APPENDIX 'A'

GEOTECHNICAL AND ENVIRONMENTAL REPORTS

TREK GEOTECHNICAL

Quality Engineering | Valued Relationships

Morrison Hershfield

Polo Park Infrastructure Upgrades

Prepared for:

Ron Bruce
Morrison Hershfield
25 Scurfield Blvd, Unit 1
Winnipeg, MB R3Y 1G4
Attention: Ron Bruce

Distribution:

Project Number:
0035 008 00

Date:
September 2013
Final Report

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TREK GEOTECHNICAL Quality Engineering | Valued Relationships

September 27, 2013 Our File No. 0035 008 00

Ron Bruce
Morrison Hershfield
25 Scurfield Blvd, Unit 1
Winnipeg, MB R3Y 1G4

RE: Sub-Surface Investigation Report for Polo Park Infrastructure Upgrades

TREK Geotechnical Inc. is pleased to submit our Report for the sub-surface investigations for the Polo Park Infrastructure Upgrades.

Please contact the undersigned if you have any questions. Thank you for the opportunity to serve you on this assignment.

Sincerely,

TREK Geotechnical Inc.
Per:

Nelson John Ferreira, M. Sc., P. Eng.
Geotechnical Engineer, Principal
Tel: 204.975.9433 ext. 103

cc: Stephen Renner, C.E.T. (TREK Geotechnical)
Beta Taryana, E.I.T. (TREK Geotechnical)

Revision History

Revision No.	Author	Issue Date	Description
0	SLR	September 27, 2013	Final Report

Authorization Signatures

Prepared By:

Stephen Renner, C.E.T.
Geotechnical Technologist

Reviewed By:

PROVINCE OF MANITOBA
N. J. FERREIRA
Member
22892
REGISTERED PROFESSIONAL ENGINEER
Sept. 27, 2013

Nelson John Ferreira, M. Sc., P.Eng.
Geotechnical Engineer

APEGM
Certificate of Authorization
Trek Geotechnical Inc.
No. 4877 Date: Sept. 27, 2013

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1.0 Introduction

This report summarizes the results of the sub-surface investigation completed for the proposed Polo Park Infrastructure Upgrades. Information regarding the asphalt, concrete, road base for the existing road, and the soil stratigraphy beneath the pavement structure is provided.

2.0 Sub-Surface Investigation and Laboratory Program

A total of 24 test holes were drilled along St. James St., Ellice Ave., St. Matthews Ave., and Madison St. as part of the sub-surface investigation. The test holes drilled at each location are listed in Table 1 and the test hole locations are shown on Figures 01.

Table 1. List of Test Holes Drilled at Each Alley

Street Location	Test Hole
St. James St. between Yukon Ave. and Maroons Rd.	TH13-05, TH13-13 to TH13-19B, and TH13-21
Ellice Ave. between Century St. and Milt Stegall Rd.	TH13-20, TH13-22, and TH13-23
St. Matthews Ave. between Century St. and Madison St.	TH13-01 and TH13-02
St. Matthews Ave. between St. James St. and Empress St.	TH13-06 to TH13-12
Madison St. between Century St. And St. Matthews Ave.	TH13-03
St. James Industrial Park between Madison St. and St. James St.	TH13-04

The sub-surface investigation was conducted from August 26 to 28, 2013. The test holes were drilled to a depth of 3.1 m below road surface by Paddock Drilling Ltd. using their MP8 truck mounted drill rig equipped with 125 mm diameter solid stem augers. At test hole TH13-19 only the pavement structure was drilled as overhead and underground utilities prevented further drilling. The pavement structure (asphalt and/or concrete) was cored by Quality Coring using a portable coring drill press equipped with a hollow 150 mm diameter diamond core drill bit. The sub-surface conditions were observed during drilling and visually classified by Beta Taryana, EIT of TREK Geotechnical Inc. (TREK). Other pertinent information such as groundwater and drilling conditions were also recorded during the drilling investigation.

Disturbed (auger cuttings) samples retrieved during the sub-surface investigation were transported to TREK's material testing laboratory for further testing. Pavement core samples were also retrieved and logged at TREK's material testing laboratory. The laboratory testing program consisted of moisture content determination on all samples, and Atterberg limits and grain size analysis (hydrometer method) on select samples.

Information gathered is included in separate appendices (Appendix A to C). The information provided in the Appendices includes test hole logs, laboratory testing summary tables and results, and photos of the asphalt and concrete cores.

Test hole locations shown on Figures 01 are based on measured distances from existing infrastructure such as hydro poles, light standards, red light cameras, street intersections and/or edge of pavement.

Figure

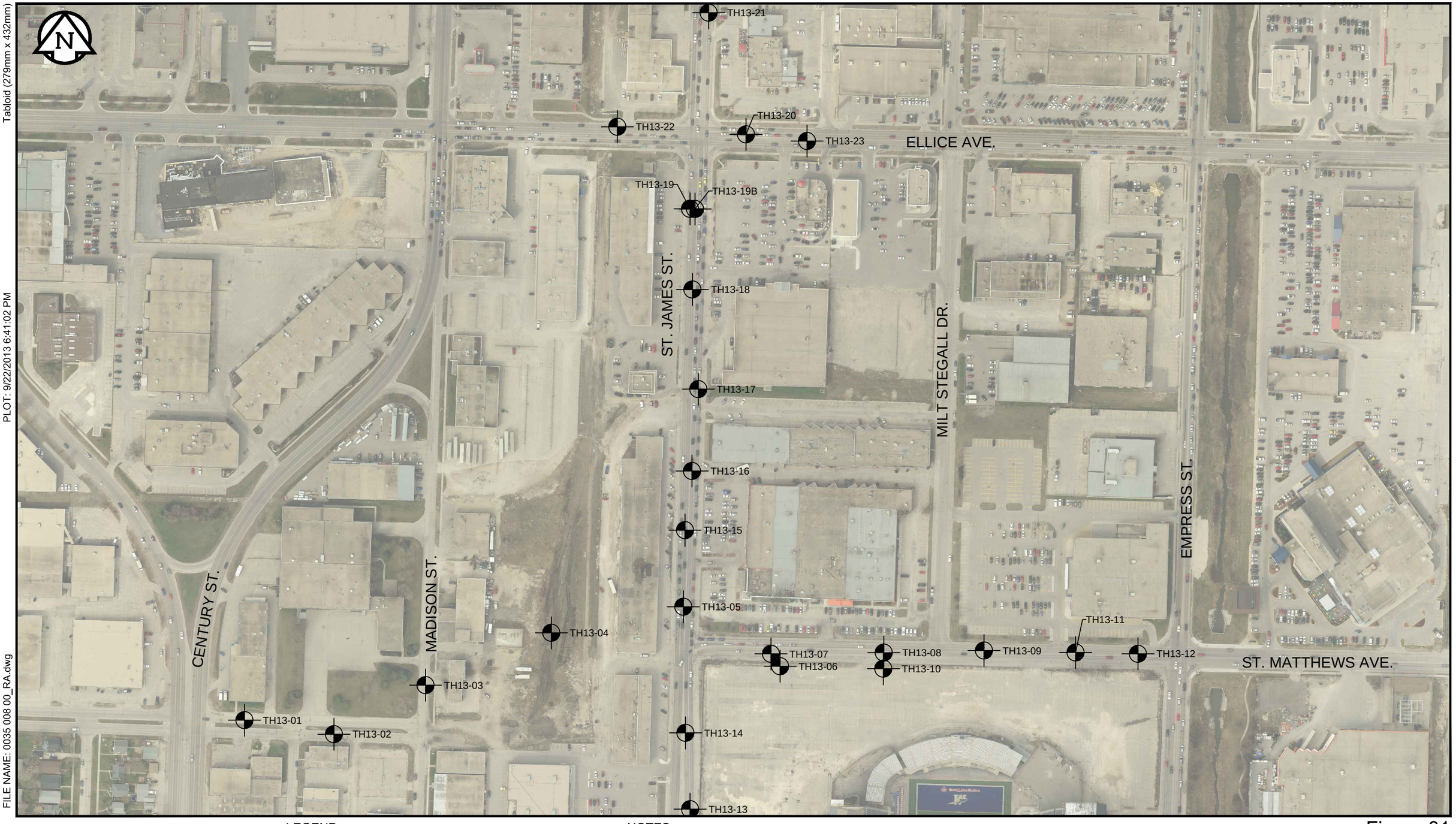
TREK GEOTECHNICAL

0035 008 00
Morrison Hershfield
Polo Park Infrastructure Upgrades

Tabloid (279mm x 432mm)

PLOT: 9/22/2013 6:41:02 PM

FILE NAME: 0035 008 00_RA.dwg



0 25 50 75 100m
SCALE : 1:2500 (279mm x 432mm)

LEGEND :

TEST HOLE (TREK, AUGUST 26 TO 28, 2013)

NOTES :

1. AERIAL IMAGE PROVIDED BY MORRISON HERSHFIELD

Figure 01
Test Hole Location Plan

Appendix A

Test Hole Logs

Sub-Surface Log

Test Hole TH13-01
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. Matthews Ave between Century St. and Madison St.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		CONCRETE - 216 mm thick		C136		
		CLAY (Fill) - silty, trace coarse grained sand, trace organics, trace silt inclusions (<10 mm diam.)		C137	●	
0.5		- dark grey to black - moist, firm, high plasticity		G138	●	✤
		SILT - trace clay, brown, moist, firm, low plasticity		G139	●	
		CLAY - silty, trace silt inclusions (<10 mm diam.), trace oxidation - grey - moist, stiff - high plasticity		G140	●	✤△
1.0		SILT - some clay, trace fine grained sand, brown, moist, soft, low plasticity		G141	●	
		- clayey below 1.2 m		G142	●	✤
1.5		- some clay below 1.5 m		G143	●	
		CLAY - silty, trace silt inclusions (<5 mm diam.) - grey - moist, firm - high plasticity		G144	●	✤△
2.0						
2.5						
3.0				G145	●	✤△

END OF HOLE AT 3.1 m in CLAY

Notes:
1) Sloughing observed below 1.1 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement
4) Test hole Located on St Matthews Ave. between Century St. and Madison St., west bound, median lane, 4.8 m south from edge of north curb, 19.8 m E from LP# 2-040-401.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-02
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. Matthews Ave between Century St. and Madison St.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 26, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		CONCRETE - 203 mm thick		C8		
		SILT and CLAY (Fill) - trace sand, trace silt inclusions (<5 mm diam.) - dark grey - moist, stiff - high plasticity		G9	●	△✤
0.5				G10	●	✤
1.0				G11	●	△✤
		CLAY - silty, trace silt inclusions (<5 mm diam.) - grey - moist, stiff - high plasticity		G12	●	△ ✤
1.5				G13	●	✤
		- silt seam (100 mm thick) at 1.8 m - soft to firm below 1.9 m		G14	●	
2.0						
2.5						
3.0				G15	●	✤△

END OF HOLE AT 3.1 m IN CLAY

Notes:
1) No seepage or sloughing observed.
2) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
3) Test hole located on St Matthews Ave. between Century St. and Madison St., east bound, median lane, 5.2 m north from edge of S curb, 82.6 m east from LP# 2-040-401.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-03
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	Madison St. between Century St. and St. Matthews Ave.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 25 mm thick		C126
		CONCRETE - 152 mm thick		C127
		CLAY (Fill) - silty, trace gravel (<10 mm diam.), trace silt inclusions (<5 mm diam.) - dark grey - moist, firm - high plasticity		G128
0.5				G129
				G130
		SILT AND CLAY - trace fine grained sand, trace oxidation - brown - moist, firm - intermediate plasticity		G131
1.0				
		CLAY - silty, trace silt inclusions (<5 mm diam.), trace oxidation - grey - moist, firm - high plasticity		G132
1.5				G133
				G134
2.0				
2.5				G135
3.0				

Bulk Unit Wt (kN/m^3): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 50 100 150 200 250

Test Type: △ Torvane △ | ✤ Pocket Pen. ✤ | ☒ Qu ☒ | ○ Field Vane ○

END OF HOLE AT 3.1 m in CLAY

Notes:
1) Sloughing observed below 2.3 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Test hole located on Madison St. between Century St. and St. Matthews Ave., north bound, 4.9 m east from edge of west curb, 24.1 m north from edge of north curb on St. Matthews Ave.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-04
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. James Industrial between Madison St. and St. James St.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 26, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		SAND (Fill) - trace gravel (<10 mm diam.) - grey, dry, compact - poorly graded medium and coarse grained sand - granular		G1
0.5		CLAY (Fill) - silty, trace coarse grained sand, trace silt inclusions (<10 mm diam.) - dark grey, moist, firm, high plasticity		G2
		SILT - clayey, trace fine and coarse grained sand - brown, moist, soft, low plasticity		G3
				G4
1.0		CLAY - silty, trace silt inclusions (<5 mm diam.) - grey - moist, stiff - high plasticity		
1.5				G5
				G6
2.0				
2.5		- firm below 2.7 m		
3.0				G7

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21
Particle Size (%): 0 20 40 60 80 100
PL MC LL: 0 20 40 60 80 100
Undrained Shear Strength (kPa): 0 50 100 150 200 250
Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

END OF HOLE AT 3.1 m IN CLAY

Notes:
1) No Sloughing or seepage observed.
2) Test hole backfilled with auger cuttings and bentonite.
3) Test hole located on St. James Industrial between Madison St. and St. James St., 46.0 m west from west side of 916 St. James St., 92.2 m north from north side of 860 St. James St.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-05
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. James St. between Ellice Ave. and St. Matthews Ave.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 30, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 108 mm thick		C197
		CONCRETE - 184 mm thick		C198
		CLAY (Fill) - silty, trace sand, trace silt inclusions (<5 mm diam.), trace organics, black, moist, stiff, high plasticity		G199
				G200
0.5		SILT - trace clay, trace fine grained sand - brown - moist, soft - low plasticity		G201
1.0		CLAY - silty, trace silt inclusions (<5 mm diam.) - brown - moist, stiff - high plasticity		G202
1.5				G203
2.0		- silt seam (50 mm thick) at 2.2 m		G204
2.5				G205
3.0		END OF HOLE AT 3.1 m in CLAY		

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21
Particle Size (%): 0 20 40 60 80 100
PL MC LL: 0 20 40 60 80 100
Undrained Shear Strength (kPa): 0 50 100 150 200 250
Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

Notes:
1) Sloughing observed below 0.8 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Test hole located on St. James St. between Ellice Ave. and St. Matthews Ave., south bound, median lane, 5.6 m east from edge of west curb, 11.2 m south from 9th hydro pole.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-06

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. Matthews Ave between St. James St. and Empress St.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		SAND (Fill) - trace to some gravel (<15 mm diam.), trace clay, grey, dry, compact - well graded medium and coarse grained sand to fine gravel, granular		G146
0.5		CLAY (Fill) - silty, trace oxidation, trace coarse grained sand, trace organics - dark grey - moist, stiff - high plasticity		G147
1.0		SILT AND CLAY - trace sand, trace oxidation - dark grey, moist, firm, intermediate plasticity		G148
		CLAY - silty, trace oxidation, trace silt incluions (<5 mm diam.) - grey - moist, stiff, high plasticity		G149
1.5		SILT - trace clay, trace fine grained sand - brown - wet, soft - low plasticity		G150
		CLAY - silty, trace silt inclusions (<10 mm diam.), trace oxidation - grey - moist, firm - high plasticity		G151
2.0		- silt seam (100 mm thick) at 2.3 m		G152
2.5				G153
3.0		END OF HOLE AT 3.1 m in SILT		

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 50 100 150 200 250

Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

Notes:
1) Sloughing observed below 1.2 m depth.
2) No seepage observed.
3) Test hole Backfilled with auger cuttings and bentonite.
4) Test hole located on St. Matthews Ave. between St. James St. and Empress St., 6.1 m south from edge of south curb, 4.5 m west from LP# 2-048-405.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-07
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. Matthews Ave between St. James St. and Empress St.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 26, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) 0 50 100 150 200 250 — Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○
		ASPHALT - 57 mm thick		C33		
		CONCRETE - 210 mm thick		C34		
		CLAY (Fill) - trace sand, trace silt inclusions (<10mm diam.), trace oxidation - grey - moist, firm, high plasticity		G35	●	✤
0.5				G36	●	△ ✤
		SILT - trace clay, trace fine grained sand - brown - moist, soft - low plasticity				
1.0				G37	●	
		CLAY - silty, trace silt inclusions (<5mm diam.), trace oxidation - grey - moist, stiff - high plasiticy		G38	●	△ ✤
1.5		- silt seam (100 mm thick) at 1.6 m - firm below 1.7 m		G39	●	△ ✤
2.0				G40	●	✤
2.5		- soft below 2.4 m				
				G41	●	✤ △
3.0		END OF HOLE AT 3.1 m in CLAY				

Notes:
1) Sloughing observed below 0.9 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Test hole located on St. Matthews Ave. between St. James St. and Empress St., east bound, curb lane, 2.4 m north from edge of south curb, 5.1 m west from LP# 2-048-405.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-08

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. Matthews Ave between St. James St. and Empress St.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 26, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 121 mm thick		C42
		CONCRETE - 140 mm thick		C43
		SILT and CLAY (Fill) - trace coarse grained sand, trace organics - black - moist, firm - intermediate plasticity		G44
0.5				G45
1.0		CLAY - silty, trace oxidation - dark grey - moist, stiff - high plasticity		G46
1.5				G47
2.0		- silt seam (100 mm thick) at 2.2 m - grey, trace silt inclusions (<10mm diam.) below 2.3 m		G48
2.5				
3.0				G49

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 50 100 150 200 250

Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

END OF HOLE AT 3.1 m in CLAY

Notes:
1) Sloughing observed below 1.5 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Test hole located on St. Matthews Ave. between St. James St. and Empress St., east bound, median lane, 5.2 m north from edge of south curb, 27.3 m east from LP# 2-048-405.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

Sub-Surface Log

Test Hole TH13-09
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. Matthews Ave between St. James St. and Empress St.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT - 108 mm thick		C117		
		CONCRETE - 127 mm thick		C118		
		CLAY (Fill) - silty, trace coarse grained sand - dark grey - moist, stiff - high plasticity		G119	●	
0.5				G120	●	✤ △
		SILT - trace fine grained sand, trace clay - brown - moist, firm, low plasticity		G121	●	
1.0		CLAY - silty, trace silt inlcusions (<5 mm diam.) - brown - moist, firm to stiff - high plasticity				
		- silt seam (100 mm thick) at 1.3 m		G122	●	✤ △
1.5				G123	●	✤
2.0		SILT - trace clay, trace fine grained sand - brown - wet, soft - low plasticity		G124	●	
2.5						
				G125	●	
3.0						

END OF HOLE AT 3.1 m in SILT

Notes:
1) Sloughing observed below 1.6 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Test hole located on St. Matthews Ave. between St. James St. and Empress St., west bound, median lane, 5.6 m south from edge of north curb , 46.5 m east from LP# 2-048-406.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-10
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. Matthews Ave between St. James St. and Empress St.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		SAND (Fill) - trace to some gravel (<10 mm diam.), trace clay, grey, dry, compact, well graded coarse grained sand to fine gravel, granular		G154
		ORGANIC CLAY (Topsoil) - silty, trace fine and coarse grained sand, trace silt inclusions (<5mm diam.), trace organics - black - moist, firm - high plasticity		G155
0.5				
		CLAY (Fill) - silty, trace coarse grained sand, trace oxidation - grey - moist, stiff - high plasticity		G156
1.0				
				G157
1.5		- dark grey below 1.5 m		
				G158
		CLAY - silty, trace silt incluions (<10 mm diam.) - grey - moist, firm - high plasticity		
2.0				
		- silt seam (100 mm thick) at 2.4 m		G159
2.5				
				G160
3.0				

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21
Particle Size (%): 0 20 40 60 80 100
PL MC LL: 0 20 40 60 80 100
Undrained Shear Strength (kPa): 0 50 100 150 200 250
Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

END OF HOLE AT 3.1 m in SILT

Notes:
1) Sloughing observed below 2.1 m depth.
2) No seepage observed.
3) Test hole Backfilled with auger cuttings and bentonite.
4) Test hole located on St. Matthews Ave. between St. James St. and Empress St., 6.1 m south from edge of south curb, 27.3 m east from LP # 2-048-405.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-11
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. Matthews Ave between St. James St. and Empress St.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 102 mm thick		C107
		CONCRETE - 121 mm thick		C108
		SAND (Fill) - trace to some gravel (<15 mm diam.), trace clay, grey, dry, compact, well graded coarse sand to fine gravel, granular		G109
0.5		CLAY (Fill) - trace silt inclusion (<5 mm diam.), trace coarse grained sand - black - moist, firm - intermediate plasticity		G110
1.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace oxidation - grey - moist, stiff - high plasticity		G111
				G112
1.5		SILT - trace clay, trace fine grained sand - brown - moist, soft - low plasticity		G113
2.0				G114
2.5		CLAY - silty, trace oxidation - grey - moist, stiff - high plasticity - silt seam (100 mm thick) at 2.7 m, firm below 2.7 m		G115
3.0				G116

Bulk Unit Wt (kN/m^3): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 50 100 150 200 250

Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

END OF HOLE AT 3.1 m in CLAY

Notes:
1) Sloughing observed below 2.0 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Test hole located on St. Matthews Ave. between St. James St. and Empress St., west bound, median lane, 5.3 m south from edge of north curb, 5.0 m east from LP# 2-048-403.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-12

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. Matthews Ave between St. James St. and Empress St.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT - 83 mm thick		C98		
		CONCRETE - 146 mm thick		C99		
		CLAY (Fill) - silty, trace sand, trace silt inclusions (<5 mm diam.) - black, moist, firm, high plasticity		G100	●	
0.5		- brown below 0.5 m		G101	●	△✤
				G102	●	△✤
		CLAY - silty, trace silt seams (<100 mm thick), black, moist, firm, high plasticity - brown below 0.8 m				
1.0						
1.5				G103	●	✤
		SILT - trace clay, trace fine grained sand - brown - moist, soft - low plasticity		G104	●	
2.0				G105	●	
2.5		CLAY - silty, trace oxidation - brown - moist, stiff - high plasticity				
				G106	●	△✤
3.0		END OF HOLE AT 3.1 m in CLAY				

Notes:
1) Sloughing observed below 2.0 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Test hole located on St. Matthews Ave. between St. James St. and Empress St., west bound, median lane, 5.3 m south from edge of north curb, 4.5 m west from LP# 2-048-402.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-13
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. James St. between St. Matthews Ave. and Maroons Rd.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 26, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT - 38 mm thick		C16		
		CONCRETE - 203 mm thick		C17		
		SAND (Fill) - trace to some gravel (<20 mm diam.), trace clay, light brown, wet, well graded fine sand to coarse grained gravel, limestone		G18	●	
0.5		CLAY (Fill) - trace fine and coarse grained sand - grey - moist, stiff - high plasticity				
1.0				G19	●	△ ✤
				G20	●	△ ✤
1.5						
		CLAY - silty, trace oxidation, trace silt inclusions (<5 mm diam.), trace silt seams (<100 mm thick), mottled brown and grey, moist, firm to stiff, high plasticity - grey below 1.8 m		G21	●	△ ✤
2.0						
2.5		- firm below 2.4 m				
				G22	●	✤
3.0		END OF HOLE AT 3.1 m in CLAY				

Notes:
1) Sloughing observed below 1.4 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Test hole located on St, James St. between St. Matthews Ave. and Maroons Rd., north bound, curb lane, 2.6 m west from edge of east curb, 1.7 m north from LP# 2-048-769.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-14
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. James St. between St. Matthews Ave. and Maroons Rd.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 26, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 76 mm thick		C23
		CONCRETE - 178 mm thick		C24
		CLAY (Fill) - trace sand - dark grey - moist, stiff - high plasticity		G25 G26
1.0		SILT - trace fine grained sand, trace clay - brown - moist, soft, low plasticity		G27
		CLAY - silty, trace silt inclusions (<10 mm diam.) - brown, moist, firm, high plasticity		G28
1.5		SILT - trace clay, trace fine grained sand - brown - moist, soft, low plasticity		G29
2.0		CLAY - silty, trace silt inclusions (<5 mm diam.), trace oxidation - grey - moist, firm to stiff - high plasticity - silt seam (100 mm thick) at 1.9 m		G30 G31
2.5		- soft to firm below 2.7 m		
3.0				G32

Bulk Unit Wt (kN/m^3): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 50 100 150 200 250

Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

END OF HOLE AT 3.1 m IN CLAY

Notes:
1) No sloughing or seepage observed.
2) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
3) Test hole located on St, James St. between St. Matthews Ave. and Maroons Rd., north bound, median lane, 5.1 m west from edge of east curb, 32.6 m south from LP# 2-099-364.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-15
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. James St. between Ellice Ave. and St. Matthews Ave.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT - 44 mm thick		C61		
		CONCRETE - 273 mm thick		C62		
		CLAY (Fill) - silty, trace sand - black, moist, soft, low plasticity		G63		
0.5		- brown below 0.5 m				
		SILT - trace clay, trace fine grained sand, brown, moist, soft, low plasticity		G64		
		CLAY - silty, dark grey, moist, firm high plasticity				
		- stiff below 0.9 m		G65		
1.0						
				G66		
1.5						
				G67		
2.0		- grey below 2.0 m - silt seam (100 mm thick) at 2.1 m, firm below 2.1 m				
				G68		
2.5						
				G69		
3.0						

END OF HOLE AT 3.1 m in CLAY

Notes:
1) Sloughing observed below 2.0 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Test hole located on St. James St. between Ellice Ave. and St. Matthews Ave., south bound, median lane, 5.1 m east from edge of west curb, 1 m south from 8th hydro pole.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-16
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. James St. between Ellice Ave. and St. Matthews Ave.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Material Description	Sample Type	Sample Number
	ASPHALT - 51 mm thick		C70
	CONCRETE - 178 mm thick		C71
	CLAY (Fill) - silty, trace to some gravel (<15 mm diam.), trace silt inclusions (<5mm diam.) - black - moist, stiff - high plasticity		G72
0.5			G73
	SILT - trace clay, trace fine grained sand - brown - moist, firm, low plasticity		G74
1.0	CLAY - silty, trace silt inclusions (<5 mm diam.), trace oxidation - grey - moist, stiff - high plasticity		G75
1.5			G76
2.0	- silt seam (50 mm thick) at 2.0 m		G77
2.5	- firm below 2.4 m		
3.0			G78

