

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %
230.1	0	0	**CLAY FILL (CH)** - Black, damp to moist, firm, high plasticity, trace rootlets, trace fine to coarse grained sand.		S1	
230			**SILTY CLAY (CH)** - Mottled black/brown, moist, stiff, high plasticity.			
	1				S2	
229						
228.9		5	**SILT (ML)** - Tan, moist, soft, no plasticity.			
228.4					S3	
	2		**SILTY CLAY (CH)** - Mottled brown/grey, moist, stiff, high plasticity, trace silt lenses (1 mm thick).		S4	
228.2						
228			**SILT (ML)** - Tan, moist, soft, low plasticity.			
227.5						
	3	10	**SILTY CLAY (CH)** - Mottled brown/grey, moist, stiff, high plasticity, trace silt nodules.			
227						
			- Firm below 3.66 m.			
	4					
226					S5	
		15				
	5					
225						
	6	20			S6	
224						
	7					
223		25	- Grey below 7.62 m.		S7	
	8					
222						
					S8	
	9	30	- Trace fine grained gravel below 9.14 m.			
221						

SPT (N) blows/0.15 m ▲
DYNAMIC CONE (N) blows/ft △
20 40 60

Cu POCKET PEN (kPa) ★
Cu TORVANE (kPa) ◆
20 40 60 80
PL MC LL
%
20 40 60 80

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.
INSPECTOR O.Wang
APPROVED MRT. DATE 2/8/10

SPT & TORVANE 2 P:\PROJECTS\2009\09-0109-04\DESIGN\GEO\LOGS\RRCC SKATE PARK (5-AUG-09).GPJ

KGS GROUP

SUMMARY LOG

HOLE NO. **TH09-08**

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲ / DYNAMIC CONE (N) blows/ft △ (20 40 60)	Cu POCKET PEN (kPa) ★ / Cu TORVANE (kPa) ◆ (20 40 60 80)	PL MC LL % (20 40 60 80)
220	11	35		- Soft below 10.67 m.		S9			◆ ◆	
219						S10			◆ ◆	
218.2	12	40		END OF HOLE AT 12.19 m					◆	
218										
217	13	45								
216	14									
215	15	50								
214	16									
213	17	55								
212	18	60								
211	19									
210	20	65								
209	21	70								

Notes:
1. 0.61 m of bentonite at the bottom, 0.61 m at surface. Testhole backfilled with auger cuttings.
2. No water in testhole at end of drilling.
3. Testhole squeezing between 1.54 m and 3.05 m below ground.
4. Testhole stayed open to bottom depth of 12.19 m at end of drilling.

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.

INSPECTOR O.Wang

APPROVED MRJ. DATE 2/8/10

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