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 50 100 150 200 250

Test Type: △ Torvane △ | ✤ Pocket Pen. ✤ | ☒ Qu ☒ | ○ Field Vane ○

END OF HOLE AT 3.1 m in CLAY

Notes:
1) Sloughing observed below 2.2 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Test hole located on St. James St. between Ellice Ave. and St. Matthews Ave., north bound, median lane, 8.7 m east from edge of west curb, 2.3 m south from 7th hydro pole.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-17
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. James St. between Ellice Ave. and St. Matthews Ave.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 51 mm thick		C79
		CONCRETE - 241 mm thick		C80
		SAND (Fill) - trace clay, trace to some gravel (<15 mm diam.), grey, dry, compact, well graded coarse sand to fine gravel, granular		G81
0.5		CLAY (Fill) - silty, trace gravel (<10 mm diam,), trace oxidation, trace organics - mottled dark grey and brown - moist, stiff, high plasticity		G82
1.0		SILT - trace fine grained sand, trace clay - grey - moist, soft - low plasticity		G83
		- brown below 1.2 m		G84
1.5		CLAY - silty, trace silt inclusions (<5 mm diam.), trace oxidation - grey - moist, firm - high plasticity		G85
2.0		- silt seam (25 mm thick) at 2.3 m		G86
2.5				G87
3.0		END OF HOLE AT 3.1 m in CLAY		

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 50 100 150 200 250

Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

Notes:
1) Sloughing observed below 2.2 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) St. James St. between Ellice Ave. and St. Matthews Ave., north bound, curb lane, 2.2 m west from edge of east curb, 8.7 m north from 6th hydro pole.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-18
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. James St. between Ellice Ave. and St. Matthews Ave.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 64 mm thick		C52
		CONCRETE - 210 mm thick		C53
		SAND (Fill) - trace clay, trace to some gravel (<15 mm diam.), grey, wet, compact, well graded coarse sand to fine gravel, granular		G54
0.5		CLAY (Fill) - silty, trace gravel (<10 mm diam.), trace fine grained sand, trace silt inclusions (<5mm diam.) - grey - moist, very stiff - high plasticity		G55
1.0		SILT - trace clay, trace fine grained sand - brown - moist, soft, low plasticity - wet below 1.2 m		G56
				G57
1.5				
				G58
2.0				
		CLAY - silty, trace silt inclusions (<5 mm diam.) - grey - moist, stiff, high plasticity - firm below 2.4 m		G59
2.5				
				G60
3.0		END OF HOLE AT 3.1 m in CLAY		

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21
Particle Size (%): 0 20 40 60 80 100
PL MC LL: 0 20 40 60 80 100
Undrained Shear Strength (kPa): 0 50 100 150 200 250
Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

Notes:
1) Sloughing observed below 1.1 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) St. James St. between Ellice Ave. and St. Matthews St., south bound, median lane, 5.2 m east from edge of west curb, 21.9 m south from 3rd hydro pole.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-19

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. James St. between Ellice Ave. and St. Matthews Ave.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT - 38 mm thick		C50		
		CONCRETE - 197 mm thick		C51		

END OF HOLE AT 0.2 m

Notes:
1) Test hole could not be advanced into sub-grade materials due to overhead power lines.
2) Test hole backfilled with sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
3) St. James St. between Ellice Ave. and St. Matthews Ave., south bound, curb lane, 1.9 m east from edge of west curb, 0.9 m north from 2nd hydro pole.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

Sub-Surface Log

Test Hole TH13-19B

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. James St. between Ellice Ave. and St. Matthews Ave.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 29, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 64 mm thick		C188
		CONCRETE - 184 mm thick		C189
		SAND (Fill) - trace clay, trace to some gravel (<15 mm diam.), dark grey, dry, compact, poorly graded coarse sand to fine gravel, granular		G190
0.5		CLAY (Fill) - silty, trace coarse grained sand, trace oxidation, trace silt inclusions (<5mm diam.) - black - moist, stiff - high plasticity - grey below 0.7 m		G191
1.0				G192
		SILT - trace clay, trace fine grained sand - brown - moist, soft - low plasticity		G193
1.5				
		CLAY - silty,trace silt inclusions (<5 mm diam.) - grey - moist, firm - high plasticity		G194
2.0				
		- silt seam (50 mm thick) at 2.2 m		G195
2.5				
				G196
3.0				

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa)

Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

0 50 100 150 200 250

END OF HOLE AT 3.1 m in CLAY

Notes:

1) Sloughing observed below 1.2 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) St. James St. between Ellice Ave. and St. Matthews Ave., south bound, median lane, 5.4 m east from edge of west curb, 0.9 m north from 2nd hydro pole.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

Sub-Surface Log

Test Hole TH13-20
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	Ellice Ave. between St. James St. and Milt Stegall Dr.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 28, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 57 mm thick		C170
		CONCRETE - 248 mm thick		C171
0.5		CLAY (Fill) - silty, trace silt inclusions (<10 mm diam.), trace oxidation, trace organics - grey - moist, firm - high plasticity		G172
				G173
1.0		SILT - trace clay, trace fine grained sand - brown - moist, soft - low plasticity		G174
				G175
1.5				
				G176
2.0				
2.5		CLAY - silty, trace silt inclusions (<5 mm diam.) - grey - moist, stiff - high plasticity		G177
				G178
3.0		END OF HOLE AT 3.1 m in CLAY		

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 50 100 150 200 250

Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

Notes:
1) Sloughing observed below 1.0 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Ellice Ave. between St. James St. and Milt Stegall Dr., west bound, median lane, 5.2 m south from edge of north curb, 7.2 m west from red light camera pole.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-21
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	St. James St. between Yukon Ave. and Ellice Ave.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 27, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT - 70 mm thick		C88		
		CONCRETE - 203 mm thick		C89		
		CLAY (Fill) - silty, trace sand, dark grey, moist, stiff, high plasticity		G90		
				G91		
0.5		CLAY - silty, trace coarse grained sand, trace silt inclusions (<10mm diam.), trace oxidation - grey - moist, stiff - high plasticity		G92		
1.0		SILT - trace clay, trace fine grained sand - brown - wet, soft - low plasticity				
1.5				G93		
				G94		
2.0				G95		
2.5						
		- clay seam (100 mm thick) at 2.7 m		G96		
				G97		
3.0		END OF HOLE AT 3.1 m in CLAY				

Notes:
1) Sloughing observed below 2.6 m depth.
2) Seepage observed at 2.3 m below surface.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) St. James St. between Yukon Ave. and Ellice Ave., north bound, curb lane, 2.4 m west from edge of east curb, 17.3 m south from edge of north entrance curb of 1065 St. James St.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Sub-Surface Log

Test Hole TH13-22

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	Ellice Ave. between Century St. and St. James St.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 28, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m^3) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type: Torvane, Pocket Pen., Qu, Field Vane 0 50 100 150 200 250
		ASPHALT - 102 mm thick		C179		
		CONCRETE - 216 mm thick		C180		
		CLAY (Fill) - silty, trace gravel (<10 mm diam.), trace oxidation - black - moist, firm to stiff - high plasticity		G181		
0.5				G182		
1.0		- firm below 1.0 m		G183		
				G184		
1.5		- dark grey, stiff below 1.3 m		G185		
		CLAY - silty, trace silt inclusions (<5 mm diam.), trace oxidation - brown - moist, firm - high plasticity		G186		
2.5				G187		
3.0		END OF HOLE AT 3.1 m in CLAY				

Notes:
1) Sloughing observed below 2.1 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Ellice Ave. between Century St. and St. James St., west bound, curb lane, 2.2 m south from edge of north curb, 1.5 m west from LP# 2-041-173.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

Sub-Surface Log

Test Hole TH13-23
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 008 00
Project Name:	Polo Park Infrastructure Upgrades	**Location:**	Ellice Ave. between Century St. and Milt Stegall Dr.
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	-
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	August 28, 2013

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 50 mm thick		C161
		CONCRETE - 191 mm thick		C162
		CLAY (Fill) - silty, trace fine grained sand, trace silt inclusions (<5 mm diam.) - dark grey - moist, firm, high plasticity		G163
0.5		- brown below 0.5 m		G164
1.0				G165
		SILT - trace clay, trace fine grained sand - brown - moist, soft - low plasticity		G166
1.5				G167
2.0		- clay seam (50 mm thick) at 2.3 m		G168
2.5		CLAY - silty, trace silt inclusions (<5 mm diam.), trace oxidation - grey - moist, stiff - high plasticity		G169
3.0				

Bulk Unit Wt (kN/m^3): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa)

Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

0 50 100 150 200 250

END OF HOLE AT 3.1 m in CLAY

Notes:
1) Sloughing observed below 1.1 m depth.
2) No seepage observed.
3) Test hole backfilled with auger cuttings and bentonite to 0.3 m below ground surface, sand to 0.1 below top of pavement and asphalt cold patch to top of pavement.
4) Ellice Ave. between St. James St. and Milt Stegall Dr., east bound, median lane, 5.1 m north from edge of south curb, 15.6 m west from LP# 2-041-079.

Logged By: Beta Taryana **Reviewed By:** Stephen Renner **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 0035 008 00 - POLO PARK INFRASTRUCTURE UPGRADES.GPJ TREK GEOTECHNICAL.GDT 9/27/13

Appendix B

Lab Testing Summary Tables and Lab Testing Results

Polo Park Infrastructure Upgrade
Sub-Surface Investigation

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH13-01	St Matthews Ave. between Century St. and Madison St., west bound, median lane, 4.8 m south from edge of north curb, 19.8 m E from LP# 2-040-401	Concrete	216													
						Clay (Fill)	0.2	0.3	26							
						Clay (Fill)	0.4	0.5	20							
						Silt	0.6	0.7	19							
						Clay	0.8	0.9	19							
						Silt	1.1	1.2	25							
						Silt	1.3	1.4	38							
						Silt	1.7	1.9	39							
						Clay	2.0	2.1	48							
						Clay	2.9	3.0	58							
TH13-02	St Matthews Ave. between Century St. and Madison St., east bound, median lane, 5.2 m north from edge of S curb, 82.6 m east from LP# 2-040-401	Concrete	203													
						Silt and Clay (Fill)	0.3	0.4	28							
						Silt and Clay (Fill)	0.6	0.7	25	1	19	44	37	14	51	37
						Silt and Clay (Fill)	0.9	1.0	30							
						Clay	1.2	1.3	38							
						Clay	1.5	1.6	37							
						Clay	1.8	1.9	37							
						Clay	2.9	3.0	56							
TH13-03	Madison St. between Century St. and St. Matthews Ave., north bound, 4.9 m east from edge of west curb, 24.1 m north from edge of north curb on St. Matthews Ave.	Asphalt	25	Concrete	152											
						Clay (Fill)	0.2	0.3	20							
						Clay (Fill)	0.3	0.4	19							
						Clay (Fill)	0.7	0.8	19							
						Silt and Clay	0.9	1.0	25	0	8	46	46	12	47	35
						Clay	1.3	1.4	38							
						Clay	1.6	1.7	39							
						Clay	1.9	2.0	48							
						Clay	2.8	2.9	58							
TH13-04	St. James Industrial between Madison St. and St. James St., 46.0 m west from west side of 916 St. James St., 92.2 m north from north side of 860 St. James St.	No asphalt present		No concrete present												
						Sand (Fill)	0.0	0.1	7							
						Clay (Fill)	0.4	0.5	23							
						Silt	0.6	0.4	21	0	10	68	22	14	28	14
						Silt	0.8	0.9	33							
						Clay	1.5	1.6	23							
						Clay	1.8	1.9	40							
						Clay	2.9	3.0	52							
TH13-05	St. James St. between Ellice Ave. and St. Matthews Ave., south bound, median lane, 5.6 m east from edge of west curb, 11.2 m south from 9th hydro pole	Asphalt	108	Concrete	184											
						Clay (Fill)	0.2	0.3	36							
						Clay (Fill)	0.3	0.4	33							
						Silt	0.7	0.8	20							
						Clay	1.1	1.2	27							
						Clay	1.7	1.8	26							
						Clay	2.2	2.3	37							
						Clay	2.8	2.9	49							

Polo Park Infrastructure Upgrade
Sub-Surface Investigation

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH13-06	St. Matthews Ave. between St. James St. and Empress St., 6.1 m south from edge of south curb, 4.5 m west from LP# 2-048-405	No asphalt present		No concrete present												
						Sand (Fill)	0.0	0.2	10							
						Clay (Fill)	0.3	0.4	24							
						Silt and Clay	1.0	1.1	20							
						Clay	1.2	1.3	28							
						Silt	1.6	1.7	20							
						Clay	1.9	2.0	26							
						Clay	2.3	2.4	22							
						Clay	2.8	2.9	47							
TH13-07	St. Matthews Ave. between St. James St. and Empress St., east bound, curb lane, 2.4 m north from edge of south curb, 5.1 m west from LP# 2-048-405	Asphalt	57	Concrete	210											
						Clay (Fill)	0.3	0.4	26							
						Clay (Fill)	0.5	0.6	28							
						Silt	1.1	1.2	23							
						Clay	1.4	1.5	36							
						Clay	1.6	1.7	25							
						Clay	1.9	2.0	38							
						Clay	2.9	3.0	54							
TH13-08	St. Matthews Ave. between St. James St. and Empress St., east bound, median lane, 5.2 m north from edge of south curb, 27.3 m east from LP# 2-048-405	Asphalt	121	Concrete	140											
						Silt and Clay (Fill)	0.4	0.5	17							
						Silt and Clay (Fill)	0.6	0.7	28	0	31	39	30	14	39	25
						Clay	1.0	1.1	25							
						Clay	1.4	1.5	26							
						Clay	2.2	2.3	42							
						Clay	2.9	3.0	51							
TH13-09	St. Matthews Ave. between St. James St. and Empress St., west bound, median lane, 5.6 m south from edge of north curb , 46.5 m east from LP# 2-048-406	Asphalt	108	Concrete	127											
						Clay (Fill)	0.2	0.3	23							
						Clay (Fill)	0.5	0.6	25							
						Silt	0.7	0.8	23							
						Clay	1.3	1.4	29							
						Clay	1.9	1.8	26							
						Silt	2.0	2.1	24							
						Silt	2.8	2.9	24							
TH13-10	St. Matthews Ave. between St. James St. and Empress St., 6.1 m south from edge of south curb, 27.3 m east from LP # 2-048-405	No asphalt present		No concrete present												
						Sand (Fill)	0.0	0.2	11							
						Organic Clay (Topsoil)	0.3	0.4	31							
						Clay (Fill)	0.7	0.8	26							
						Clay (Fill)	1.3	1.4	25							
						Clay (Fill)	1.7	1.8	26							
						Clay	2.4	2.5	39							
						Clay	2.8	2.9	53							

Polo Park Infrastructure Upgrade
Sub-Surface Investigation

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH13-11	St. Matthews Ave. between St. James St. and Empress St., west bound, median lane, 5.3 m south from edge of north curb, 5.0 m east from LP# 2-048-403	Asphalt	102	Concrete	121											
						Sand (Fill)	0.2	0.3	14							
						Clay (Fill)	0..7	0.8	30							
						Clay	1.1	1.2	26							
						Clay	1.3	1.4	25							
						Silt	1.6	1.7	22							
						Silt	2.0	2.1	23							
						Clay	2.7	2.8	41							
						Clay	2.8	2.9	48							
TH13-12	St. Matthews Ave. between St. James St. and Empress St., west bound, median lane, 5.3 m south from edge of north curb, 4.5 m west from LP# 2-048-402	Asphalt	83	Concrete	146											
						Clay (Fill)	0.2	0.3	14							
						Clay (Fill)	0.5	0.6	22							
						Clay (Fill)	0.7	0.8	29	0	18	38	44	17	52	35
						Clay	1.4	1.5	26							
						Silt	1.6	1.7	23							
						Silt	1.9	2.0	24							
						Clay	2.8	2.9	44							
TH13-13	St, James St. between St. Matthews Ave. and Maroons Rd., north bound, curb lane, 2.6 m west from edge of east curb, 1.7 m north from LP# 2-048-769	Asphalt	38	Concrete	203											
						Sand (Fill)	0.3	0.5	9							
						Clay (Fill)	1.1	1.2	32							
						Clay (Fill)	1.3	1.4	35							
						Clay	1.7	1.8	41							
						Clay	2.9	3.0	77							
TH13-14	St, James St. between St. Matthews Ave. and Maroons Rd., north bound, median lane, 5.1 m west from edge of east curb, 32.6 m south from LP# 2-099-364	Asphalt	76	Concrete	178											
						Clay (Fill)	0.3	0.4	20							
						Clay (Fill)	0.4	0.5	26							
						Silt	1.0	1.1	21							
						Clay	1.2	1.3	29							
						Silt	1.4	1.6	23							
						Clay	1.9	2.0	36							
						Clay	2.1	2.2	44							
						Clay	2.9	3.0	53							
TH13-15	St. James St. between Ellice Ave. and St. Matthews Ave., south bound, median lane, 5.1 m east from edge of west curb, 1 m south from 8th hydro pole	Asphalt	44	Concrete	273											
						Clay (Fill)	0.3	0.4	30							
						Silt	0.7	0.8	19	0	18	59	23	14	26	12
						Clay	0.9	1.0	25							
						Clay	1.4	1.5	27							
						Clay	1.8	1.9	38							
						Clay	2.1	2.2	39							
						Clay	2.8	2.9	51							

Polo Park Infrastructure Upgrade
Sub-Surface Investigation

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH13-16	St. James St. between Ellice Ave. and St. Matthews Ave., north bound, median lane, 8.7 m east from edge of west curb, 2.3 m south from 7th hydro pole	Asphalt	51	Concrete	178											
						Clay (Fill)	0.2	0.3	13							
						Clay (Fill)	0.4	0.5	21							
						Silt	0.7	0.8	17							
						Clay	1.4	1.5	29							
						Clay	1.6	1.7	32							
						Clay	2.0	2.1	35							
						Clay	2.9	3.0	52							
TH13-17	St. James St. between Ellice Ave. and St. Matthews Ave., north bound, curb lane, 2.2 m west from edge of east curb, 8.7 m north from 6th hydro pole	Asphalt	51	Concrete	241											
						Sand (Fill)	0.3	0.4	9							
						Clay (Fill)	0.7	0.8	23							
						Silt	1.0	1.1	21							
						Silt	1.3	1.4	20							
						Clay	1.6	1.7	30							
						Clay	2.3	2.4	44							
						Clay	2.8	2.9	46							
TH13-18	St. James St. between Ellice Ave. and St. Matthews St., south bound, median lane, 5.2 m east from edge of west curb, 21.9 m south from 3rd hydro pole	Asphalt	64	Concrete	210											
						Sand (Fill)	0.3	0.4	14							
						Clay (Fill)	0.6	0.7	20	0	17	38	46	16	54	39
						Silt	1.0	1.1	19							
						Silt	1.2	1.3	21							
						Silt	1.8	1.9	21							
						Clay	2.2	2.3	34							
						Clay	2.9	3.0	48							
TH13-19	St. James St. between Ellice Ave. and St. Matthews Ave., south bound, curb lane, 1.9 m east from edge of west curb, 0.9 m north from 2nd	Asphalt	38	Concrete	197											
						Test hole could not be advanced into sub-grade materials due to overhead power lines										
TH13-19B	St. James St. between Ellice Ave. and St. Matthews Ave., south bound, median lane, 5.4 m east from edge of west curb, 0.9 m north from 2nd hydro pole	Asphalt	64	Concrete	184											
						Sand (Fill)	0.2	0.4	10							
						Clay (Fill)	0.6	0.7	18							
						Clay (Fill)	0.9	1.0	25							
						Silt	1.2	1.3	26							
						Clay	1.7	1.8	35							
						Clay	2.2	2.3	39							
						Clay	2.8	2.9	49							

Polo Park Infrastructure Upgrade
Sub-Surface Investigation

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH13-20	Ellice Ave. between St. James St. and Milt Stegall Dr., west bound, median lane, 5.2 m south from edge of north curb, 7.2 m west from red light camera pole	Asphalt	57	Concrete	248											
						Clay (Fill)	0.3	0.4	35							
						Clay (Fill)	0.6	0.7	27							
						Silt	0.9	1.0	22							
						Silt	1.2	1.3	22							
						Silt	1.7	1.8	23							
						Clay	2.2	2.3	35							
						Clay	2.8	2.9	50							
TH13-21	St. James St. between Yukon Ave. and Ellice Ave., north bound, curb lane, 2.4 m west from edge of east curb, 17.3 m south from edge of north entrance curb of 1065 St. James St.	Asphalt	70	Concrete	203											
						Clay (Fill)	0.3	0.4	24							
						Clay (Fill)	0.4	0.5	27							
						Clay	0.6	0.7	29	0	4	38	58	62	16	46
						Silt	1.4	1.5	24							
						Silt	1.6	1.7	24							
						Silt	2.0	2.1	22							
						Silt	2.7	2.8	29							
						Silt	2.8	2.9	24							
TH13-22	Ellice Ave. between Century St. and St. James St., west bound, curb lane, 2.2 m south from edge of north curb, 1.5 m west from LP# 2-041-173	Asphalt	102	Concrete	216											
						Clay (Fill)	0.3	0.4	29							
						Clay (Fill)	0.7	0.8	22							
						Clay (Fill)	1.0	1.1	20							
						Clay (Fill)	1.2	1.3	27							
						Clay (Fill)	1.7	1.8	31							
						Clay	2.2	2.3	40							
						Clay	2.8	2.9	45							
TH13-23	Ellice Ave. between St. James St. and Milt Stegall Dr., east bound, median lane, 5.1 m north from edge of south curb, 15.6 m west from LP# 2-041-079	Asphalt	50	Concrete	191											
						Clay (Fill)	0.2	0.3	22							
						Clay (Fill)	0.7	0.8	28							
						Clay (Fill)	1.0	1.1	33							
						Silt	1.2	1.3	24							
						Silt	1.6	1.7	23							
						Silt	2.3	2.4	25							
						Clay	2.8	2.9	42							

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Moisture Content Report
ASTM D2216-98

Project No. 0035 008 00
Client Morrison Hershfield
Project Polo Park Infrastructure Upgrades

Sample Date August 19 to 21, 2013
Test Date August 26 to 30, 2013
Technician Beta Taryana

Test Hole	TH13-01	TH13-01	TH13-01	TH13-01	TH13-01	TH13-01
Depth (m)	0.2 - 0.3	0.4 - 0.5	0.6 - 0.7	0.8 - 0.9	1.1 - 1.2	1.3 - 1.4
Sample #	G137	G138	G139	G140	G141	G142
Tare ID	D49	E11	Z89	D48	Z77	D44
Mass of tare	8.3	8.3	8.4	8.4	8.3	8.3
Mass wet + tare	378.0	453.9	346.7	518.2	422.2	440.0
Mass dry + tare	301.5	378.4	281.9	383.8	345.1	351.7
Mass water	76.5	75.5	64.8	134.4	77.1	88.3
Mass dry soil	293.2	370.1	273.5	375.4	336.8	343.4
Moisture %	26.1%	20.4%	23.7%	35.8%	22.9%	25.7%

Test Hole	TH13-01	TH13-01	TH13-01	TH13-02	TH13-02	TH13-02
Depth (m)	1.7 - 1.9	2.0 - 2.1	2.9 - 3.0	0.3 - 0.4	0.6 - 0.7	0.9 - 1.0
Sample #	G143	G144	G145	G9	G10	G11
Tare ID	A25	W26	D13	A31	E70	W73
Mass of tare	8.5	8.2	8.4	8.5	8.5	8.4
Mass wet + tare	504.9	438.7	386.8	298.2	349.2	360.3
Mass dry + tare	412.3	306.6	252.1	234.7	280.6	278.1
Mass water	92.6	132.1	134.7	63.5	68.6	82.2
Mass dry soil	403.8	298.4	243.7	226.2	272.1	269.7
Moisture %	22.9%	44.3%	55.3%	28.1%	25.2%	30.5%

Test Hole	TH13-02	TH13-02	TH13-02	TH13-02	TH13-03	TH13-03
Depth (m)	1.2 - 1.3	1.5 - 1.6	1.8 - 1.9	2.9 - 3.0	0.2 - 0.3	0.3 - 0.4
Sample #	G12	G13	G14	G15	G128	G129
Tare ID	A104	P16	E67	F67	W06	E91
Mass of tare	8.2	8.5	8.3	8.4	8.4	8.4
Mass wet + tare	390.5	402.0	363.2	297.2	374.0	362.2
Mass dry + tare	285.8	296.6	267.6	194.1	313.2	305.1
Mass water	104.7	105.4	95.6	103.1	60.8	57.1
Mass dry soil	277.6	288.1	259.3	185.7	304.8	296.7
Moisture %	37.7%	36.6%	36.9%	55.5%	19.9%	19.2%

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Test Hole	TH13-03	TH13-03	TH13-03	TH13-03	TH13-03	TH13-03
Depth (m)	0.7 - 0.8	0.9 - 1.0	1.3 - 1.4	1.6 - 1.7	1.9 - 2.0	2.8 - 2.9
Sample #	G130	G131	G132	G133	G134	G135
Tare ID	E79	P26	E23	N105	E103	W31
Mass of tare	8.5	8.4	8.4	8.4	8.5	8.2
Mass wet + tare	429.8	501.7	356.8	378.9	439.8	376.9
Mass dry + tare	363.8	402.2	260.7	275.6	299.4	241.9
Mass water	66.0	99.5	96.1	103.3	140.4	135.0
Mass dry soil	355.3	393.8	252.3	267.2	290.9	233.7
Moisture %	18.6%	25.3%	38.1%	38.7%	48.3%	57.8%

Test Hole	TH13-04	TH13-04	TH13-04	TH13-04	TH13-04	TH13-04
Depth (m)	0.0 - 0.1	0.4 - 0.5	0.6 - 0.7	0.8 - 0.9	1.5 - 1.6	1.8 - 1.9
Sample #	G1	G2	G3	G4	G5	G6
Tare ID	D25	W91	E78	Z95	Z70	W05
Mass of tare	8.6	8.6	8.4	8.5	8.4	8.2
Mass wet + tare	257.8	257.6	368.8	292.0	421.7	382.2
Mass dry + tare	242.5	210.5	305.7	221.5	345.1	276.3
Mass water	15.3	47.1	63.1	70.5	76.6	105.9
Mass dry soil	233.9	201.9	297.3	213.0	336.7	268.1
Moisture %	6.5%	23.3%	21.2%	33.1%	22.8%	39.5%

Test Hole	TH13-04	TH13-05	TH13-05	TH13-05	TH13-05	TH13-05
Depth (m)	2.9 - 3.0	0.2 - 0.3	0.3 - 0.4	0.7 - 0.8	1.1 - 1.2	1.7 - 1.8
Sample #	G7	G199	G200	G201	G202	G203
Tare ID	H5	W28	Z24	N79	W78	F41
Mass of tare	8.3	8.3	8.2	8.4	8.3	8.2
Mass wet + tare	303.3	200.6	310.2	432.9	471.5	536.0
Mass dry + tare	201.8	149.2	235.0	362.7	372.0	428.7
Mass water	101.5	51.4	75.2	70.2	99.5	107.3
Mass dry soil	193.5	140.9	226.8	354.3	363.7	420.5
Moisture %	52.5%	36.5%	33.2%	19.8%	27.4%	25.5%

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Test Hole	TH13-05	TH13-05	TH13-06	TH13-06	TH13-06	TH13-06
Depth (m)	2.2 - 2.3	2.8 - 2.9	0.0 - 0.2	0.3 - 0.4	1.0 - 1.1	1.2 - 1.3
Sample #	G204	G205	G146	G147	G148	G149
Tare ID	Z57	P36	F100	E37	N102	Z90
Mass of tare	8.4	8.4	8.4	8.2	8.3	8.4
Mass wet + tare	406.6	401.4	264.5	456.4	404.9	338.4
Mass dry + tare	298.8	272.0	240.3	369.3	337.5	265.9
Mass water	107.8	129.4	24.2	87.1	67.4	72.5
Mass dry soil	290.4	263.6	231.9	361.1	329.2	257.5
Moisture %	37.1%	49.1%	10.4%	24.1%	20.5%	28.2%

Test Hole	TH13-06	TH13-06	TH13-06	TH13-06	TH13-07	TH13-07
Depth (m)	1.6 - 1.7	1.9 - 2.0	2.3 - 2.4	2.8 - 2.9	0.3 - 0.4	0.5 - 0.6
Sample #	G150	G151	G152	G153	G35	G36
Tare ID	N43	W71	H3	W11	Z131	Z44
Mass of tare	8.2	8.3	8.4	8.2	8.4	8.7
Mass wet + tare	440.2	470.4	454.6	387.6	417.2	334.1
Mass dry + tare	369.0	376.3	374.1	266.6	333.7	262.3
Mass water	71.2	94.1	80.5	121.0	83.5	71.8
Mass dry soil	360.8	368.0	365.7	258.4	325.3	253.6
Moisture %	19.7%	25.6%	22.0%	46.8%	25.7%	28.3%

Test Hole	TH13-07	TH13-07	TH13-07	TH13-07	TH13-07	TH13-08
Depth (m)	1.1 - 1.2	1.4 - 1.5	1.6 - 1.7	1.9 - 2.0	2.9 - 3.0	0.4 - 0.5
Sample #	G37	G38	G39	G40	G41	G44
Tare ID	W86	F121	P20	W77	A39	K18
Mass of tare	8.6	8.5	8.9	8.7	8.2	8.3
Mass wet + tare	529.6	341.9	602.7	362.2	246.2	406.5
Mass dry + tare	432.6	254.4	483.3	264.4	163.0	349.2
Mass water	97.0	87.5	119.4	97.8	83.2	57.3
Mass dry soil	424.0	245.9	474.4	255.7	154.8	340.9
Moisture %	22.9%	35.6%	25.2%	38.2%	53.7%	16.8%

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Test Hole	TH13-08	TH13-08	TH13-08	TH13-08	TH13-08	TH13-09
Depth (m)	0.6 - 0.7	1.0 - 1.1	1.4 - 1.5	2.2 - 2.3	2.9 - 3.0	0.2 - 0.3
Sample #	G45	G46	G47	G48	G49	G119
Tare ID	E46	F51	A9	P85	Z15	Z73
Mass of tare	8.4	8.3	8	8.4	8.3	8.4
Mass wet + tare	466.8	386.7	306.1	304.6	355.3	279.3
Mass dry + tare	367.8	310.6	244.4	216.6	237.6	228.4
Mass water	99.0	76.1	61.7	88.0	117.7	50.9
Mass dry soil	359.4	302.3	236.4	208.2	229.3	220.0
Moisture %	27.5%	25.2%	26.1%	42.3%	51.3%	23.1%

Test Hole	TH13-09	TH13-09	TH13-09	TH13-09	TH13-09	TH13-09
Depth (m)	0.5 - 0.6	0.7 - 0.8	1.3 - 1.4	1.7 - 1.8	2.0 - 2.1	2.8 - 2.9
Sample #	G120	G121	G122	G123	G124	G125
Tare ID	F135	Z68	F107	E6	N34	E33
Mass of tare	8.2	8.3	8.1	8.2	8.3	8.3
Mass wet + tare	456.2	366.0	426.1	454.5	445.2	587.3
Mass dry + tare	365.8	298.7	332.9	361.8	361.7	476.0
Mass water	90.4	67.3	93.2	92.7	83.5	111.3
Mass dry soil	357.6	290.4	324.8	353.6	353.4	467.7
Moisture %	25.3%	23.2%	28.7%	26.2%	23.6%	23.8%

Test Hole	TH13-10	TH13-10	TH13-10	TH13-10	TH13-10	TH13-10
Depth (m)	0.0 - 0.2	0.3 - 0.4	0.7 - 0.8	1.3 - 1.4	1.7 - 1.8	2.4 - 2.5
Sample #	G154	G155	G156	G157	G158	G159
Tare ID	F61	Z83	N75	N82	Z48	C24
Mass of tare	8.4	8.4	8.3	8.4	8.3	8.3
Mass wet + tare	289.2	306.0	364.7	397.2	384.8	357.2
Mass dry + tare	261.5	236.4	291.7	318.6	308.2	258.6
Mass water	27.7	69.6	73.0	78.6	76.6	98.6
Mass dry soil	253.1	228.0	283.4	310.2	299.9	250.3
Moisture %	10.9%	30.5%	25.8%	25.3%	25.5%	39.4%

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Test Hole	TH13-10	TH13-11	TH13-11	TH13-11	TH13-11	TH13-11
Depth (m)	2.8 - 2.9	0.2 - 0.3	0.7 - 0.8	1.1 - 1.2	1.3 - 1.4	1.6 - 1.7
Sample #	G160	G109	G110	G111	G112	G113
Tare ID	H76	W41	N92	W46	Z51	D37
Mass of tare	8.4	8.4	8.3	8.3	8.5	8.2
Mass wet + tare	452.9	208.1	373.3	450.8	403.7	637.8
Mass dry + tare	299.6	183.5	289.7	360.0	323.6	522.5
Mass water	153.3	24.6	83.6	90.8	80.1	115.3
Mass dry soil	291.2	175.1	281.4	351.7	315.1	514.3
Moisture %	52.6%	14.1%	29.7%	25.8%	25.4%	22.4%

Test Hole	TH13-11	TH13-11	TH13-11	TH13-12	TH13-12	TH13-12
Depth (m)	2.0 - 2.1	2.7 - 2.8	2.8 - 2.9	0.2 - 0.3	0.5 - 0.6	0.7 - 0.8
Sample #	G114	G115	G116	G100	G101	G102
Tare ID	W43	N109	F138	F74	A21	N104
Mass of tare	8.4	8.3	8.4	8.3	8.5	8.3
Mass wet + tare	563.4	387.9	404.3	307.0	345.2	319.4
Mass dry + tare	458.1	278.4	275.1	269.8	285.0	250.4
Mass water	105.3	109.5	129.2	37.2	60.2	69.0
Mass dry soil	449.7	270.1	266.7	261.5	276.5	242.1
Moisture %	23.4%	40.5%	48.4%	14.2%	21.8%	28.5%

Test Hole	TH13-12	TH13-12	TH13-12	TH13-12	TH13-13	TH13-13
Depth (m)	1.4 - 1.5	1.6 - 1.7	1.9 - 2.0	2.8 - 2.9	0.3 - 0.5	1.1 - 1.2
Sample #	G103	G104	G105	G106	G18	G19
Tare ID	N02	W70	Z47	D31	F137	Z112
Mass of tare	8.4	8.3	8.4	8.3	8.2	8.5
Mass wet + tare	414.6	542.4	515.1	390.1	570.3	305.7
Mass dry + tare	331.5	441.4	416.0	273.5	525.3	233.6
Mass water	83.1	101.0	99.1	116.6	45.0	72.1
Mass dry soil	323.1	433.1	407.6	265.2	517.1	225.1
Moisture %	25.7%	23.3%	24.3%	44.0%	8.7%	32.0%

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Test Hole	TH13-13	TH13-13	TH13-13	TH13-14	TH13-14	TH13-14
Depth (m)	1.3 - 1.4	1.7 - 1.8	2.9 - 3.0	0.3 - 0.4	0.4 - 0.5	1.0 - 1.1
Sample #	G20	G21	G22	G25	G26	G27
Tare ID	F132	W09	W108	K5	H36	C10
Mass of tare	8.4	8.4	8.4	8.3	8.5	8.3
Mass wet + tare	297.0	460.0	398.7	376.1	451.4	425.5
Mass dry + tare	222.1	329.5	229.1	315.5	359.6	353.2
Mass water	74.9	130.5	169.6	60.6	91.8	72.3
Mass dry soil	213.7	321.1	220.7	307.2	351.1	344.9
Moisture %	35.0%	40.6%	76.8%	19.7%	26.1%	21.0%

Test Hole	TH13-14	TH13-14	TH13-14	TH13-14	TH13-14	TH13-15
Depth (m)	1.2 - 1.3	1.4 - 1.6	1.9 - 2.0	2.1 - 2.2	2.9 - 3.0	0.3 - 0.4
Sample #	G28	G29	G30	G31	G32	G63
Tare ID	K19	Z138	E29	D36	N107	F42
Mass of tare	8.3	8.4	8.4	8.6	8.4	8.3
Mass wet + tare	388.5	395.2	387.9	436	236.8	347.5
Mass dry + tare	303.1	322.2	287.5	305.7	157.2	269.2
Mass water	85.4	73.0	100.4	130.3	79.6	78.3
Mass dry soil	294.8	313.8	279.1	297.1	148.8	260.9
Moisture %	29.0%	23.3%	36.0%	43.9%	53.5%	30.0%

Test Hole	TH13-15	TH13-15	TH13-15	TH13-15	TH13-15	TH13-15
Depth (m)	0.7 - 0.8	0.9 - 1.0	1.4 - 1.5	1.8 - 1.9	2.1 - 2.2	2.8 - 2.9
Sample #	G64	G65	G66	G67	G68	G69
Tare ID	Z102	F98	W53	A101	Z08	F134
Mass of tare	8.4	8.3	8.3	8.4	8.2	8.3
Mass wet + tare	361.8	319	390.3	357.8	368.1	332.1
Mass dry + tare	305.1	256.7	308.6	261.7	266.7	222.4
Mass water	56.7	62.3	81.7	96.1	101.4	109.7
Mass dry soil	296.7	248.4	300.3	253.3	258.5	214.1
Moisture %	19.1%	25.1%	27.2%	37.9%	39.2%	51.2%

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Test Hole	TH13-16	TH13-16	TH13-16	TH13-16	TH13-16	TH13-16
Depth (m)	0.2 - 0.3	0.4 - 0.5	0.7 - 0.8	1.4 - 1.5	1.6 - 1.7	2.0 - 2.1
Sample #	G72	G73	G74	G75	G76	G77
Tare ID	N91	E93	Z87	N114	K12	F91
Mass of tare	8.3	8.4	8.4	8.4	8.4	8.1
Mass wet + tare	273.6	331.7	425.5	423.9	389.2	320.5
Mass dry + tare	243.9	276.1	366	331.6	297.5	239.6
Mass water	29.7	55.6	59.5	92.3	91.7	80.9
Mass dry soil	235.6	267.7	357.6	323.2	289.1	231.5
Moisture %	12.6%	20.8%	16.6%	28.6%	31.7%	34.9%

Test Hole	TH13-16	TH13-17	TH13-17	TH13-17	TH13-17	TH13-17
Depth (m)	2.9 - 3.0	0.3 - 0.4	0.7 - 0.8	1.0 - 1.1	1.3 - 1.4	1.6 - 1.7
Sample #	G78	G81	G82	G83	G84	G85
Tare ID	E101	E4	C26	Z105	K21	W68
Mass of tare	8.4	8.3	8.3	8.3	8.4	8.3
Mass wet + tare	404.5	246	347	401.7	498.1	444.8
Mass dry + tare	268.4	226.7	283.4	333.1	415.7	343.4
Mass water	136.1	19.3	63.6	68.6	82.4	101.4
Mass dry soil	260.0	218.4	275.1	324.8	407.3	335.1
Moisture %	52.3%	8.8%	23.1%	21.1%	20.2%	30.3%

Test Hole	TH13-17	TH13-17	TH13-18	TH13-18	TH13-18	TH13-18
Depth (m)	2.3 - 2.4	2.8 - 2.9	0.3 - 0.4	0.6 - 0.7	1.0 - 1.1	1.2 - 1.3
Sample #	G86	G87	G54	G55	G56	G57
Tare ID	Z86	F127	E75	W92	W57	A107
Mass of tare	8.3	8.2	8.4	8.4	8.3	8.3
Mass wet + tare	414.7	393.4	523.5	386.7	439.4	434.5
Mass dry + tare	290.3	272.8	461.5	324	371.6	361.9
Mass water	124.4	120.6	62.0	62.7	67.8	72.6
Mass dry soil	282.0	264.6	453.1	315.6	363.3	353.6
Moisture %	44.1%	45.6%	13.7%	19.9%	18.7%	20.5%

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Test Hole	TH13-18	TH13-18	TH13-18	TH13-19B	TH13-19B	TH13-19B
Depth (m)	1.8 - 1.9	2.2 - 2.3	2.9 - 3.0	0.2 - 0.4	0.6 - 0.7	0.9 - 1.0
Sample #	G58	G59	G60	G190	G191	G192
Tare ID	F24	E66	E74	P04	W101	N94
Mass of tare	8.3	8.3	8.4	8.4	8.4	8.4
Mass wet + tare	527.1	373.5	332	326.3	388.4	428.4
Mass dry + tare	435.3	280.2	226.4	296.9	329.4	344.8
Mass water	91.8	93.3	105.6	29.4	59.0	83.6
Mass dry soil	427.0	271.9	218.0	288.5	321.0	336.4
Moisture %	21.5%	34.3%	48.4%	10.2%	18.4%	24.9%

Test Hole	TH13-19B	TH13-19B	TH13-19B	TH13-19B	TH13-20	TH13-20
Depth (m)	1.2 - 1.3	1.7 - 1.8	2.2 - 2.3	2.8 - 2.9	0.3 - 0.4	0.6 - 0.7
Sample #	G193	G194	G195	G196	G172	G173
Tare ID	W56	E111	A3	E56	Z63	Z66
Mass of tare	8.4	8.4	8.3	8.3	8.4	8.3
Mass wet + tare	453.8	328.5	449.3	437	381.5	418.3
Mass dry + tare	362.3	245.9	326.5	295.2	284	332.1
Mass water	91.5	82.6	122.8	141.8	97.5	86.2
Mass dry soil	353.9	237.5	318.2	286.9	275.6	323.8
Moisture %	25.9%	34.8%	38.6%	49.4%	35.4%	26.6%

Test Hole	TH13-20	TH13-20	TH13-20	TH13-20	TH13-20	TH13-21
Depth (m)	0.9 - 1.0	1.2 - 1.3	1.7 - 1.8	2.2 - 2.3	2.8 - 2.9	0.3 - 0.4
Sample #	G174	G175	G176	G177	G178	G90
Tare ID	F40	F44	K8	Z06	P23	F18
Mass of tare	8.3	8.3	8.3	8.2	8.2	8.3
Mass wet + tare	476.5	528.1	486.3	391.5	404.3	269.3
Mass dry + tare	391.8	433.4	397.6	292.8	272.9	219.4
Mass water	84.7	94.7	88.7	98.7	131.4	49.9
Mass dry soil	383.5	425.1	389.3	284.6	264.7	211.1
Moisture %	22.1%	22.3%	22.8%	34.7%	49.6%	23.6%

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Moisture Content Report
ASTM D2216-98

Project No. 0035 008 00
Client Morrison Hershfield
Project Polo Park Infrastructure Upgrades

Sample Date August 19 to 21, 2013
Test Date August 26 to 30, 2013
Technician Beta Taryana

Test Hole	TH13-21	TH13-21	TH13-21	TH13-21	TH13-21	TH13-21
Depth (m)	0.4 - 0.5	0.6 - 0.7	1.4 - 1.5	1.6 - 1.7	2.0 - 2.1	2.7 - 2.8
Sample #	G91	G92	G93	G94	G95	G96
Tare ID	Z118	E52	E115	N111	D22	W01
Mass of tare	8.3	8.4	8.4	8.4	8.4	8.3
Mass wet + tare	383.3	378.6	399.8	464	464.2	410.6
Mass dry + tare	303.1	295.6	323.2	377.3	383.4	321
Mass water	80.2	83.0	76.6	86.7	80.8	89.6
Mass dry soil	294.8	287.2	314.8	368.9	375.0	312.7
Moisture %	27.2%	28.9%	24.3%	23.5%	21.5%	28.7%

Test Hole	TH13-21	TH13-22	TH13-22	TH13-22	TH13-22	TH13-22
Depth (m)	2.8 - 2.9	0.3 - 0.4	0.7 - 0.8	1.0 - 1.1	1.2 - 1.3	1.7 - 1.8
Sample #	G97	G181	G182	G183	G184	G185
Tare ID	E109	C25	W50	W99	E20	Z54
Mass of tare	8.5	8.4	8.3	8.2	8.4	8.3
Mass wet + tare	539	325.4	470.1	450.4	301	401.6
Mass dry + tare	435.6	254.8	387.2	377.7	239.5	308.6
Mass water	103.4	70.6	82.9	72.7	61.5	93.0
Mass dry soil	427.1	246.4	378.9	369.5	231.1	300.3
Moisture %	24.2%	28.7%	21.9%	19.7%	26.6%	31.0%

Test Hole	TH13-22	TH13-22	TH13-23	TH13-23	TH13-23	TH13-23
Depth (m)	2.2 - 2.3	2.8 - 2.9	0.2 - 0.3	0.7 - 0.8	1.0 - 1.1	1.2 - 1.3
Sample #	G186	G187	G163	G164	G165	G166
Tare ID	H15	Z27	F48	Z132	F116	H29
Mass of tare	8.3	8.4	8.4	8.3	8.3	8.3
Mass wet + tare	428.4	418.8	299.2	419.6	382.6	539.9
Mass dry + tare	308.1	292.4	245.9	329.1	289.2	438.7
Mass water	120.3	126.4	53.3	90.5	93.4	101.2
Mass dry soil	299.8	284.0	237.5	320.8	280.9	430.4
Moisture %	40.1%	44.5%	22.4%	28.2%	33.3%	23.5%

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Moisture Content Report
ASTM D2216-98

Project No. 0035 008 00
Client Morrison Hershfield
Project Polo Park Infrastructure Upgrades

Sample Date August 19 to 21, 2013
Test Date August 26 to 30, 2013
Technician Beta Taryana

Test Hole	TH13-23	TH13-23	TH13-23			
Depth (m)	1.6 - 1.7	2.3 - 2.4	2.8 - 2.9			
Sample #	G167	G168	G169			
Tare ID	P07	E35	F3			
Mass of tare	8.3	8.4	8.3			
Mass wet + tare	455.9	420.1	415.8			
Mass dry + tare	372.7	338.2	295.4			
Mass water	83.2	81.9	120.4			
Mass dry soil	364.4	329.8	287.1			
Moisture %	22.8%	24.8%	41.9%			

Test Hole						
Depth (m)						
Sample #						
Tare ID						
Mass of tare						
Mass wet + tare						
Mass dry + tare						
Mass water						
Mass dry soil						
Moisture %						

Test Hole						
Depth (m)						
Sample #						
Tare ID						
Mass of tare						
Mass wet + tare						
Mass dry + tare						
Mass water						
Mass dry soil						
Moisture %						

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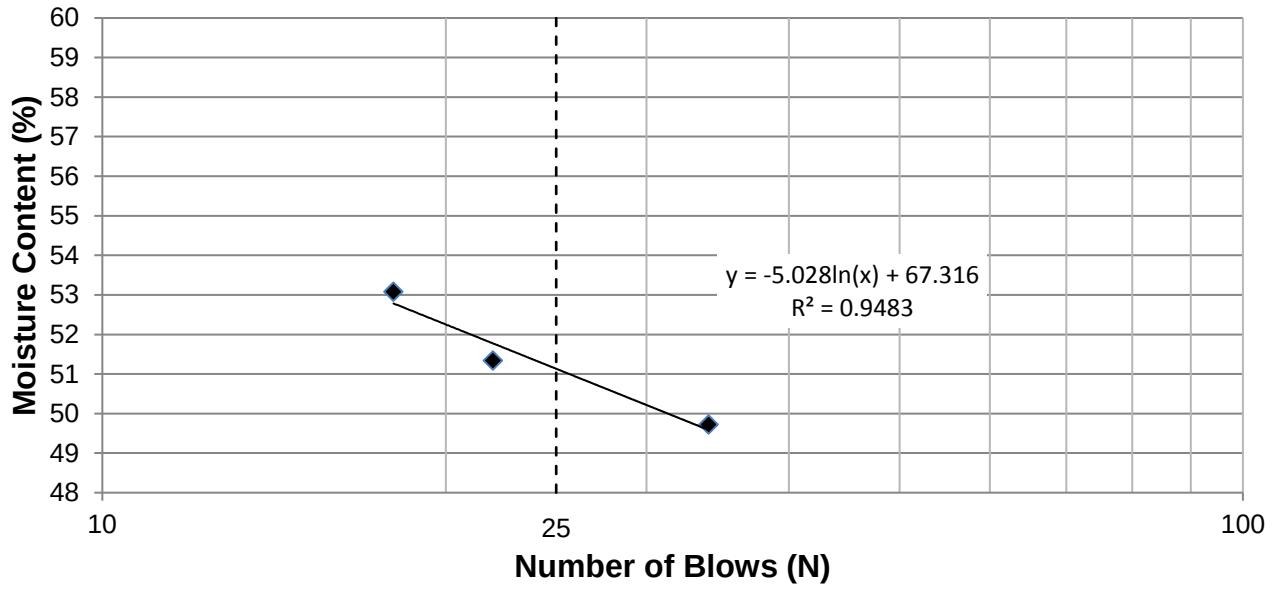
Atterberg Limits
ASTM D4318

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-02
Sample #	G10
Depth (m)	0.6 - 0.7
Sample Date	26-Aug-13
Test Date	17-Sep-13
Technician	Beta Taryana

Liquid Limit	51
Plastic Limit	14
Plasticity Index	37

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	34	22	18		
Mass Wet Soil + Tare (g)	25.326	24.891	26.086		
Mass Dry Soil + Tare (g)	21.565	21.185	21.940		
Mass Tare (g)	14.001	13.967	14.129		
Mass Water (g)	3.761	3.706	4.146		
Mass Dry Soil (g)	7.564	7.218	7.811		
Moisture Content (%)	49.722	51.344	53.079		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.046	20.332			
Mass Dry Soil + Tare (g)	19.266	19.571			
Mass Tare (g)	13.800	14.060			
Mass Water (g)	0.780	0.761			
Mass Dry Soil (g)	5.466	5.511			
Moisture Content (%)	14.270	13.809			

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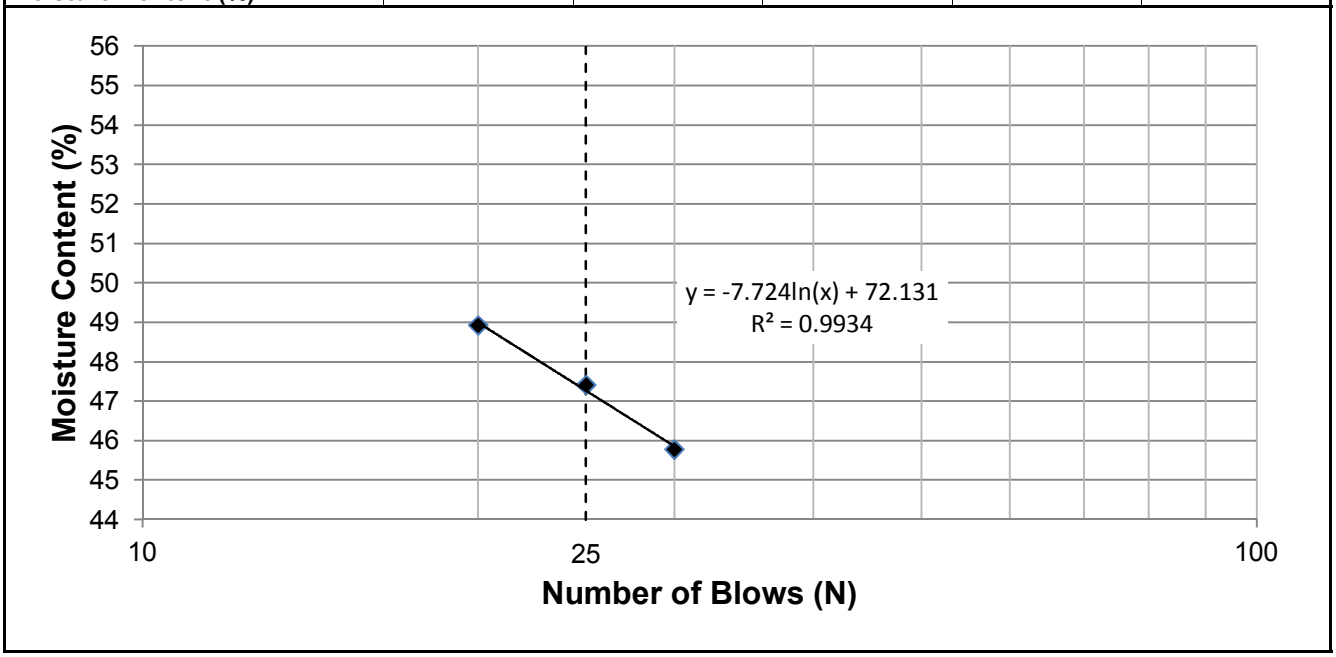
Atterberg Limits
ASTM D4318

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-03
Sample #	G131
Depth (m)	0.9 - 1.0
Sample Date	26-Aug-13
Test Date	17-Sep-13
Technician	Beta Taryana

Liquid Limit	47
Plastic Limit	12
Plasticity Index	35

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	30	25	20		
Mass Wet Soil + Tare (g)	25.176	24.104	26.074		
Mass Dry Soil + Tare (g)	21.683	20.828	22.132		
Mass Tare (g)	14.053	13.919	14.075		
Mass Water (g)	3.493	3.276	3.942		
Mass Dry Soil (g)	7.630	6.909	8.057		
Moisture Content (%)	45.780	47.416	48.926		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.840	20.644			
Mass Dry Soil + Tare (g)	20.085	19.924			
Mass Tare (g)	14.102	13.959			
Mass Water (g)	0.755	0.720			
Mass Dry Soil (g)	5.983	5.965			
Moisture Content (%)	12.619	12.070			

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Atterberg Limits
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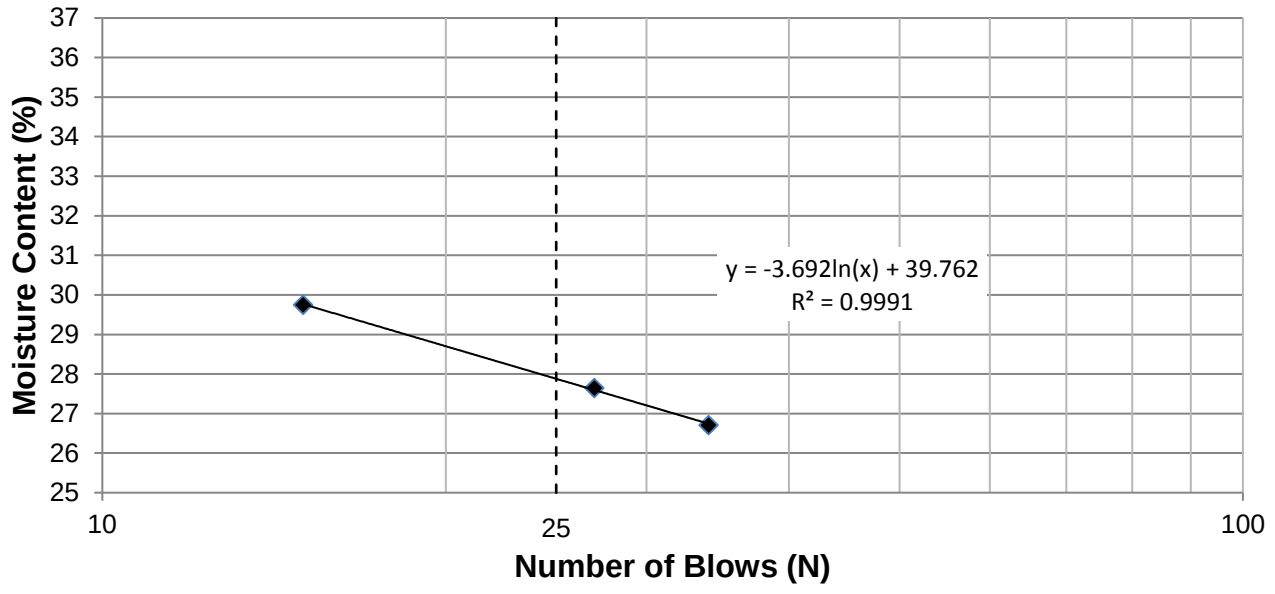
Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-04
Sample #	G3
Depth (m)	0.6 - 0.7
Sample Date	26-Aug-13
Test Date	17-Sep-13
Technician	Beta Taryana

Liquid Limit	28
Plastic Limit	14
Plasticity Index	14

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	34	27	15		
Mass Wet Soil + Tare (g)	26.560	25.680	26.104		
Mass Dry Soil + Tare (g)	23.939	23.150	23.328		
Mass Tare (g)	14.125	13.999	13.997		
Mass Water (g)	2.621	2.530	2.776		
Mass Dry Soil (g)	9.814	9.151	9.331		
Moisture Content (%)	26.707	27.647	29.750		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.576	20.448			
Mass Dry Soil + Tare (g)	19.750	19.668			
Mass Tare (g)	14.000	14.221			
Mass Water (g)	0.826	0.780			
Mass Dry Soil (g)	5.750	5.447			
Moisture Content (%)	14.365	14.320			

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Atterberg Limits
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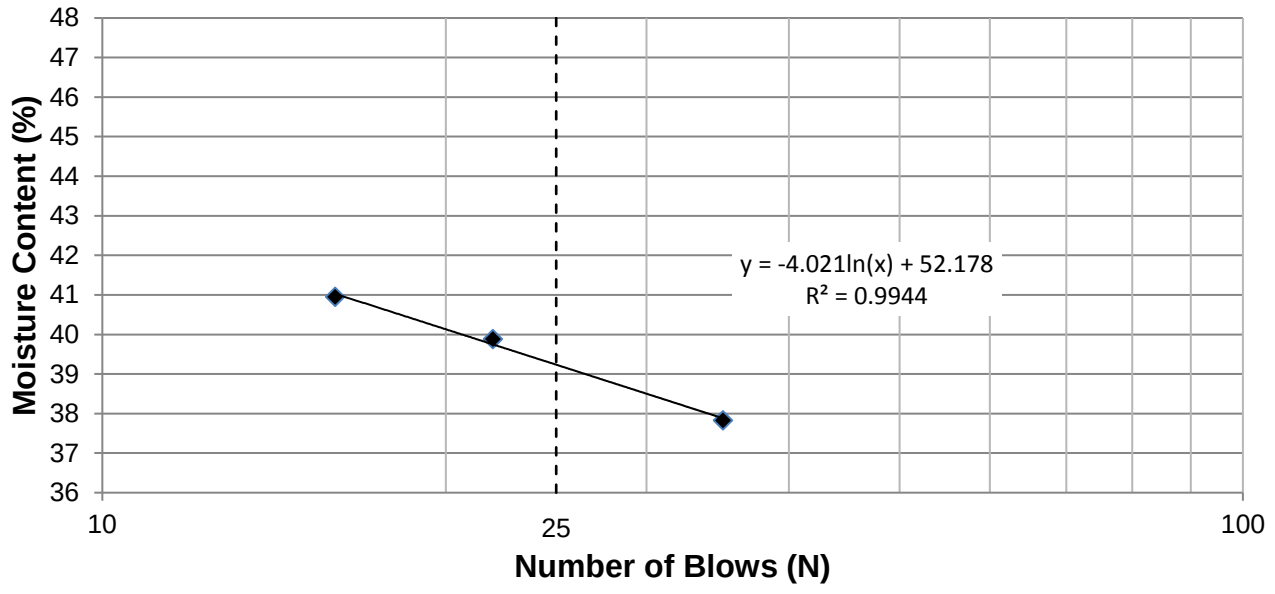
Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-08
Sample #	G45
Depth (m)	0.6 - 0.7
Sample Date	26-Aug-13
Test Date	17-Sep-13
Technician	Beta Taryana

Liquid Limit	39
Plastic Limit	14
Plasticity Index	25

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	35	22	16		
Mass Wet Soil + Tare (g)	24.975	27.252	28.422		
Mass Dry Soil + Tare (g)	21.902	23.502	24.233		
Mass Tare (g)	13.778	14.100	14.003		
Mass Water (g)	3.073	3.750	4.189		
Mass Dry Soil (g)	8.124	9.402	10.230		
Moisture Content (%)	37.826	39.885	40.948		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.235	20.384			
Mass Dry Soil + Tare (g)	19.492	19.596			
Mass Tare (g)	14.175	13.964			
Mass Water (g)	0.743	0.788			
Mass Dry Soil (g)	5.317	5.632			
Moisture Content (%)	13.974	13.991			

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Atterberg Limits
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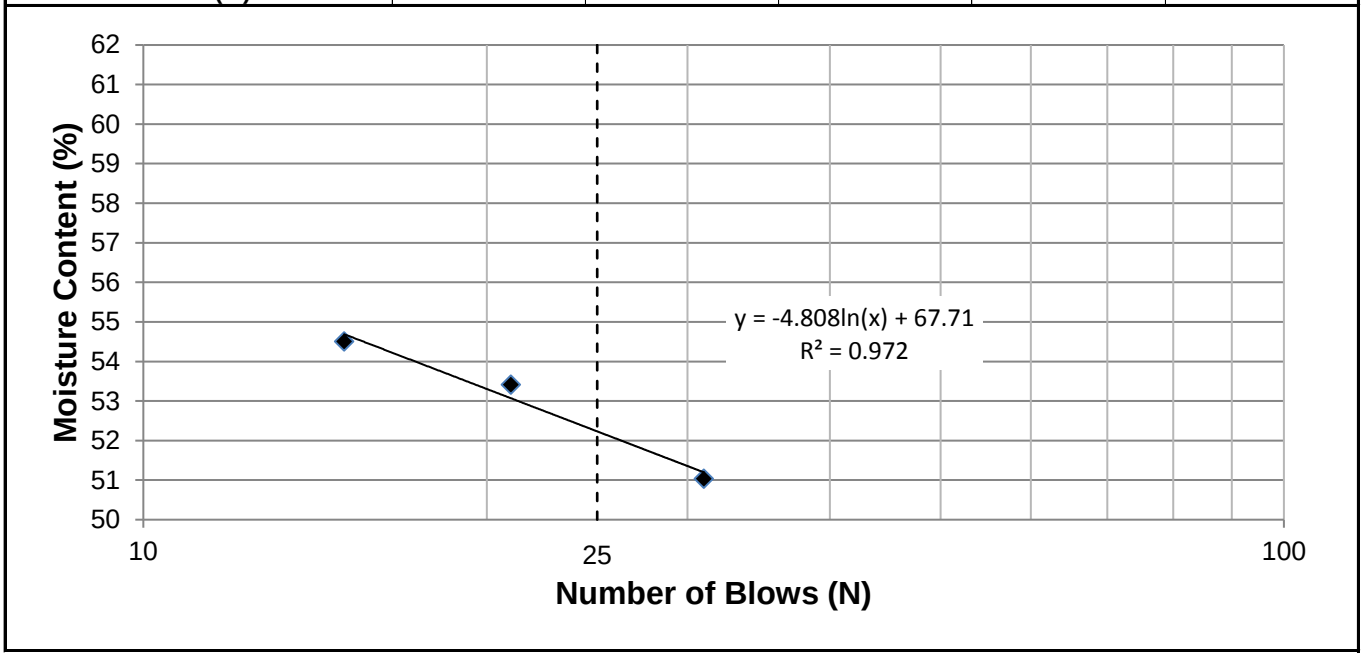
Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-12
Sample #	G102
Depth (m)	0.6 - 0.8
Sample Date	27-Aug-13
Test Date	16-Sep-13
Technician	Beta Taryana

Liquid Limit	52
Plastic Limit	17
Plasticity Index	35

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	31	21	15		
Mass Wet Soil + Tare (g)	24.268	24.868	24.274		
Mass Dry Soil + Tare (g)	20.830	21.182	20.735		
Mass Tare (g)	14.094	14.281	14.242		
Mass Water (g)	3.438	3.686	3.539		
Mass Dry Soil (g)	6.736	6.901	6.493		
Moisture Content (%)	51.039	53.413	54.505		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.140	20.336			
Mass Dry Soil + Tare (g)	19.236	19.407			
Mass Tare (g)	14.056	14.047			
Mass Water (g)	0.904	0.929			
Mass Dry Soil (g)	5.180	5.360			
Moisture Content (%)	17.452	17.332			

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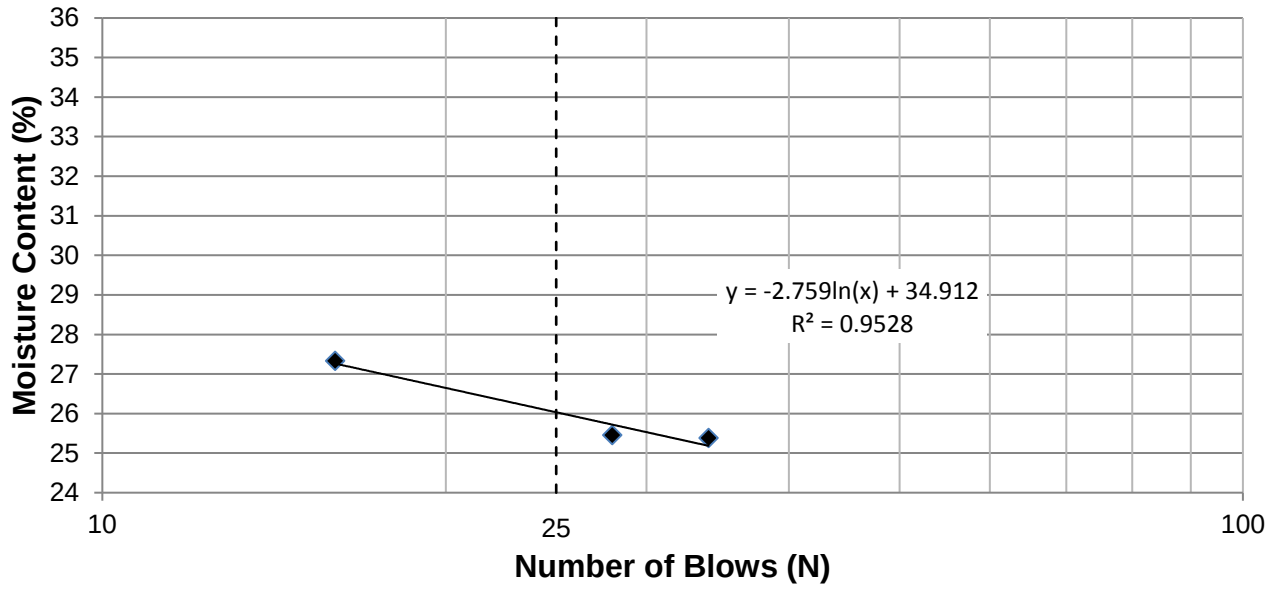
Atterberg Limits
ASTM D4318

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-15
Sample #	G64
Depth (m)	0.7 - 0.8
Sample Date	27-Aug-13
Test Date	17-Sep-13
Technician	Beta Taryana

Liquid Limit	26
Plastic Limit	14
Plasticity Index	12

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	34	28	16		
Mass Wet Soil + Tare (g)	27.105	26.107	25.911		
Mass Dry Soil + Tare (g)	24.471	23.578	23.345		
Mass Tare (g)	14.094	13.642	13.957		
Mass Water (g)	2.634	2.529	2.566		
Mass Dry Soil (g)	10.377	9.936	9.388		
Moisture Content (%)	25.383	25.453	27.333		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.680	20.258			
Mass Dry Soil + Tare (g)	19.858	19.493			
Mass Tare (g)	14.047	13.992			
Mass Water (g)	0.822	0.765			
Mass Dry Soil (g)	5.811	5.501			
Moisture Content (%)	14.146	13.907			

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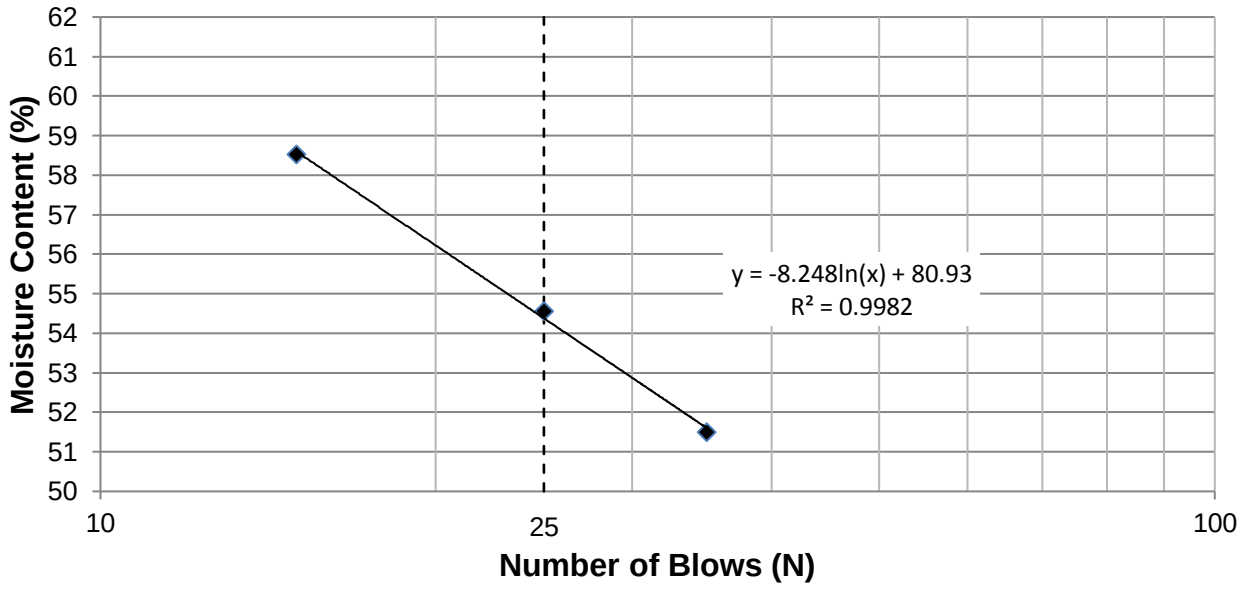
Atterberg Limits
ASTM D4318

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-18
Sample #	G55
Depth (m)	0.6 - 0.7
Sample Date	27-Aug-13
Test Date	16-Sep-13
Technician	Beta Taryana

Liquid Limit	54
Plastic Limit	16
Plasticity Index	39

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	35	25	15		
Mass Wet Soil + Tare (g)	23.548	23.833	25.427		
Mass Dry Soil + Tare (g)	20.320	20.381	21.232		
Mass Tare (g)	14.052	14.053	14.064		
Mass Water (g)	3.228	3.452	4.195		
Mass Dry Soil (g)	6.268	6.328	7.168		
Moisture Content (%)	51.500	54.551	58.524		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	21.815	20.312			
Mass Dry Soil + Tare (g)	20.750	19.468			
Mass Tare (g)	13.928	14.032			
Mass Water (g)	1.065	0.844			
Mass Dry Soil (g)	6.822	5.436			
Moisture Content (%)	15.611	15.526			

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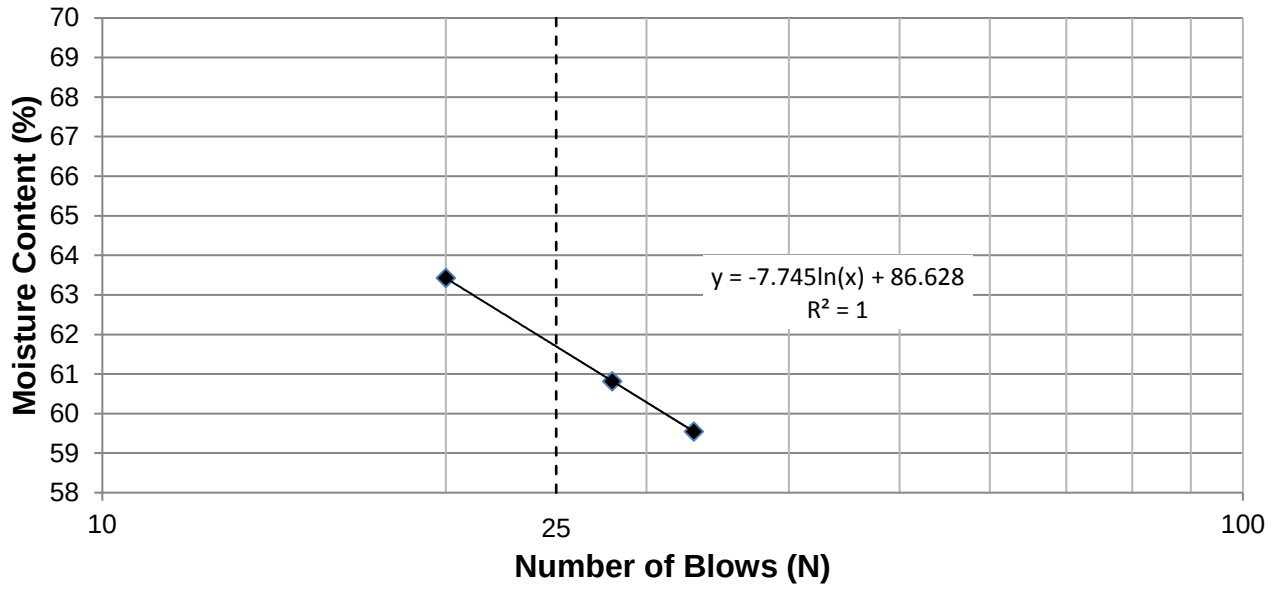
Atterberg Limits
ASTM D4318

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-21
Sample #	G92
Depth (m)	0.6 - 0.7
Sample Date	27-Aug-13
Test Date	17-Sep-13
Technician	Beta Taryana

Liquid Limit	62
Plastic Limit	16
Plasticity Index	46

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	33	28	20		
Mass Wet Soil + Tare (g)	24.307	25.374	26.533		
Mass Dry Soil + Tare (g)	20.509	21.042	21.620		
Mass Tare (g)	14.131	13.919	13.874		
Mass Water (g)	3.798	4.332	4.913		
Mass Dry Soil (g)	6.378	7.123	7.746		
Moisture Content (%)	59.548	60.817	63.426		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	21.756	20.523			
Mass Dry Soil + Tare (g)	20.686	19.669			
Mass Tare (g)	14.052	14.010			
Mass Water (g)	1.070	0.854			
Mass Dry Soil (g)	6.634	5.659			
Moisture Content (%)	16.129	15.091			

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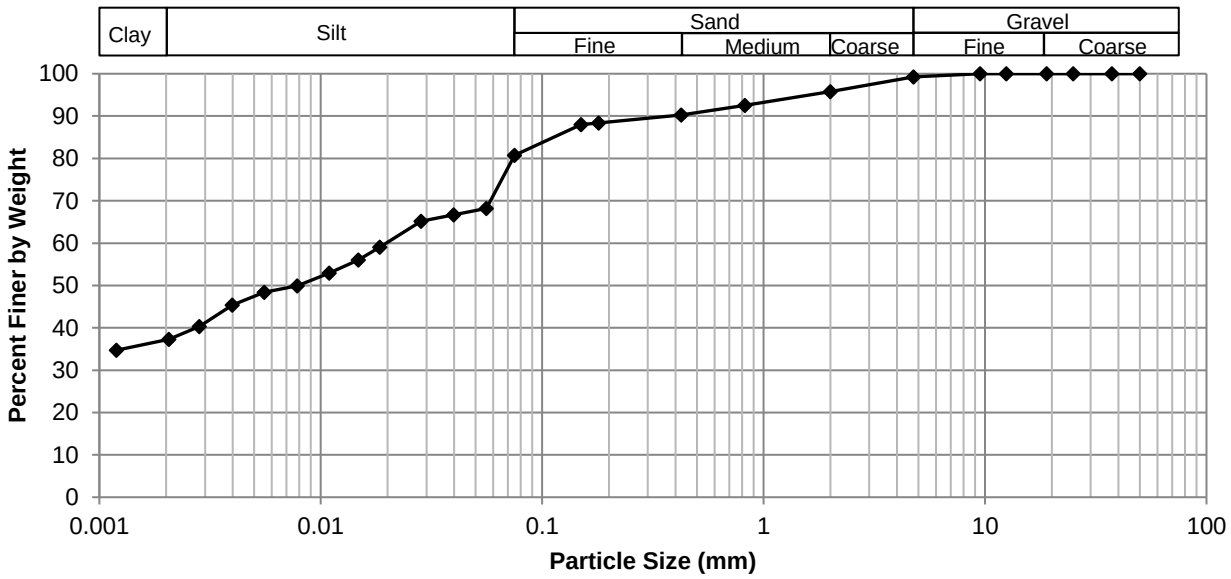
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-02
Sample #	G10
Depth (m)	0.6 - 0.7
Sample Date	26-Aug-13
Test Date	16-Sep-13
Technician	Beta Taryana

Gravel	0.8%
Sand	18.5%
Silt	43.7%
Clay	37.1%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	99.23	0.0750	80.77
37.5	100.00	2.00	95.80	0.0560	68.18
25.0	100.00	0.825	92.53	0.0399	66.66
19.0	100.00	0.425	90.30	0.0284	65.14
12.5	100.00	0.180	88.35	0.0185	59.06
9.50	100.00	0.150	88.01	0.0148	56.01
4.75	99.23	0.075	80.77	0.0109	52.97
				0.0078	49.93
				0.0056	48.41
				0.0040	45.37
				0.0028	40.32
				0.0021	37.28
				0.0012	34.72

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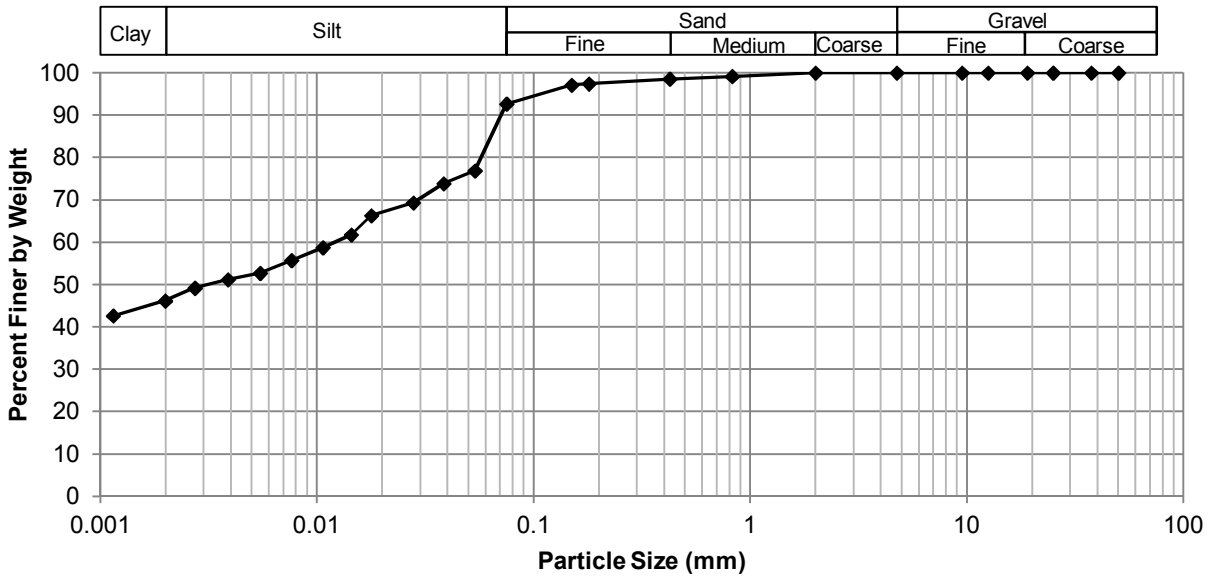
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-03
Sample #	G131
Depth (m)	0.9 - 1.0
Sample Date	26-Aug-13
Test Date	26-Sep-13
Technician	Chiran Peiris

Gravel	0.0%
Sand	7.4%
Silt	46.4%
Clay	46.2%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	92.61
37.5	100.00	2.00	100.00	0.0536	76.88
25.0	100.00	0.825	99.16	0.0385	73.85
19.0	100.00	0.425	98.52	0.0278	69.31
12.5	100.00	0.180	97.38	0.0178	66.29
9.50	100.00	0.150	97.11	0.0144	61.75
4.75	100.00	0.075	92.61	0.0107	58.72
				0.0076	55.70
				0.0055	52.67
				0.0039	51.16
				0.0027	49.17
				0.0020	46.14
				0.0011	42.62

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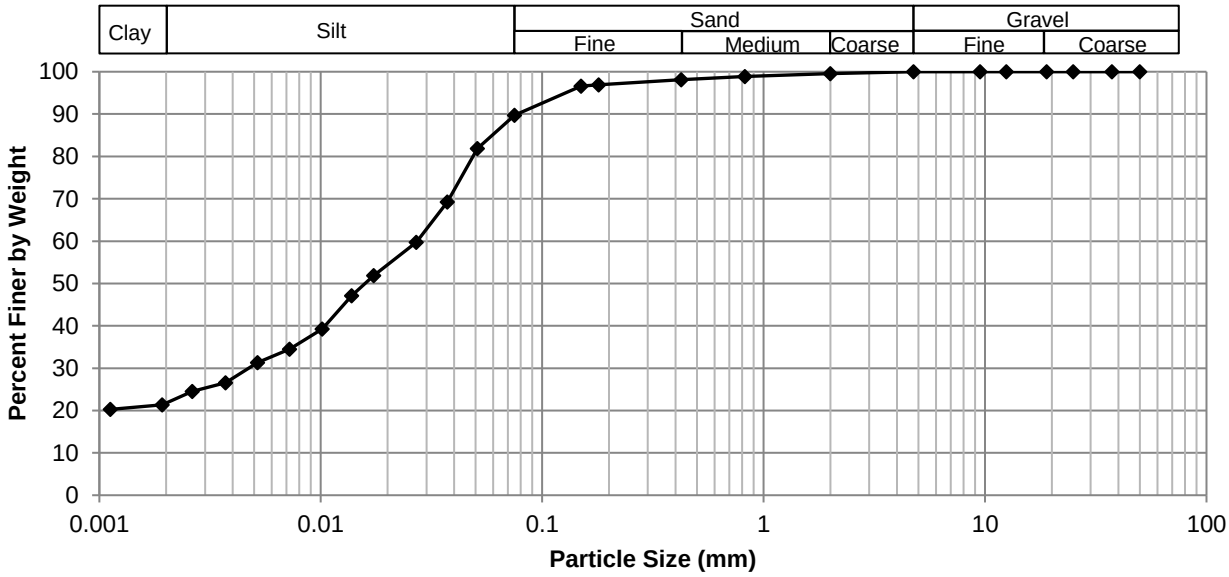
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-04
Sample #	G3
Depth (m)	0.6 - 0.7
Sample Date	26-Aug-13
Test Date	16-Sep-13
Technician	Beta Taryana

Gravel	0.0%
Sand	10.3%
Silt	68.0%
Clay	21.7%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	89.71
37.5	100.00	2.00	99.53	0.0510	81.90
25.0	100.00	0.825	98.84	0.0373	69.25
19.0	100.00	0.425	98.10	0.0270	59.77
12.5	100.00	0.180	96.88	0.0173	51.87
9.50	100.00	0.150	96.62	0.0138	47.13
4.75	100.00	0.075	89.71	0.0102	39.23
				0.0072	34.49
				0.0052	31.33
				0.0037	26.59
				0.0026	24.50
				0.0019	21.34
				0.0011	20.26

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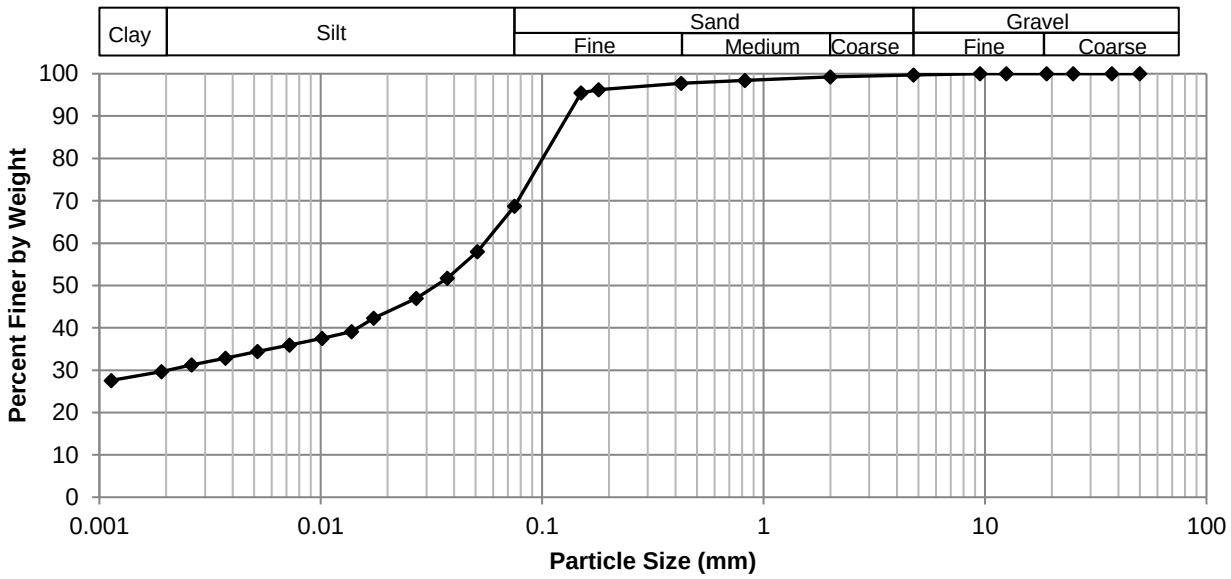
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-08
Sample #	G45
Depth (m)	0.6 - 0.7
Sample Date	26-Aug-13
Test Date	14-Sep-13
Technician	Beta Taryana

Gravel	0.3%
Sand	31.0%
Silt	38.8%
Clay	29.9%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	99.75	0.0750	68.71
37.5	100.00	2.00	99.24	0.0510	58.03
25.0	100.00	0.825	98.40	0.0373	51.72
19.0	100.00	0.425	97.76	0.0270	46.99
12.5	100.00	0.180	96.22	0.0173	42.27
9.50	100.00	0.150	95.46	0.0138	39.12
4.75	99.75	0.075	68.71	0.0102	37.54
				0.0072	35.96
				0.0052	34.39
				0.0037	32.81
				0.0026	31.24
				0.0019	29.66
				0.0011	27.58

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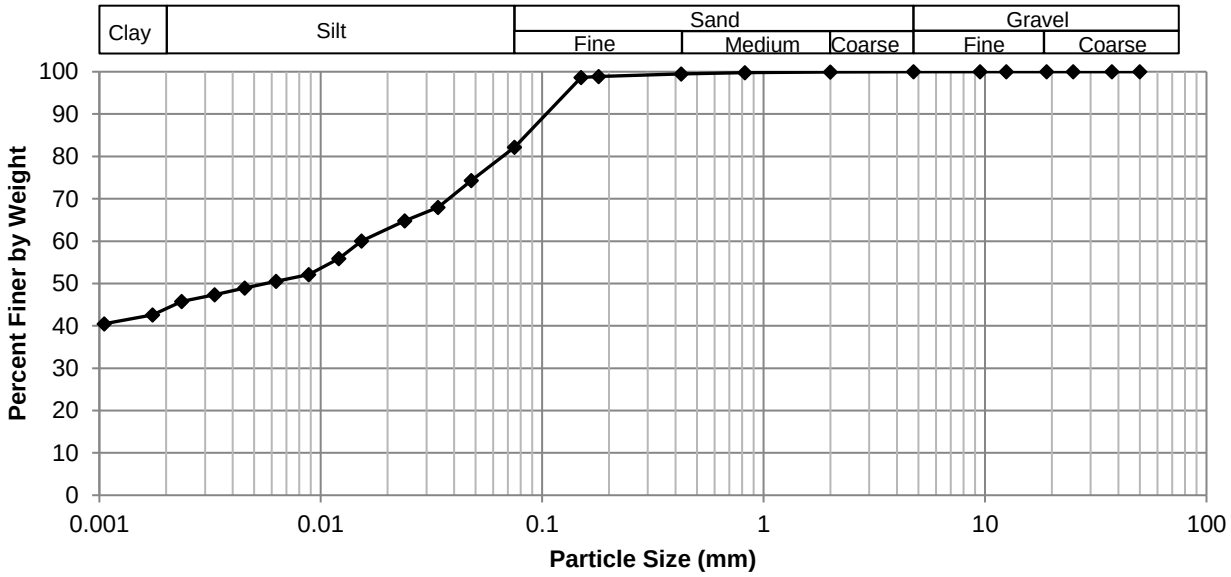
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-12
Sample #	G102
Depth (m)	0.7 - 0.8
Sample Date	27-Aug-13
Test Date	14-Sep-13
Technician	Beta Taryana

Gravel	0.0%
Sand	17.8%
Silt	38.3%
Clay	43.9%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	82.21
37.5	100.00	2.00	99.97	0.0479	74.33
25.0	100.00	0.825	99.76	0.0338	67.98
19.0	100.00	0.425	99.48	0.0239	64.80
12.5	100.00	0.180	98.90	0.0153	60.04
9.50	100.00	0.150	98.63	0.0121	55.91
4.75	100.00	0.075	82.21	0.0088	52.10
				0.0063	50.52
				0.0045	48.93
				0.0033	47.34
				0.0024	45.75
				0.0017	42.58
				0.0011	40.49

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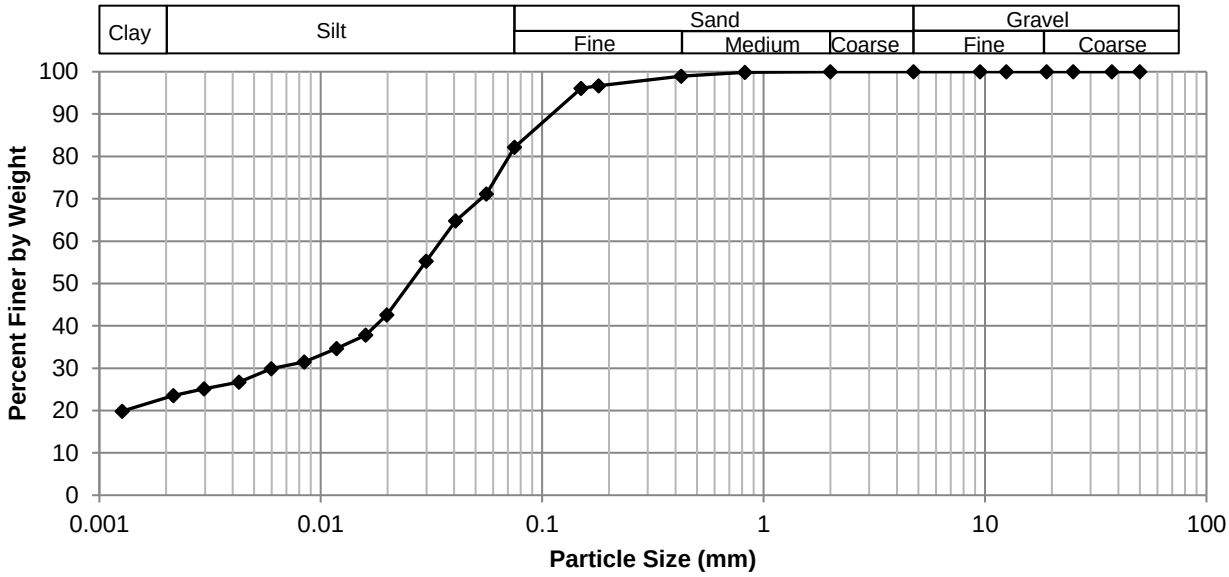
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-15
Sample #	G64
Depth (m)	0.7 - 0.8
Sample Date	26-Aug-13
Test Date	16-Sep-13
Technician	Beta Taryana

Gravel	0.0%
Sand	17.8%
Silt	59.3%
Clay	22.9%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	82.18
37.5	100.00	2.00	100.00	0.0560	71.17
25.0	100.00	0.825	99.82	0.0407	64.82
19.0	100.00	0.425	98.92	0.0299	55.29
12.5	100.00	0.180	96.66	0.0199	42.59
9.50	100.00	0.150	96.05	0.0160	37.83
4.75	100.00	0.075	82.18	0.0118	34.65
				0.0084	31.48
				0.0060	29.89
				0.0043	26.71
				0.0030	25.12
				0.0022	23.54
				0.0013	19.86

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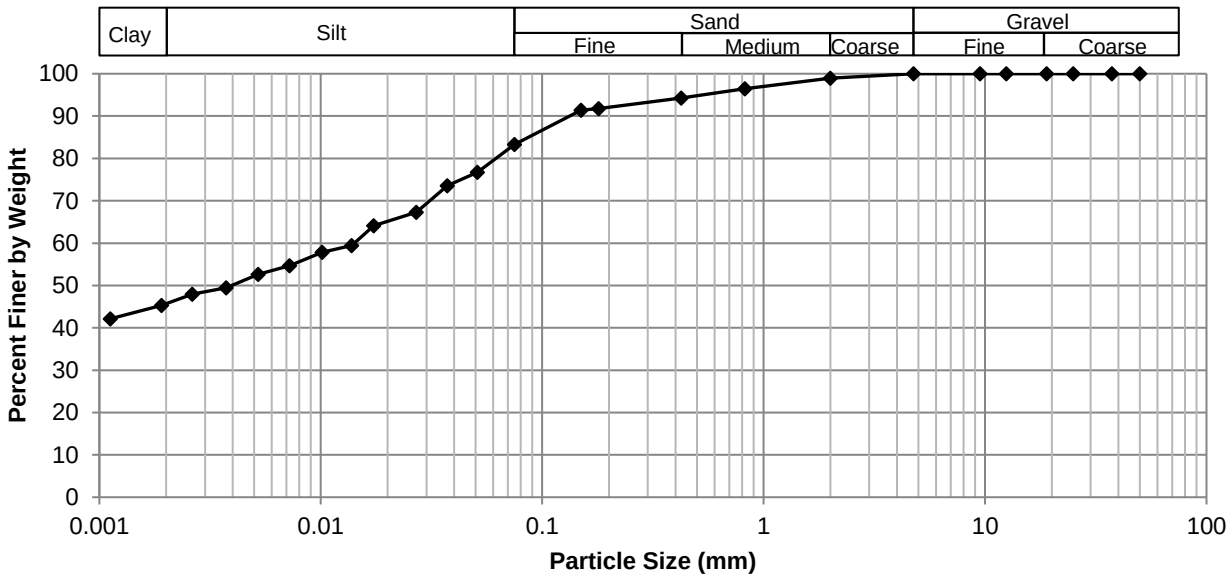
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-18
Sample #	G55
Depth (m)	0.6 - 0.7
Sample Date	27-Aug-13
Test Date	15-Sep-13
Technician	Beta Taryana

Gravel	0.0%
Sand	16.7%
Silt	37.7%
Clay	45.6%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	83.29
37.5	100.00	2.00	98.94	0.0510	76.70
25.0	100.00	0.825	96.49	0.0373	73.56
19.0	100.00	0.425	94.30	0.0270	67.28
12.5	100.00	0.180	91.79	0.0173	64.14
9.50	100.00	0.150	91.37	0.0138	59.42
4.75	100.00	0.075	83.29	0.0102	57.85
				0.0072	54.71
				0.0052	52.64
				0.0037	49.50
				0.0026	47.93
				0.0019	45.28
				0.0011	42.14

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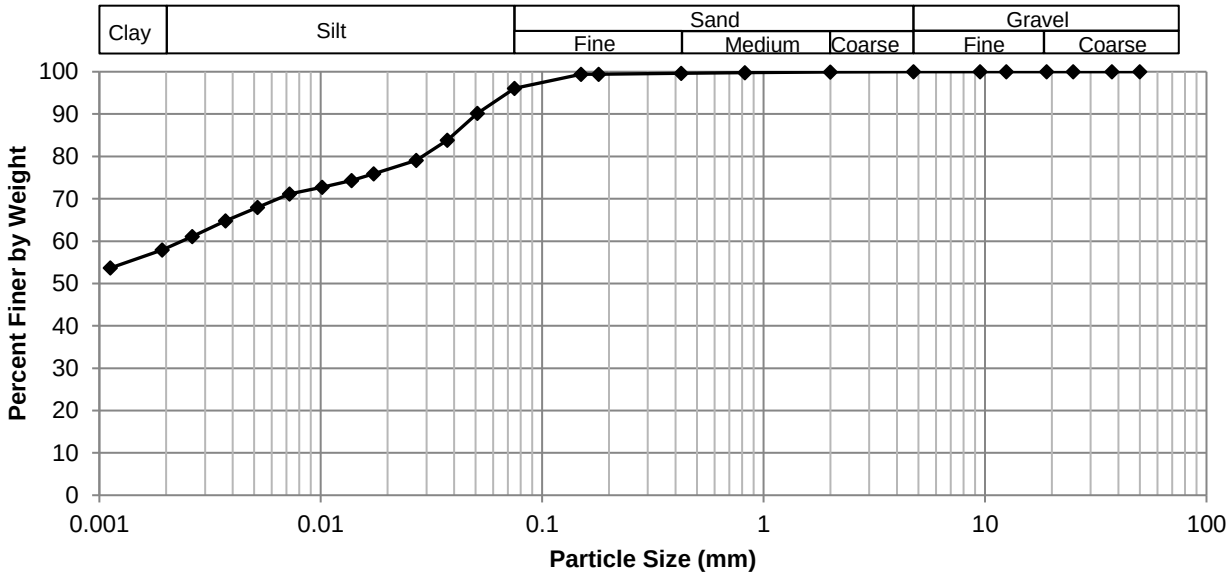
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 008 00
Client	Morrison Hershfield
Project	Polo Park Infrastructure Upgrades
Test Hole	TH13-21
Sample #	G92
Depth (m)	0.6 - 0.7
Sample Date	27-Aug-13
Test Date	15-Sep-13
Technician	Beta Taryana

Gravel	0.0%
Sand	3.9%
Silt	37.8%
Clay	58.3%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	96.07
37.5	100.00	2.00	99.92	0.0510	90.15
25.0	100.00	0.825	99.77	0.0373	83.81
19.0	100.00	0.425	99.61	0.0270	79.05
12.5	100.00	0.180	99.40	0.0173	75.88
9.50	100.00	0.150	99.40	0.0138	74.29
4.75	100.00	0.075	96.07	0.0102	72.70
				0.0072	71.12
				0.0052	67.94
				0.0037	64.77
				0.0026	61.09
				0.0019	57.92
				0.0011	53.66

Appendix C

Photographs of Pavements Core Samples

Photo 1: Concrete Core Sample from Test Hole TH13-01

Photo 2: Concrete Core Sample from Test Hole TH13-02

Photo 3: Asphalt and Concrete Core Sample from Test Hole TH13-03

Photo 4: Asphalt and Concrete Core Sample from Test Hole TH13-05

Photo 5: Asphalt and Concrete Core Sample from Test Hole TH13-07

Photo 6: Asphalt and Concrete Core Sample from Test Hole TH13-08

Photo 7: Asphalt and Concrete Core Sample from Test Hole TH13-09

Photo 8: Asphalt and Concrete Core Sample from Test Hole TH13-11

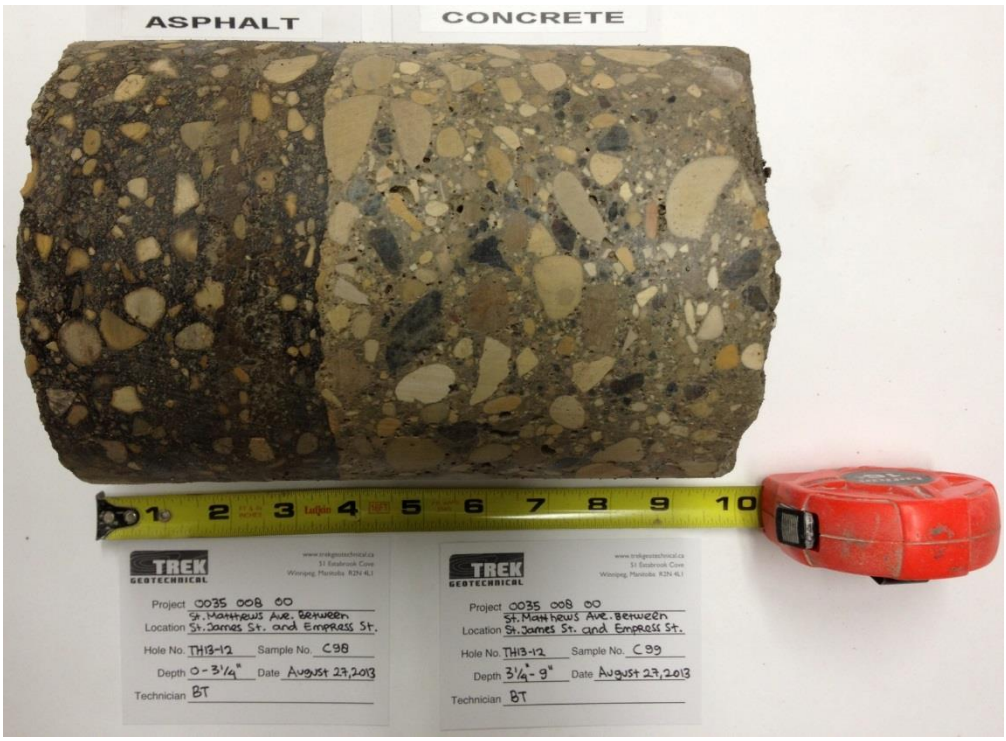


Photo 9: Asphalt and Concrete Core Sample from Test Hole TH13-12

Photo 10: Asphalt and Concrete Core Sample from Test Hole TH13-13

Photo 11: Asphalt and Concrete Core Sample from Test Hole TH13-14

Photo 12: Asphalt and Concrete Core Sample from Test Hole TH13-15

Photo 13: Asphalt and Concrete Core Sample from Test Hole TH13-16

Photo 14: Asphalt and Concrete Core Sample from Test Hole TH13-17

Photo 15: Asphalt and Concrete Core Sample from Test Hole TH13-18

Photo 16: Asphalt and Concrete Core Sample from Test Hole TH13-19

Photo 17: Asphalt and Concrete Core Sample from Test Hole TH13-19B

Photo 18: Asphalt and Concrete Core Sample from Test Hole TH13-20

Photo 19: Asphalt and Concrete Core Sample from Test Hole TH13-21

Photo 20: Asphalt and Concrete Core Sample from Test Hole TH13-22

Photo 21: Asphalt and Concrete Core Sample from Test Hole TH13-23

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GEOTECHNICAL REPORT FOR THE ST. MATHEWS–OMANDS CREEK CROSSING

PREPARED FOR DILLON CONSULTING BY A. DEAN GOULD P.ENG May 22,2009

1.0 Terms of Reference

In accordance with the proposal of March 2,2009 the writer was commissioned to undertake a subsurface investigation of the site for the proposed culvert replacement crossing of Omand's Creek adjacent Empress Street. The site is located at the intersection of St. Mathews Avenue and Empress Street and is a main road artery of the City of Winnipeg. The site is bounded by commercial building to the southeast, a beer vender to the northeast and Empress Street to the west. Omand's creek is a main waterway, which has been, relocated to its present location in early 1950 The terrain s basically level and lacks vegetation.

2.0 Subsurface Investigation

The subsurface investigation commenced on March 12,2009 and consisted of four (4) test holes, which were located through survey by Dillon Consulting in the area of the proposed crossing. The test holes were 150mm in diameter and were produced by a track-mounted auger-drilling machine owned and operated by Maple Leaf Environmental of Winnipeg. Each test hole extended from ground surface to auger refusal on dense glacial till. Test holes were logged and sampled for identifcation of the soil stratigraphy. Disturbed samples were subjected to identification in the field and a following confirmation by the writer to identify and anomalies. Insitu Dutch Cone penetration tests were performed in Test Holes 4 to obtain insitu strength tests of the glacial till for foundation design. The ground water level in all test holes was measured following completion and each hole was backfilled with local clays. Test Holes 1was dry, Test Holes 3 and 4 showed minor water inflow at depths of 1.37m and 2.13m respectively. The location of all test holes is shown on the appended plan.

3.0 Soil Profile

The soil stratigraphy at the site as determined through this investigation and described on the attached logs was found to be typical of the area, consisting of approximately 8 meters of surface lacustrine clays overlying glacial till. Overlying the clays is up to 2 meters of a granular fill. The glacial till surface at approximately Elevation 224 was found to dip slightly from east to west. Dutch cone penetration tests indicate a very dense till (N<50) at Elevation 223 +/-. Moisture content testing was performed in the writer's facility on disturbed samples and the results of that testing is shown plotted on the attached logs. Undisturbed Shelby tube samples of the clay were obtained for laboratory testing and the

undrained strength was found to be 70.7 kPa, 50 Kpa less than the overburden pressure at the sample elevation of 224.38. From the stability analysis of the existing slope, through a back analysis technique soil strength parameters of phi=15 degrees and a cohesion of 2 kPa produced a computed Factor of Safety against sliding of 1.13 which appears reasonable for the current condition of slope stability. Applying these soil strength parameters in the General Bearing equation (re: Canadian Foundation Manual 3rd Edition) an ultimate bearing capacity of 140.9 kPa was determined. Using s Factor of Safety of 2.0 allowable bearing capacity in the clays was found to be 111.7 kPa slightly lower than the 120.7 kPa determined. For a typical raft footing design within the clay strata, the following allowable bearing pressure at the base (Elevation 228) that should be applied in design assuming a 2.5 surcharge due to the fill height above the obvert of the box culvert:

Depth of Fill Below Street Grade	Footing Width	ULS Capacities	Allowable Bearing Capacity
2.5 meters	1 m	140.9 kPa	111.7 kPa

The underlying glacial till was relatively soft through the upper zone (N=16-20) and became dense (N=>50) at a depth of 9.4 – 9.1 meters. The insitu strengths of the glacial till, as determined through the Dutch Cone Penetration testing are as follows;

Test Hole No.	Elevation	N Blows/300mm Average values	Ultimate Bearing Capacity of Till	Allowable Bearing Capacity of Till FS=2
1	224.7- 223.8	25 (20*)	1198.8 kPa	640.6 kPa
1	223.8-223.2	39 (27*)	1538.1 kPa	810.5 kPa
4	222.08	69 (42*)	2664.7 kPa	1273.6 kPa

* Reduction made for water table or Omand's creek levels

4.0 Foundation Considerations

For the proposed box culvert it is assumed by the writer that minimal movement could be tolerated and that the structure would be designed structurally as a monolithic unit. Movements that would occur could potentially be reflected in the surface pavements and be accommodated in the pavement joints. Some fill consolidation over the obvert of the culvert can be anticipated which can be minimized with close quality compaction control. The base support for a raft footing would distribute both structure and fill loadings on the clay soils. Concentrated loads from the walls could produce some differential loading, which can be minimized with the provision of a 300mm granular free draining layer below the slab to distribute loading. Upstream and downstream cut-offs are normally required to

prevent erosion undercutting during high and low flow velocity periods. The granular layer must be provided with drains, which extend through the cut-offs to prevent uplift forces on the raft.

Foundations for a structure that is sensitive to movement and stress from traffic surface loading should utilize a pile foundation bearing upon the dense glacial till at or near Elevation 222. Piles could be of either cast in place concrete with expanded bases for heavy loads or driven concrete piles. For the cast in place piles it is not anticipated that sleeving of the holes would be required. Driven piles which are expected to reach the following set criteria at a depth of 12 meters below grade would have the following design capacities;

Pile Diameter	Final Set Blows/25mm *	Capacity
300 mm	6 blows/25 mm	450 kN
350 mm	8 blows/25 mm	600 kN
400 mm	10 blows/25 mm	800 kN

- For a pile driving hammer delivering a minimum of 30,000 ft-lbs per blow

5.0 Retaining Walls and Containment Structures

For the retaining walls, the design should be based upon the Rankin wall coefficient of 0.8 for clay soils in direct contact with the walls. Provision of drainage through a granular backfill and a weeping tile system can reduce the backfill pressure markedly allowing the coefficient of 0.35 to be applied in wall design.
Free draining backfill comprised of crushed dolomitic Limestone meeting the following grading specification is recommended for the backfill and the granular sub base below the floor slab:

Cdn Metric Sieve Size	% of Total Weight Passing
40,000	95-100%
20,000	35-70%
10,000	10-30%
5,000	0-5%

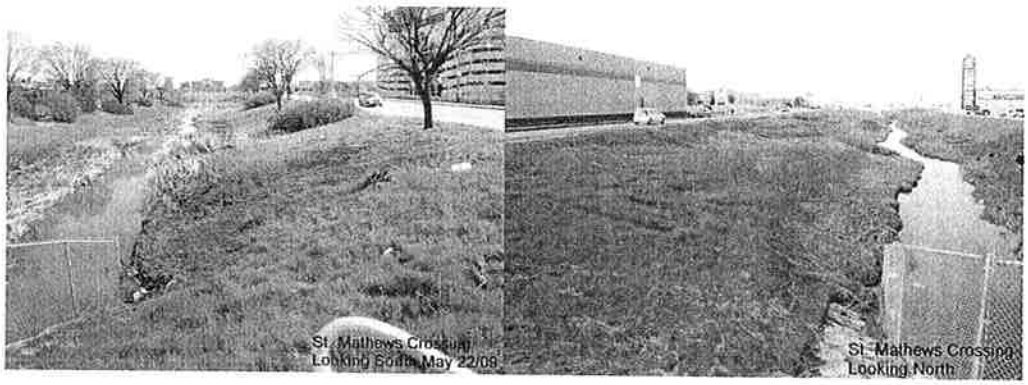
The material should be placed in 150mm lifts and compacted to 98% of maximum dry density according to ASTM D-698

A box culvert, when designed as a raft, essentially removes weight from the base of the footing by replacing soil weight with water of lower density. The raft distributes load uniformly on a soil base that has experienced loading, consequently neither settlement nor

uplift would be experienced providing the design pressures is equal to overburden pressure at the design base elevation. Should the box culvert remain empty for an extended period of time (3 months) a small amount of rebound may occur, however since the base will be underlain by between 4-5 meters of clay soil which has been preloaded with the existing culverts and street traffic, and the underlying glacial till has a low potential for rebound, the upward movement should be low.

6.0 Shoring Requirements

Due to proximity of Empress Street and the need for this major thoroughfare to be in service during the construction of the box culvert crossing, there will be a need for shoring to support the roadway during excavation for the base slab and placement of the walls. Shoring design must recognize both lateral soil loading and lateral loads produced from traffic.



The shoring should be designed on the based of a Rankin soil pressure coefficient of 0.3 considered adequate for temporary works performed during the winter or during low flow periods when Oman's creek levels are low.

7.0 Slope Stability

The Omand's Creek slopes both upstream and downstream of the structure are known to be unstable. As indicated above, a back analysis of the existing slopes shown in Section A-A and B-B attached was made to verify the mobilized effective soil parameters and to determine safe slopes.

The back analysis was performed utilizing the 2-dimensional computer program G-Slope and the Bishops Modified method of analysis. The analysis produced similar results for both sections and the following effective soil strength parameters for the brown clay (Factor of Safety against sliding 1.1 or near unity). The failure scarp locations in both

sections matched the observed failure scarp positions as shown on the photographs. The lower surface of the most probable failure surface was between Elevation 227.5 and 228, approximately 1-1.5 meters below the base slab of the box culvert.

Angle of Internal Friction (phi) = 15 degrees

Cohesion = 2 kPa

Based upon this analysis remedial measures to stabilize the slopes included Rock Caisson installations and Shear Keys. The structure granular backfill will effectively become a large portion of a Shear Key.

The length of the slope stabilization is questionable as Omand's Creek from Sargent Avenue to St Mathews and south, presents evidence of instability. For this structure, a length of 20 meters upstream and downstream of the existing CMP is assumed as part of the project. A summary of the options and the computed benefits are as follows:

Stabilization Options

Option	Factor of Safety	Improvement %	Total Length	Estimated Costs
Shear Key	1.39 4m base at Elev 229.5	23.4%	38 meters west side(2000cu.m)	$ 70,000*
Rock Caissons	1.57 14-1800mm R/C @ 4m c-c	38.7%	38 meters west side	$ 91,000*

Costs estimated on basis of $40.00/cu.m of rock fill and $6,500/caisson

Seismic Considerations

The Winnipeg area is within in a low seismic zone having a peak horizontal ground velocity less than 0.4g. This complies to a Class C area of Seismic Response in accordance with the National Building Code of Canada, 2005 Table 4.1.8.4.A A calculation of the impact on structures produces minimal seismic response factors and is normally neglected in local practise.

7.0 Recommendations

Based upon the above, the following recommendations are offered:

1. That the box culvert be founded upon a structural raft footing at or about Elevation 228 (approximately 1.5 meters below the base of channel) and the allowable soil bearing pressure in design be 120 kPa

2. Below the raft a free draining granular base should be provided to distribute structure and fill loading to the base soil. Consolidation and settlement should be minimal since the base foundation has experienced loading of this magnitude under current service.

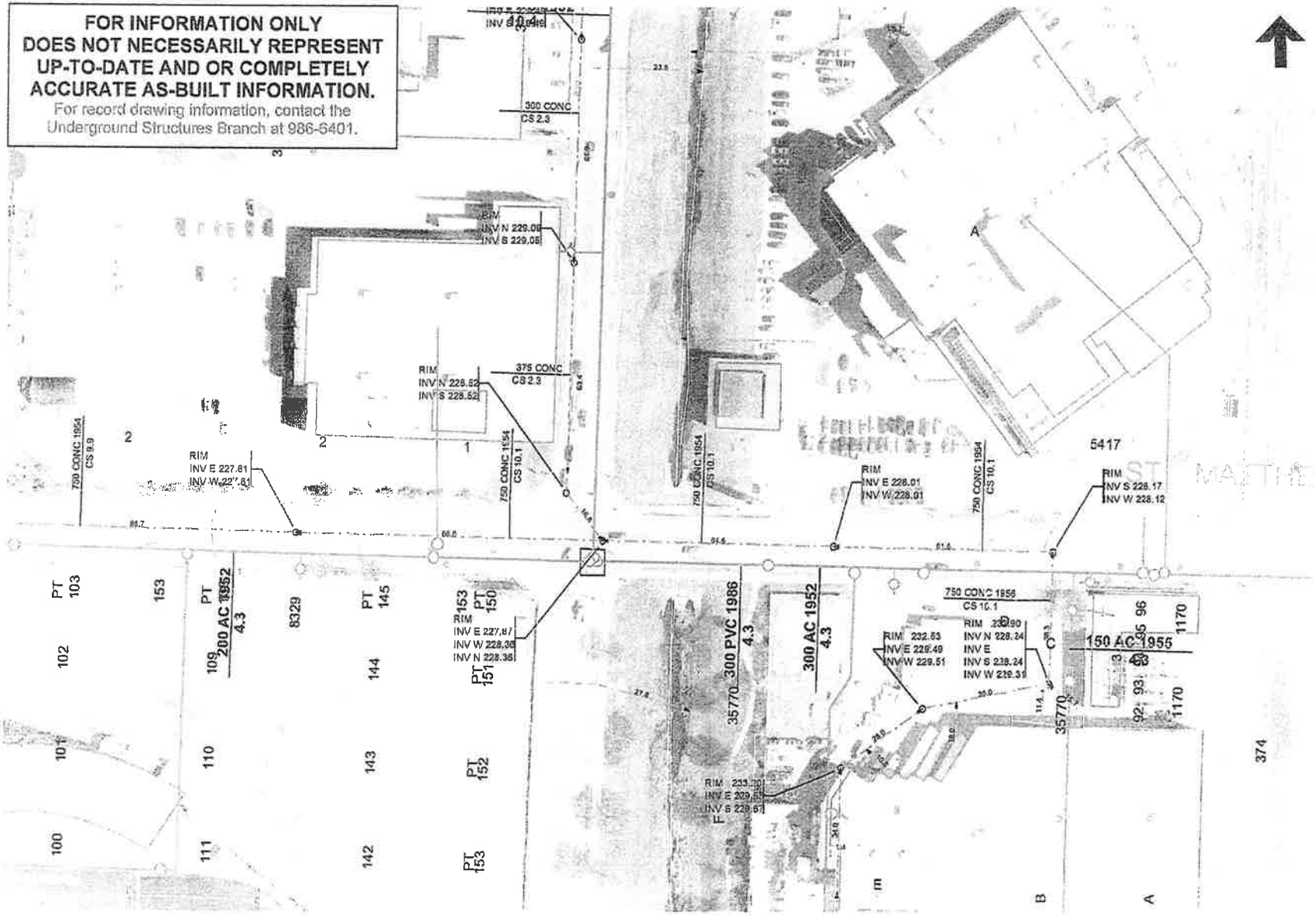
3. Upstream and downstream cut-off walls should be provided to prevent undercutting during high and low flows. The cut-off walls should be equipped with drain holes to prevent hydraulic uplift on base. The material grading specifications for the recommended granular sub base are provided in section 5.0

4. That embankment stabilization consisting of a shear key be installed along the west slope of Omands Creek through a distance of 20 meters upstream and downstream of the structure.

5. That type 50 sulphate resistant cement be used in all concrete in contact with the soil

Respectfully Submitted,

A. Dean Gould P.Eng
Geotechnical Consultant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ACCURATE AS-BUILT INFORMATION.
For record drawing information, contact the
Underground Structures Branch at 986-6401.
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INV N 229.05
INV S 229.05
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CS 2.3
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INV S 228.52
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CS 9.9
RIM
INV E 227.61
INV W 227.61
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CS 10.1
750 CONC 1954
CS 10.1
RIM
INV E 228.01
INV W 228.01
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INV E
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4.3
35770
35770
PT 103
PT 102
PT 101
PT 100
153
109
110
111
8329
PT 145
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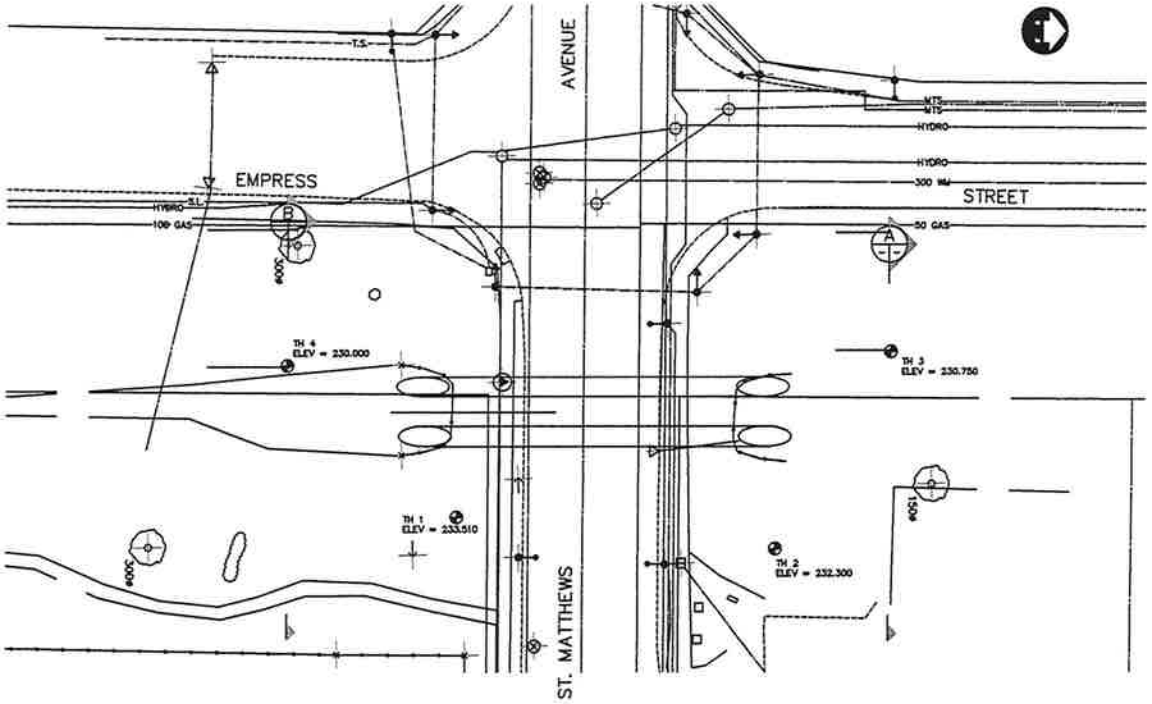

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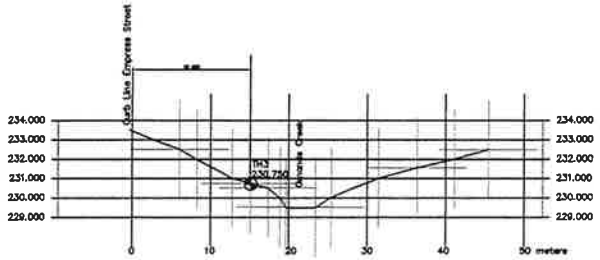

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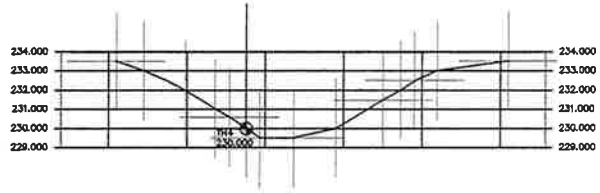

SECTION B–B
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PRELIMINARY ONLY
NOT FOR CONSTRUCTION

NO.	REVISIONS	DATE	BY

DESIGNED BY
DRAWN BY DCW
CHECKED BY JSB
APPROVED BY
HOR. SCALE 1:250
VERTICAL
DATE APR 24, 2009

DILLON CONSULTING

RELEASED FOR CONSTRUCTION
DATE

ENGINEER'S SEAL

CONSULTANT PROJECT NO.
08-8683-2000

THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

OMAND'S CREEK CULVERT
THROUGH ST. MATTHEWS AVENUE

CITY DRAWING NUMBER

SHEET SK-1 OF

BID OPPORTUNITY

A. Dean Gould P.Eng and Associates	**Location: St. Mathews – Omands Creek Crossing** UTM E N	**TEST HOLE NO. 1**	**PROJECT NO.**

Project Description: St. Mathews at Omands Creek – SE Corner
Client : Dillon Consulting

Drilling Date: March 12, 2009
Driller: MAPLE LEAF ENVIRONMENTAL
Logged By; R.J. GOULD

SPL No	Depth (m)	Log	SOIL DESCRIPTION Collar Elevation 233.510	MOISTURE CONTENT 10 20 30 40 50 60 70 80
			0- 1.67m Gravel Fill	
			1.67 – 8.43m Brown Clay mixed with grey and becoming moist and soft at D=4.6m	
	5			
			8.43 – 10.67m Tan silt Till	
	10		End of Hole at 10.69 m No water in hole following drilling operation	
			Dutch Cone Test Results	
	15		**Depth N blows/300mm** 8.83-9.14 20 9.14-9.44 25 9.44-9.74 32 9.74-10.04 38	
	20		10.04-10.34 40 10.34-10.64 45 10.36-10.67 53	
	25			

LEGEND

Topsoil Silt Brown clay Grey clay
Glacial till Sand and gravel
Plastic Limit x.....x Liquid Limit
N=Dutch Cone penetration tests blows/300mm
Qu= Unconfined Compression Strength (kPa)

TEST HOLE 1

A. Dean Gould P.Eng and Associates	**Location: St. Mathews – Omands Creek Crossing** UTM E N	**TEST HOLE NO. 2**	**PROJECT NO.**
Project Description: St. Mathews at Omands Creek – NE Corner **Client : Dillon Consulting**		**Drilling Date: March 12, 2009** **Driller: MAPLE LEAF ENVIRONMENTAL** **Logged By; R.J. GOULD**	

SPL No	Depth (m)	Log	SOIL DESCRIPTION Collar Elevation 232.300	MOISTURE CONTENT 10 20 30 40 50 60 70 80
			0- 2.29m Gravel Fill	
			2.29 – 2.74m Brown Clay mixed with grey and becoming moist and soft at D=	
	5		2.74 – 9.45m Grey Lacustrine highly plastic Clay	
			qu@7.92 = 70.66 kPa Unit Wt=1687 kg/cm	
			9.45m Tan silt Till	
	10		End of Hole at 9.45 m No water in hole following drilling operation	
	15			
	20			
	25			

LEGEND

Topsoil Silt Brown clay Grey clay

Glacial till Sand and gravel

Plastic Limit x.....x Liquid Limit

N=Dutch Cone penetration tests blows/300mm

Qu= Unconfined Compression Strength (kPa)

TEST HOLE 2

A. Dean Gould P.Eng and Associates	**Location: St. Mathews – Omands Creek Crossing** UTM E N	**TEST HOLE NO. 3**	**PROJECT NO.**

Project Description: St. Mathews at Omands Creek – NW Corner
Client : Dillon Consulting

Drilling Date: March 12, 2009
Driller: MAPLE LEAF ENVIRONMENTAL
Logged By; R.J. GOULD

SPL No	Depth (m)	Log	SOIL DESCRIPTION Collar Elevation 230.750	MOISTURE CONTENT 10 20 30 40 50 60 70 80
			0- 1.52m Gravel Fill with some clay, natural or original soil profile commences at 1.52m same level as Omands Creek – Water inflow at 1.37m	
	5		1.52 – 7.92m Brown and Grey, highly plastic lacustrine Clay	
			4.57 m test hole sloughed-	
			7.92 – 8.38 m Tan silt Till End of Hole at 8.38 m auger refusal	
	10			
	15			
	20			
	25			

LEGEND

Topsoil, Silt, Brown clay, Grey clay, Glacial till, Sand and gravel

Plastic Limit x.....x Liquid Limit
N=Dutch Cone penetration tests blows/300mm
Qu= Unconfined Compression Strength (kPa)

TEST HOLE 3

A. Dean Gould P.Eng and Associates	**Location: St. Mathews – Omands Creek Crossing** UTM E N	**TEST HOLE NO. 4**	**PROJECT NO.**

Project Description: St. Mathews at Omands Creek – SW Corner
Client : Dillon Consulting

Drilling Date: March 12, 2009
Driller: MAPLE LEAF ENVIRONMENTAL
Logged By; R.J. GOULD

SPL No	Depth (m)	Log	SOIL DESCRIPTION Collar Elevation 230.000	MOISTURE CONTENT 10 20 30 40 50 60 70 80
			0- 1.52m Brown weathered silty Clay (fill)	
			1.52 – 7.92m Grey, higly plastic lacustrine Clay	
			water inflow at 2.13 m	
	5		organic odor	
			7.92 – 8.38 m Tan silt Till	
	10		End of Hole at 8.38 m auger refusal No water in hole following drilling operation	
			Dutch Cone Test Results **Depth N blows/300mm** 7.92 – 8.38m 69	
	15			
	20			
	25			

LEGEND

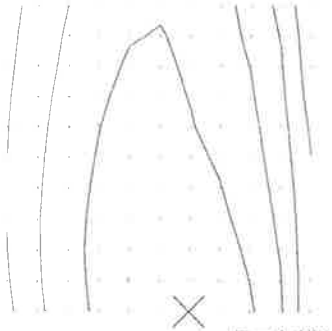
Topsoil Silt Brown clay Grey clay
Glacial till Sand and gravel
Plastic Limit x.....x Liquid Limit
N=Dutch Cone penetration tests blows/300mm
Qu= Unconfined Compression Strength (kPa)

TEST HOLE 4

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Omands Creek	9.8	0	0	1	0
Clay Fill	17	5	24	1	0
Brown Clay	17	2	15	1	0
Silt Till	20	5	30	1	0

A. Dean Gould, P.Eng - Winnipeg, MB

St. Mathews Box Culvert
May 14,2009
Cross Section B-B



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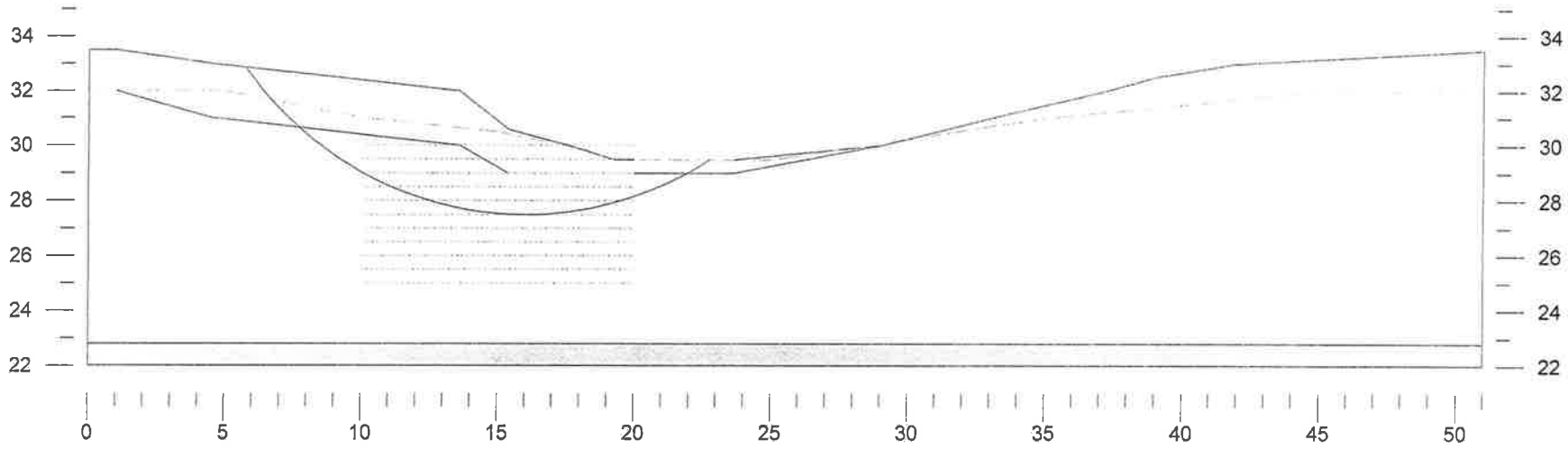
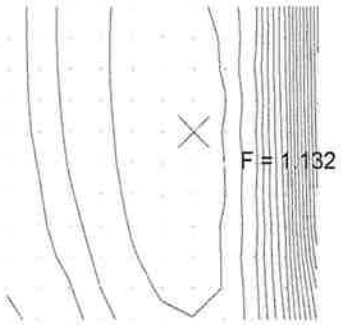
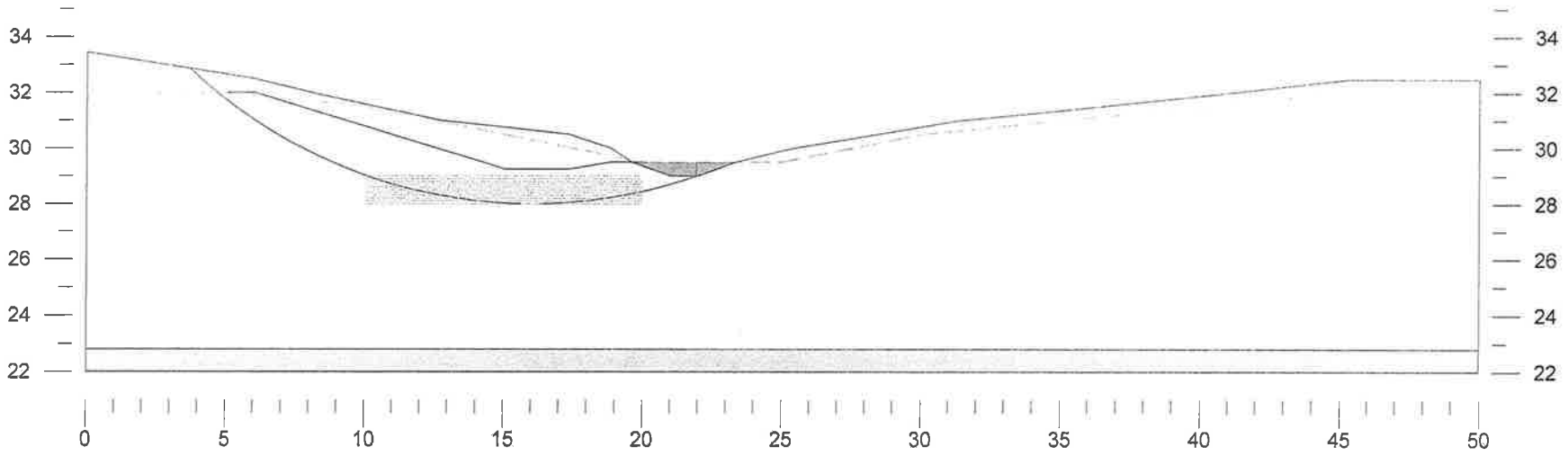


	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Omands Creek	9.8	0	0	1	0
Clay Fill	17	5	24	1	0
Brown Clay	16.5	2	15	1	0
Clay Till	20	5	30	1	0

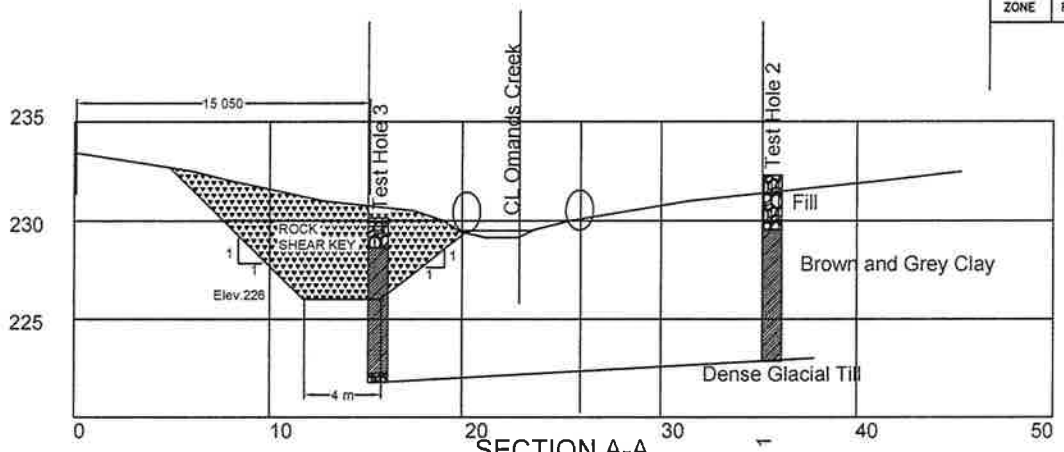
A. Dean Gould, P.Eng - Winnipeg, MB

St. Mathews Box Culvert
May 14,2009
Cross Section A-A

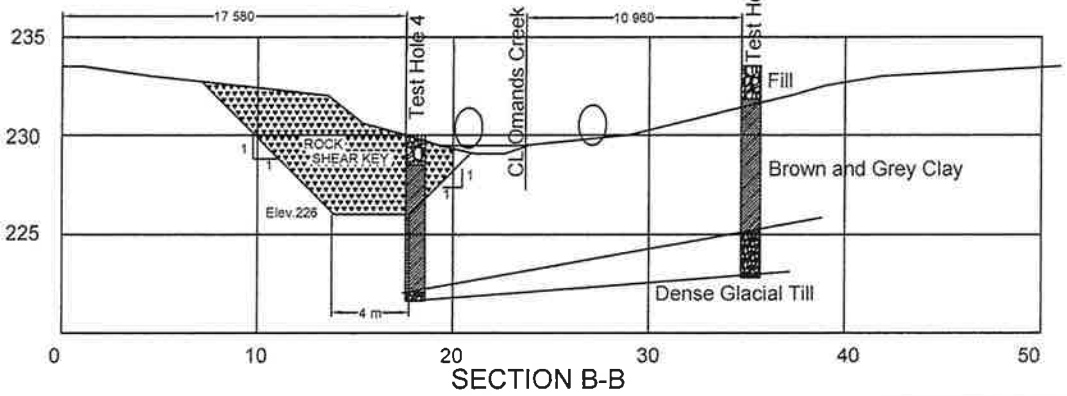




REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



SECTION A-A



SECTION B-B

DILLON CONSULTING - ST. MATHEWSA CULVERT

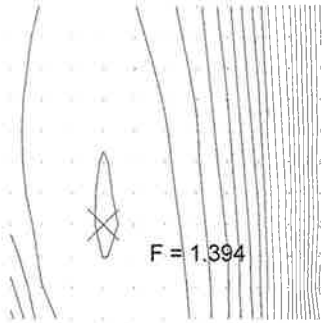
CROSS SECTIONS A-A AND B-B SHOWING
TEST HOLE AND SOIL STRATIGRAPHY
WITH SHEAR KEY STABILIZATION OPTION

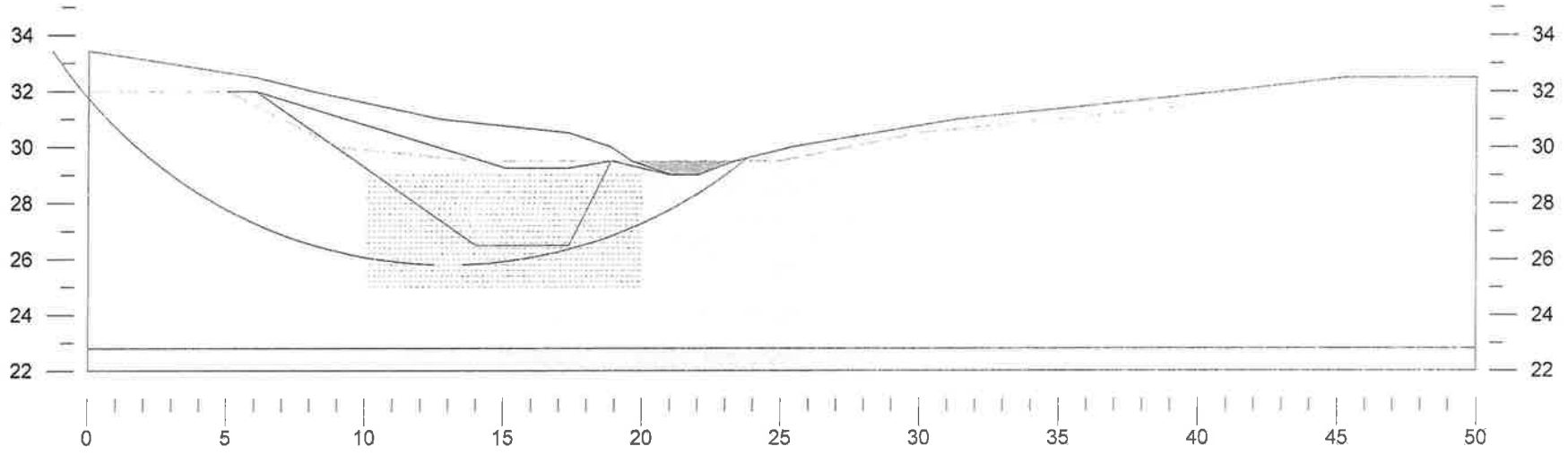
Design By: A. Dean Gould	SIZE	FSCM NO.	DWG NO. D-STMXSK	REV
Survey By: Dillon Consulting	SCALE		SHEET	

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Omands Creek	9.8	0	0	1	0
Clay Fill	17	5	24	1	0
Shear Key	19	0	40	1	0
Brown Clay	16.5	2	15	1	0
Clay Till	20	5	30	1	0

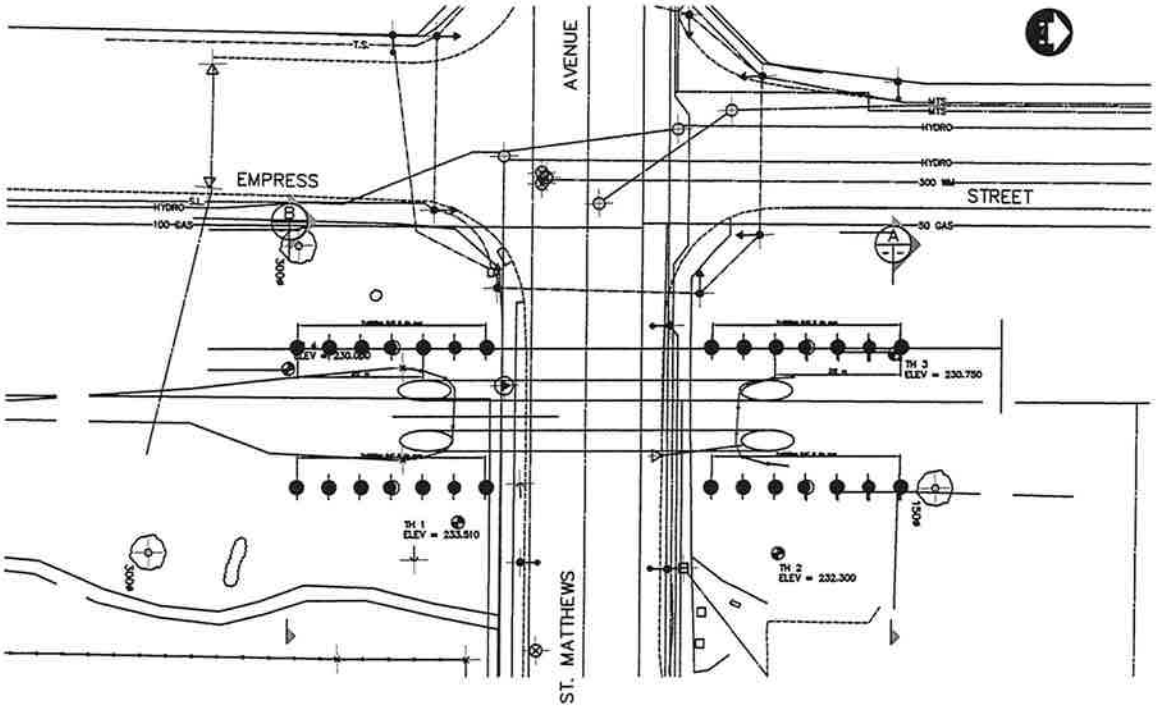
A. Dean Gould, P.Eng - Winnipeg, MB

St. Mathews Box Culvert
May 14,2009
Cross Section A-A
with Shear Key





WO 101-64



TEST HOLE LAYOUT
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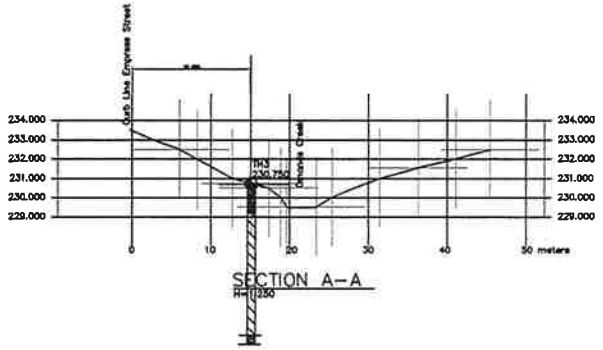

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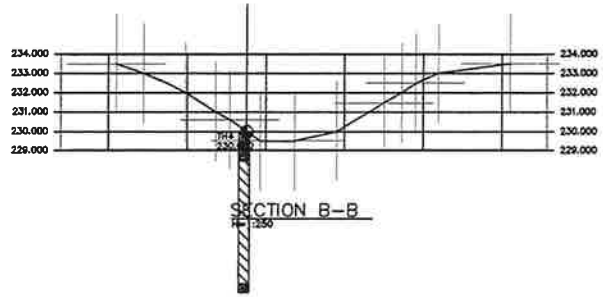

SECTION B-B
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PRELIMINARY ONLY
NOT FOR CONSTRUCTION

DESIGNED BY	
DRAWN BY	DDW
CHECKED BY	JSB
APPROVED BY	
HOR. SCALE	1:250
VERTICAL	
DATE	APR 24, 2009

DILLON CONSULTING

RELEASED FOR CONSTRUCTION

DATE

ENGINEER'S SEAL

CONSULTANT PROJECT NO. 08-8683-2000

THE CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

OMAND'S CREEK CULVERT
THROUGH ST. MATTHEWS AVENUE

CITY DRAWING NUMBER

SHEET SK-1 OF

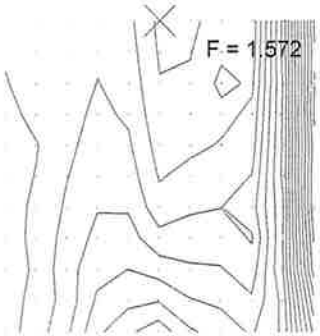
ROCK CAISSON OPTION

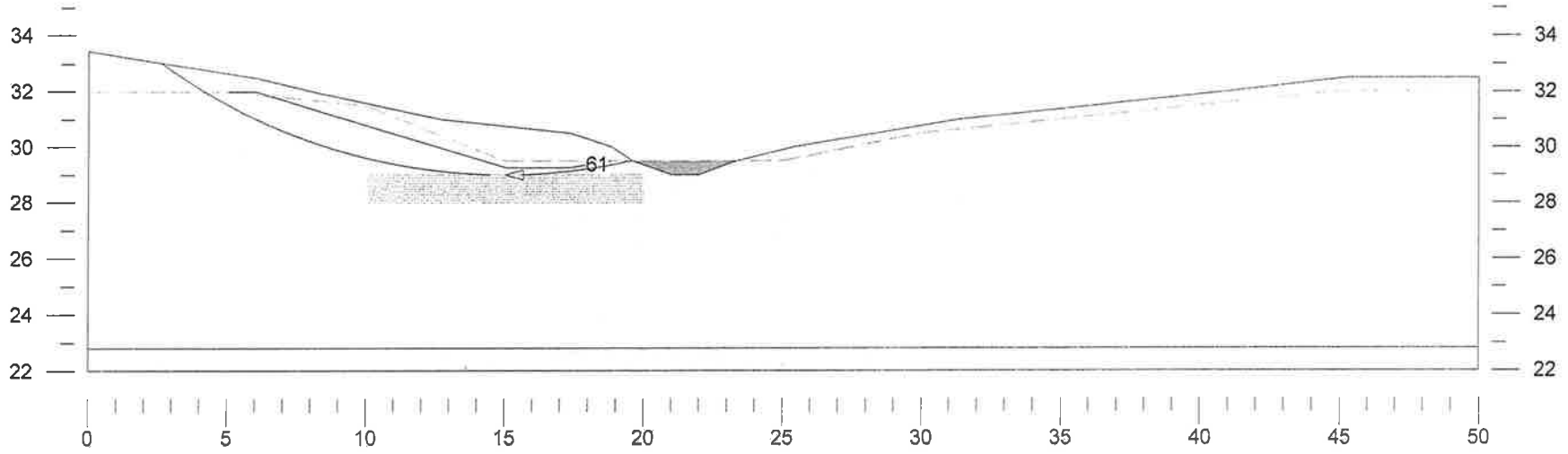
BID OPPORTUNITY

	Gamma kN/m3	C kPa	Phi deg	Piezo Surf.	Ru
Omands Creek	9.8	0	0	1	0
Clay Fill	17	5	24	1	0
Brown Clay	16.5	2	15	1	0
Clay Till	20	5	30	1	0

A. Dean Gould, P.Eng - Winnipeg, MB

St. Mathews Box Culvert
May 14,2009
Cross Section A-A
with 1800mm R/C at 4m o-c





ROCK CAISSON CALCULATION SHEET

PROJECT;	**St Mathews Crossing**			Job No.		
Date;	May	20	2009			
Top of Caisson Elev. m			230.5			
Base of Caisson Elev. m			222			
Socket Depth mm			500 mm			
Diameter of Rock caisson mm			1828.154 mm	6 ft		
Cross Sectional Area sq.m			2.624915			
Soil Strata				Unit		
Ground Water Elev.	R/C		229.5			
Ground Water Elev.			229.5	Weight	phi (deg)	c (kPa)
Brown Clay			230.5	16.5	15	2
Grey Clay			223	16.5	15	2
Till			222.5	20	30	5
Rock Caisson				22	45	0
Effective Stress at Base of Caisso						
	Soil	Eff Press	66.75 kPa	Shear Stress Clay		19.89
	Limestone	Eff Press	113.5 kPa	Shear Stress R/C		113.5
Resisting Force per Caisson			**245.73 kN**	55242.27 lbs		
Spacing c - c			4 m			
Resisting Force per Unit Length			**61.43 kN/m**	**External Force Value**		
			4209.512 lb/lin ft			

Report to:

CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

Preliminary Phase I Environmental Site Assessment of Properties Potentially Impacted by Proposed Polo Park Infrastructure Improvements

Document No. 1391640100-REP-V0001-01

TETRA TECH

Report to:

CITY OF WINNIPEG
PUBLIC WORKS DEPARTMENT

PRELIMINARY PHASE I ENVIRONMENTAL SITE ASSESSMENT OF PROPERTIES POTENTIALLY IMPACTED BY PROPOSED POLO PARK INFRASTRUCTURE IMPROVEMENTS

NOVEMBER 2013

Prepared by _____ Date November 25, 2013
Steven Laurie, B. Env. Sci., P.Ag., EP

Reviewed by _____ Date November 25, 2013
Brent Horning, P.Eng.

Authorized by _____ Date November 25/2013
SL/gs Brian McIntosh, P.Eng.

TETRA TECH
400-161 Portage Ave East, Winnipeg, Manitoba R3B 0Y4, Canada
Phone: 204.954.6800 Fax: 204.988.0546

TETRA TECH

REVISION HISTORY

REV. NO	ISSUE DATE	PREPARED BY AND DATE	REVIEWED BY AND DATE	APPROVED BY AND DATE	DESCRIPTION OF REVISION

EXECUTIVE SUMMARY

As part of the overall preliminary design process for the Polo Park Infrastructure Improvements being developed by Morrison Hershfield Ltd. (MH) for the City of Winnipeg, Tetra Tech was retained to perform a preliminary Phase I Environmental Site Assessment (ESA) of potentially affected properties. This ESA encompassed a total of about 13 individual parcels of land, many of which have been developed into multi-tenant commercial facilities. These properties are distributed along St. Matthews Avenue and St. James Street in the Polo Park Area of the City of Winnipeg.

The objective of this assessment was to evaluate, to the extent practical, the past and present land uses of the potentially affected properties in order to identify any potential sources of environmental contamination which may have an impact on the proposed infrastructure improvements, and may therefore require additional measures (e.g., intrusive investigations or remediation) as part of any future redevelopment.

The scope of this preliminary Phase I ESA consisted of a review of publically available records relating to the development of the area, a visual site inspection of the exterior of the identified properties, and an evaluation of this information to determine if past or present site activities may have resulted in environmental impacts. This assessment did not include any direct contact with the property owners or occupants to confirm on-site activities or infrastructure, or visual inspection of the interior of the buildings.

Based on the information obtained, development of this area for agricultural use dates back to the 19th century. Development of the western edge of the area of investigations was initiated in the early part of the 20th century (pre-1920s) as part of the parish of St. James, and comprised road construction, residential development, and a north-south railway line. Intensive commercial development of the area occurred in the 1950s and continues through to present day.

With respect to potential environmental concerns, historical railway operations suggest the possibility of historic subsurface contamination associated with either, loading and unloading activities, or the presence of fuel storage facilities to the south. Current operations in the subject area do not include any activities which may result in significant environmental impacts to subsurface soils and/or shallow groundwater.

Based on this preliminary Phase I ESA, the only area of potential environmental liability associated with development of the subject area would be in the former Oak Point Branch rail line corridor. Confirmation of the actual presence or absence of any possible subsurface impacts would require intrusive on-site investigations.

TETRA TECH

TABLE OF CONTENTS

ESA LIMITATIONS

The scope of this report is limited to the matters expressly covered and is intended solely for the client to whom it is addressed. Tetra Tech WEI Inc. makes no warranties, expressed or implied, including without limitation, as to the marketability of the site, or fitness for a particular use. The assessment was conducted using standard engineering and scientific judgment, principles and practices, within a practical scope and budget. It is partially based on the observations of the assessor during the site visit, in conjunction with archival information obtained from a number of sources, which are assumed to be correct. Except as provided, Tetra Tech WEI Inc. has made no independent investigations to verify the accuracy or completeness of the information obtained from secondary sources or personal interviews. Generally, the findings, conclusions, and recommendations are based on a limited amount of data (e.g., the number of sample points, and the number of samples submitted for laboratory analyses) interpolated between sampling points, and the actual conditions (e.g., the type, level, and extent of impacted media) on the property may vary from that described above. Any findings regarding site conditions different from those described above upon which this report is based will consequently change Tetra Tech WEI Inc. conclusions and recommendations.

1.0 BACKGROUND

The City of Winnipeg retained Morrison Hershfield Ltd. (MH) to undertake a preliminary design of Polo Park Infrastructure Improvements. These proposed improvements consist of the connection of St. Matthews Avenue between Madison Street and St. James Street.; the widening of St. Matthews Avenue between St. James Street and the railway line east of Empress Street; and the widening of St. James Street from St. Matthews Avenue to north of Ellice Avenue. The extent of the area potentially affected by the Polo Park Infrastructure redevelopment is shown on Figure 1, presented in Appendix A.

As part of the overall preliminary design process, Tetra Tech was retained to perform a preliminary Phase I Environmental Site Assessment (ESA) of the potentially affected properties. The objective of this assessment was to evaluate, to the extent practical, the past and present land uses of the potentially affected properties in order to identify any potential sources of environmental contamination which may have an impact on the proposed infrastructure improvements, and may therefore require additional measures (e.g., intrusive investigations or remediation) as part of any future redevelopment.

2.0 METHODOLOGY

This preliminary Phase I ESA was conducted in general accordance with the applicable sections of the Canadian Standards Association (CSA) Phase I ESA Standard, as outlined in the CSA publication Z768-01 (reaffirmed 2012). This ESA consisted of a historical review of multiple properties and a visual inspection of the property exterior only. This ESA did not include visual inspection of the building interiors or operations, interviews with business owners and/or tenants, or an assessment of possible hazardous material storage and handling, or the presence of possible hazardous building materials.

The activities that were completed as part of the assessment are described in the following sections.

2.1 RECORDS REVIEW

A review of publically available information from various physical and on-line resources was undertaken in order to identify conditions that could be indicative of potential environmental conditions. The information sources examined are presented below.

- Historic Aerial Photographs: A search of the aerial photographs maintained by the Manitoba Conservation Air Photo Library/ Map Sales was requested to determine the date and scale of available photographs of the subject area. Photos at approximately 10 year intervals, as available, were obtained and supplemented with more recent imagery from Google Earth Pro, and as provided by the City of Winnipeg for the period 1948 to 2013.
- City Directories: City directories (e.g., Henderson's Directory, Polk City Directory, etc.) generally list the name and primary activity for individual street addresses, on a regular basis going back to the late 19th century. In general these directories are reviewed for the subject area at 5 to 15 year intervals to determine if there are any occupants of potential environmental concern (e.g., gas stations, fuel/chemical storage sites, manufacturing facilities, etc.). Due to the historic nature of these documents, a continuous record is not always available so the dates selected for review are variable. It should also be noted that due to occasional street renaming or street address renumbering, records for a specific property may also be inconsistent. For the City of Winnipeg, select directories for the years 1880 to 1965 were reviewed through an on-line resource, and physical copies maintained by the Archives of Manitoba were reviewed for the period 1971 to 1997.

- Fire Insurance Plans: Fire insurance plans were historically developed to identify the extent of development, construction types, and potential areas of insurance liability, (e.g., fuel storage, chemical storage, heating systems, etc.) within neighbourhoods and individual building footprints, in order to determine fire risks and thereby establish the cost of insurance premiums. These plans usually cover portions of urban areas at various points in time so the availability is highly variable. Some insurance plans are available through various archives or through commercial search providers. For this assessment, Western Canada Underwriters Association Fire Insurance Maps for the period 1940 to 1975 were reviewed at the Archives of Manitoba.
- Regulatory Information: Manitoba Conservation maintains an on-line list of those properties at which a contaminant of concern (e.g., petroleum hydrocarbon, metals, pesticides, etc.) has been identified, either as a result of a reported product release or through intrusive investigations, and the parties responsible at the time of the identification. This list does not provide any information on the nature of the contaminant of concern, extent/severity of impact, or current status of mitigation/remediation measures. In the event that an impacted site is identified within the subject area, a file search request can then be submitted to Manitoba Conservation to obtain additional details. Information relating to current and historical on-site fuel storage can also requested.
- Geotechnical Reports: Geotechnical reports provide an indication of subsurface soil and shallow groundwater conditions. This information can then be used to determine the potential for groundwater concerns or ease of subsurface contaminant migration. In some cases, an indication of observed contaminant conditions may also be noted in the report or borehole logs.

In order to establish a general understanding of local conditions, a review of available geological, hydrogeological and topographic information was performed. This involves a review of available soil, surficial geology and bedrock mapping, as available through Manitoba Innovation, Energy and Mines, Mineral Resources Division, and water well and groundwater records, as available through Manitoba Conservation, Water Stewardship Division.

The sources for this information are listed in the References section of this report.

2.2 VISUAL INSPECTION

A visual inspection of the subject area was performed by Tetra Tech personnel on October 23, 2013. The inspection involved visual observations of the area from public spaces, and a general recording of observed site conditions, along with a photographic record of the area. Adjoining and local properties were also observed from the site and from public right-of-ways. As previously indicated, this visual inspection was limited to

the exterior of the subject area and did not involve any detailed assessment of the individual properties or interior inspection of any of the existing structures.

3.0 ASSESSMENT FINDINGS

3.1 SITE DESCRIPTION

The Subject area consist of an approximate 1 km long section of primarily commercial land along St. Matthews Avenue from its intersection with Century Street to the west, to the railway line crossing (CPR La Riviere Subdivision) to the east of Empress Avenue, and along a 500 m length of the east side of St. James Street from its intersection with St. Matthews Street, to north of Ellice Avenue. A general Location Plan is provided as Figure 1.

This ESA encompassed a total of 15 individual parcels of land, many of which had been developed into multi-tenant commercial facilities, resulting in 36 separate municipal addresses. These addresses and the current on-site operations for these potentially affected properties are listed in Table 1, in Appendix B.

The properties in the subject area are zoned primarily as a mix of Manufacturing Light (M1), Commercial Community (C2), Commercial Corridor (C3), and Commercial Regional (C4), general business district. The land adjacent to the southeast corner of the St. Matthews Avenue and Empress Street intersection, in the vicinity of Omand's Creek, is zoned as Parks and Recreation (PR1).

3.2 PHYSICAL SETTING

The Winnipeg area shows generally low relief reflective of the Red River Valley flood plain. Locally, ground conditions are generally flat, with topographic variations of up to 10 m in the vicinity of the primary river channels (Red River and Assiniboine River), and secondary creeks and drainage channels. The subject area itself is relatively flat with an assumed gradient easterly, towards Omand's Creek on the eastern edge of the area.

The subject area consists primarily of urban development with surface water runoff being controlled by storm water management infrastructure. Shallow groundwater flow in the subsurface overburden units is assumed to mimic the local topographic gradient, which is generally to the east towards Omand's creek and to the south towards the Assiniboine River.

The subsurface stratigraphy of the Winnipeg area generally consists of clay and silt deposits reflective of floodplain deposits from the Red and Assiniboine Rivers, and ancient glacial Lake Agassiz lake bed deposits, overlying a till layer. The till is deposited on limestone bedrock which shows some topographic variability, such that

depth to bedrock varies from less than 3 m to over 30 m, below grade throughout the City. In the subject area, overburden thickness varies from 12 to 20 m below grade as bedrock drops down to the west.

A review of available water well logs for the general area found air conditioning wells on properties to the north and south of the subject area. No well logs were found for any properties within the subject area. These logs indicate that limestone bedrock in this area is found at a depth of about 14 m below grade.

3.3 RECORDS REVIEW

3.3.1 AERIAL PHOTOGRAPHS

Aerial photographs of the subject area from the years 1948, 1959, 1968, 1979, 1988, 1997 and 2013 were used to investigate previous land use in the general area. A summary of the aerial photograph review conducted by Tetra Tech is presented below. Copies of the air photos of the subject area are provided in Appendix C.

1948 Aerial Photograph

St. James Street is present with St. Matthews Avenue present only to the west of St. James Street. The area west of St James Street is primarily open agricultural land with some residential development further west. The Oak Point railway branch is evident parallel to St. James Street, with the main line and spur line to the south of St. Matthews and a single line extending north. The area east of St. James Street has been developed as a golf course extending beyond Omand's Creek.

1959 Aerial Photograph

Extensive commercial development has occurred throughout the area, eliminating both the previous agricultural lands, and the golf course. St. Matthews Avenue east of St. James Street is now present along with Empress Street and Milt Stegal Drive. The Oak Point railway branch is evident, with additional spur lines and support buildings present on the east and west sides of the tracks to the south of St. Matthews Avenue Commercial/light industrial type buildings are present on the south side St. Matthews Avenue, west of the rail line and along the east side of Madison Street, north of St. Matthews Avenue. To the east of St. James Street, the former football stadium is present on the south side of St. Matthews Avenue, followed by limited development east of Empress Street and the Manitoba Hydro substation. On the north side of St. Matthews Avenue, east of St. James Street, is a large warehouse type building with a railway spur line running from the Oak Point branch directly into the building, as well as a connecting line to the CPR La Riviere subdivision east of Empress Street. In the photograph, rail cars are visible entering the north side of building. The area east of Milt Stegal drive is currently vacant. Building development is also present on the east side of St. James Street, both north and south of Ellice Avenue.

1968 Aerial Photograph

Development is similar to 1959 but continues to expand. New buildings are present north of St. Matthews Avenue, between St. James Street and the CPR Oak Point Line, and east of Milt Stegal Drive, and east of Omand's Creek. New buildings are also present north of St. Matthews Avenue between Century Street. (newly expanded) and Madison Street.

1979 Aerial Photograph

Development is similar to 1968 but commercial development continues to infill open areas including north of St. Matthews Avenue east of Milt Stegal Drive, between St. James Street and the Oak Point Line south of St. Matthews Avenue and south of Ellice Avenue. Additional development has also occurred north of St. Matthews Avenue on the east and west sides of Madison Street. Changes to previous development includes the clearing of the commercial buildings from the lot on the northeast corner of St. James Street and Ellice Avenue, and the removal of the spur line into the warehouse building on the northeast corner of St. James Street and St. Matthews Avenue.

1988 Aerial Photograph

Development is similar to 1979 with the only notable changes being construction of a commercial building east of St. James Street, along the south side of the spur line between the Oak Point and La Riviere rail lines.

1997 Aerial Photograph

Development is similar to 1988, with the only notable changes being redevelopment of the lot on the northwest corner of Empress Street and St. Matthews Avenue, with the western buildings having been demolished and a new building having been constructed on west edge; and the construction of a new building in the northeast corner of St. James Street and Ellice Avenue. The Oak Point Branch railway right-of-way is still present; however it appears as though the actual rail way tracks have been removed.

2013 Aerial Photograph

Development is similar to 1997, with the only notable changes being commercial building development in the former Oak Point rail line right-of-way south of St. Matthews Avenue and south of Ellice Avenue, and on the west side of St. James Street.

Based on this review of historical air photos, items of potential environmental concern relate to the operation of the Oak Point rail line (rail car storage, loading and unloading) and the warehouse building on the northeast corner of St. James Street and St. Matthews Avenue which required use of a spur line.

3.3.2 CITY DIRECTORIES

A review of city directories was conducted in order to identify any businesses which may be linked to potential historical environmental liability. As indicated by the air photo review, commercial development of the subject area did not really begin until the 1950s. A cursory review of city directories for the period 1880 to 1920 confirmed the absence of the streets to be assessed during this period, with Ellice Avenue being the only street listed, but it did not extend this far west.

A review of Henderson Directories for the period 1952 to 1997 showed the initial development to be primarily industrial, with a change to more commercial occupants in the 1970s. Referencing the air photo review, the large building on the northeast corner of St. James Street and St. Matthews Avenue corresponds to Canada General Electric operations which ran from the mid-1950s to the late 1980s/early 1990s. This building was then converted to multi-tenant commercial use. The large building immediately north of this was operated by Canada Westinghouse Company from the mid-1950s until its demolition in the early 2000s.

The area on the east side of St. James Street, north of Ellice Avenue was occupied by Security Storage Company from the 1950s until the 1970s, and the lot later cleared and redeveloped for restaurant and commercial operations.

The area south of St. Matthews, between St. James Street and Empress Street was occupied by the former Winnipeg football stadium from the 1950s to 2013. The area east of Empress Street was occupied by a City of Winnipeg Fire Hall and later a fire training center from the 1950s until early 2000s, when the area was redeveloped for commercial tenants.

The area along Madison Street, north side of St. Matthews Avenue, historically comprised an Imperial Tobacco Sales warehouse on the west side (from about 1960 to early 2000s), and a metal shop on the east side from the 1950s to late 1970s, after which the site operated as a vehicle repair and tire sales facility. The car wash facility on the northeast corner of St. Matthews Avenue and Madison Street was developed in the early 1970s and has operated in this capacity since then, with the addition of a vehicle rental office in the 1980s and the Rust check service in the 1990s.

The area between Madison Street and St. James Street contained the Oak Point rail line from at least the early 1900s, through to its removal in the late 1990s. Most of the development along this rail line was south of St. Matthews Avenue, and included a Building Products and Coal Company in the 1950s and 1960s. In the area of the intersection between St. James Street and St. Matthews Avenue, a variety of commercial tenants moved in starting in the early 1970s.

A summary of the business listings found for the subject area is provided as Table 2.

Based on this review, a variety of business operations have been present throughout the area that may have had some form of environmental concern, but no specific listings indicative of large scale chemical storage or potential waste production were noted.

3.3.3 *Fire Insurance Plans*

A review of fire insurance plans available at the Archives of Manitoba found plans for the C.N.R. Oak Point Railway branch and associated support structures. These maps identified a coal shed as well as a fuel yard owned by Border Fuel Co. in the central portion of the rail yard, to the south of the proposed area of development along St. Matthews Avenue.

Fire maps showing the St. James Street and Ellice Avenue intersection identified a warehouse operated by Canadian Westinghouse Co. Ltd. in the southeast corner of the intersection as well as a warehouse operated by Security storage Co. Ltd. to the northeast. No indications of fuel or chemical storage were noted for these sites.

3.3.4 *Regulatory Information*

A review of the Manitoba Conservation Contaminated Sites list found no records of properties of concern within the subject area. Several sites to the northwest along Ellice Avenue and to the south along Madison Street and St. James Street were noted in this review, but are not considered to represent a concern to the subject site. A listing of the impacted sites in the general area is shown in Table 3.

3.3.5 *Geotechnical Information*

As part of the proposed Polo Park Infrastructure Improvements, a geotechnical investigation program was performed by TREK Geotechnical along roadways throughout the area of interest. This investigations included borehole drilling which found the subsurface stratigraphy throughout the area to comprise layered silt and clay to a depth of 3 m below grade. A review of the available borehole logs for any observations of possible environmental concerns such as presence of fill materials, or odours was performed, and found only the presence of near surface sand or clay fill in some of the boreholes. No indications of any potential contaminant observations were noted.

3.4 Visual Inspection

A visual inspection of the subject area was performed on October 23, and general observations noted during this inspection are presented below. Photographs of development throughout the subject area, as collected during the site inspection, are presented in Appendix D.

- With the exception of the former Oak Point Branch railway right-of way, the subject area is almost all concrete or asphalt surfaced. Development comprises a number of single and two story commercial buildings including strip mall developments, “big box” style stores, and smaller, single story individual structures. Most buildings appear to be concrete structures with slab on grade foundations.
- The corridor between the east and west portions of St. Matthews Avenue consists of vacant land formerly occupied by the C.N.R. Oak Point Branch Line. Currently it appears as though the vacant land has been utilized for unauthorized dumping of concrete and asphalt debris.
- Vegetation growth within this corridor appears to be primarily uncontrolled weed species, such as fox tail, grasses, and rushes in the low lying areas.
- Within the corridor a large, older transmission tower and transformer area was present, however access is restricted and detailed inspection was not completed.
- The businesses adjacent to the proposed infrastructure improvements appear to be in good condition, and can all be categorized as commercial properties.
- Inspection of the properties did not identify any areas of concern; there was no evidence of spills, old environmental monitoring wells, or material handling activities (i.e., fuel storage tanks, maintenance yards, or garages) that would be considered as a potential environmental concern.
- Immediately southeast of the St. Matthews avenue and Empress Street intersection is a City of Winnipeg Parks and Recreation right-of-way, within which runs Omand’s Creek.

A general summary of observation relating to areas of potential environmental concern commonly examined as part of a Phase I ESA is presented in Table 4.

4.0 DISCUSSIONS/ CONCLUSIONS

This preliminary phase I ESA determined that development of the Polo Park area began as agricultural use dating back to the 19th century. Development of the western edge of the area of investigations was initiated in the early part of the 20th century (pre-1920s) as part of the parish of St. James, and comprised road construction, residential development, and a north-south railway line. Intensive development of the area occurred in the 1950s apparently as light industrial, with tenants such as General Electric and Westinghouse Canada, as well as addition of spur lines along the rail line corridor. In the 1970s, development of the area transitioned to primarily commercial, which continues through to present day.

The objective of this preliminary Phase I ESA was to determine if there was any significant potential for environmental contamination in the area of proposed redevelopment along St. Matthews Avenue and St. James Street. Based on inspection of available air photos, city directory review and a limited visual inspection of the exterior of the development across the subject area, no significant potential sources of contamination were noted. The historical rail way operations in the corridor between St. James Street and Madison Street are considered to represent the greatest potential for impact due to the time period for these operations. However, most of the historic fuel storage and activities along the rail line appear to have occurred to the south of the subject area adjacent to St. Matthews Avenue. Geotechnical drilling performed in and adjacent to the former rail line corridor did not make note of the presence of any significant amounts of fill or debris in this area. Commercial development has since occurred throughout that portion of the former rail line, suggesting that any impacts which may have been present were mitigated or remediated.

Based on the results of this preliminary Phase I ESA, it is not expected that redevelopment of the subject area along St. Matthews Avenue and St. James Street, would encounter any significant subsurface environmental concerns. However, additional drilling and subsurface soil and groundwater investigations are required, especially in the area of the former railway corridor, to confirm the absence of potential contaminants of concern.

5.0 REFERENCES

Archives of Manitoba, Various City Directories and Fire Insurance Plans.

Canadian Standards Association, *Z768-01 Phase I Environmental Site Assessment (Reaffirmed 2012).* Originally published November 2001.

Manitoba Conservation, Environmental Services, Contaminated/ Impacted Site Program, http://www.gov.mb.ca/conservation/envprograms/contams/index.html

Manitoba Conservation, Water Stewardship Division, Reports, Studies, Plans and Publications, http://www.gov.mb.ca/conservation/waterstewardship/reports/index.html#groundwater

Manitoba Conservation Groundwater Management Section, Manitoba Water Stewardship *GWDrill Database*, 2012.

Manitoba Innovation, Energy and Mines, Geological Survey, Gis Map Gallery, http://www.manitoba.ca/iem/mrd/geo/gis/index.html

Natural Resources Canada, The Atlas of Canada, http://atlas.nrcan.gc.ca/site/english/maps/topo/map

TREX Geotechnical, *Subsurface Investigations Report* for P*olo Park Infrastructure Upgrades,* Winnipeg, September 27, 2013.

University of Alberta Libraries, A division of Learning Services, Henderson's Directories: A Directory of prairie Life, http://peel.library.ualberta.ca/henderson.html

APPENDIX A

FIGURES

I:\H-M\MORRISON HERSHFIELD LTD - 9164\1391640100 - POLO PARK INFRA IMPROVEMENTS\CAD\ENV\1391640100-SKT-V0008-00.DWG 13.11.22 2:39 PM
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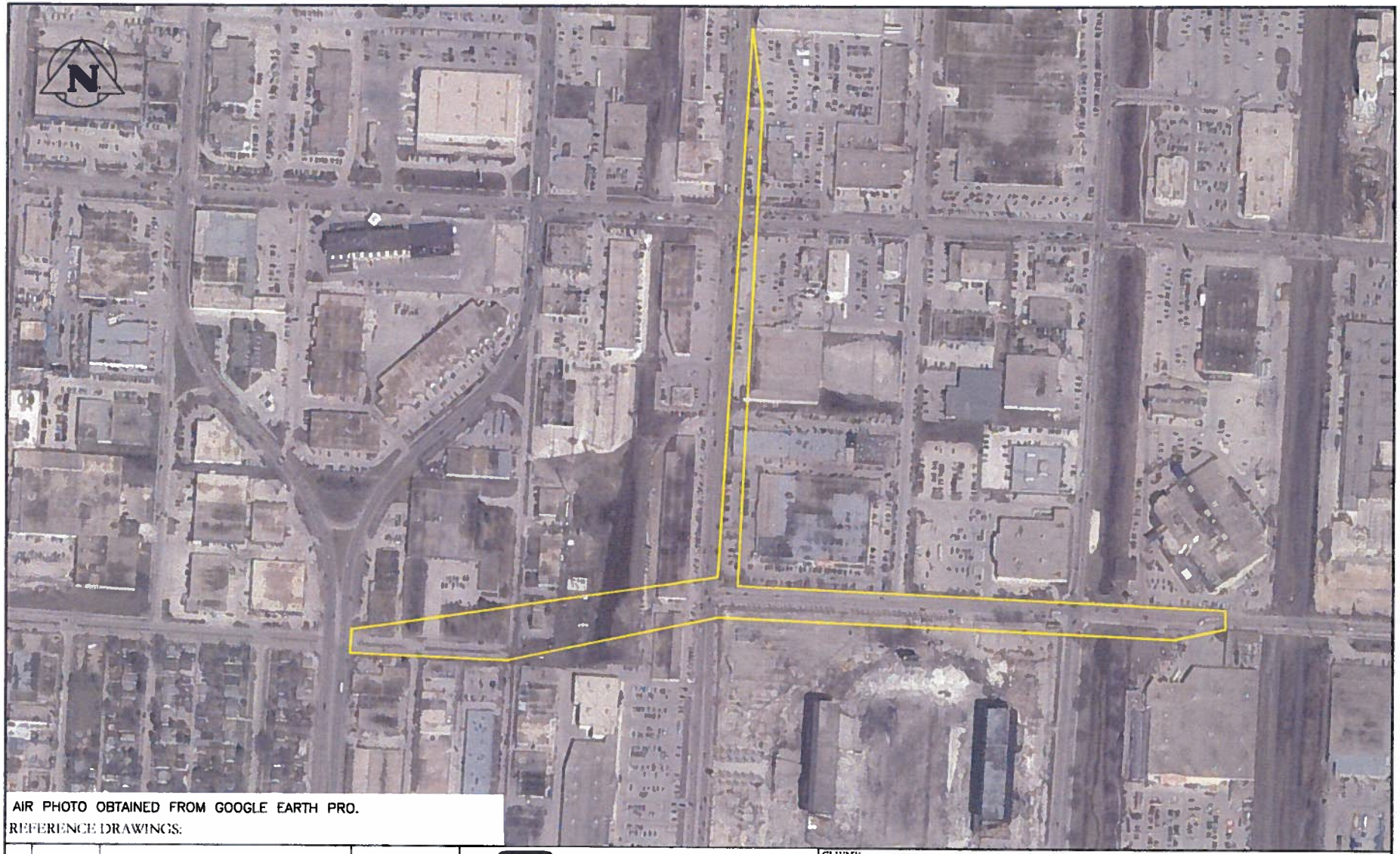

AIR PHOTO OBTAINED FROM GOOGLE EARTH PRO.

REFERENCE DRAWINGS:

NO.	DATE	DESCRIPTION	ISSUED BY
		ISSUED FOR CONSTRUCTION	

REVISIONS/ISSUE

TETRA TECH

AUTHORIZED BY: BKH
DATE: 13.11.22
CLIENT DRAWING NO.

CLIENT: CITY OF WINNIPEG

DRAWING DESCRIPTION:
FIGURE 1: PHASE I ESA ASSESSMENT AREA POLO PARK INFRASTRUCTURE IMPROVEMENTS - ST MATTHEWS AVENUE

DESIGNED BY:	BKH	DRAWN BY:	SP	DRAWING NO.	REV.
REVIEWED BY:	BKH	SCALE:	1:5000	1391640100-SKT-V0008	00

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TETRA TECH

APPENDIX B

TABLES

Table 1
Summary of Properties Assessed
Preliminary Phase I ESA of Polo Park Infrastructure Improvements

Street Address	Property Description	Building Type	Current Occupant
1691 St. Matthews Avenue 503 Century Street 505 Century Street 507 Century Street 509 Century Street	Parcel 1, Plan No. 5841	Single story multi-tenant commercial strip building. (Listing is south to north.)	Midcan Productions Eagle Vision Inc.
496 Madison Street 500 Madison Street	Part Lot 15, Plan No.5841	Vacant lot Single story office and warehouse building	Not Applicable Imagine Ability
505 Madison Street	Lot 1, Plan No. 5844		Car Wash and Rust Check Center
1649 St. Matthews Ave.	Plan No. 896, Canadian National Railway	Vacant lot	Former railway line.
890 St. James Street 892 St. James Street 894 St. James Street 900 St. James Street 902 St. James Street 902-A St. James Street 904 St. James Street	Lot 11, Plan No. 9429	Two story multi-tenant commercial strip building. (Listing is south to north.)	Cash Money Merle Norman St. James Rehabilitation Physiotherapy Center S3 Interior Design Inc. Dollar Wise Quality Cleaners Argent Frame Arthur Murray Dance School
914 St. James Street 916 St. James Street 918 St. James Street 922 St. James Street 924 St. James. Street	Lot 12, Plan No. 9429	Single story multi-tenant commercial strip building. (Partial listing from south to north - building contains total of 16 units.)	Shodor Shower Door Specialties Signs Now creative Signs and Graphics Kellet Copy Centres Vacant Living Canvas Tattoo
937 St James Street 947 St. James Street 1501 St. Matthews Avenue	Multiple Lots Plan 153 and Plan 291.	Single story multi-tenant commercial block building	Dollar Tree Staples Business Depot Hooters Restaurant
953 St. James Street	Multiple Lots Plan 153 and Plan 291.	Single story multi-tenant commercial strip building	Best Sleep Center
1450 Ellice Avenue	Part 1, Plan 5632	Single story single tenant showroom/ warehouse building	Sears Home
1441 Ellice Avenue 1445 Ellice Avenue 1017 St. James Street 1017 St. James Street 1027 St. James Street	Lot 1, Plan No. 21805	Single story multi-tenant commercial block building	Booster Juice Little Ceasers Pizza Subway Restaurant Smitty's Restaurant Wyatt Dowling Insurance
1065 St. James Street	Lot 2, Plan No. 21805	Single story single tenant showroom/ warehouse building	The Brick furniture store
1465 St. Matthews Avenue	Lot 1 and Lot 2, Plan 54622	Single story single tenant commercial building	Target Canada Co. (under construction)
Not applicable	Parcel F, Plan No. 35770	Vacant Lot	Green space with drainage channel running north south.
727 Empress Street	Not available	Single story single tenant showroom/ warehouse building	Home Depot
1340 St. Matthews Avenue	Not available	Electrical Substation	Manitoba Hydro

Table 2
Summary of City Directory Review Findings
Preliminary Phase I ESA of Polo Park Infrastructure Improvements

Street Address	1952	1956	1959	1962	1965	1975	1981	1997
1691 St. Matthews Street	No Listing (ends at Valour Rd)	No Listing (ends at Ashburn St)	No Listing (ends at St. James St.)	No Listing	No Listing	No Listing	Tetrad Design Group Inc.	Admiral Printing
503 Century Street	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	Musical Tymes (music books)
505 Century Street	No Listing	No Listing	No Listing	No Listing	No Listing	Kelbert Trophies	Trophy Cup Ltd.	Trophy Cup Ltd.
507 Century Street	No Listing	No Listing	No Listing	No Listing	No Listing	West Canadian Graphic Institute (microfilm)	West Canadian micrographics Ltd.	Vanterra Inc.
509 Century Street	No Listing	No Listing	No Listing	No Listing	No Listing	Banks Spokem Consulting Engineers	Collins-Toker Agencies Ltd.	Mid Canada Video
496 Madison Street	No Listing (ends at Silver Ave.)	No Listing (does not extend to St. Matthews)	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing
500 Madison Street	No Listing (ends at Silver Ave.)	No Listing (does not extend to St. Matthews)	No Listing	Imperial Tobacco Sales Co. (warehouse)	Imperial Tobacco Sales Co. (warehouse)/ Tuckett Ltd. (502)	Imperial Tobacco Sales Co. (warehouse)	Imperial Tobacco Ltd.	Imperial tobacco Warehouse
505 Madison Street	No Listing (ends at Silver Ave.)	No Listing (does not extend to St. Matthews)	No Listing	No Listing	No Listing	Sof Spra Car Wash	Holiday Car wash/ Rent-a-car	Madison Coin Wash/ Rust Check Centre
511 Madison Street	No Listing (ends at Silver Ave.)	No Listing (does not extend to St. Matthews)	Rosco Metal Products (511)	Rosco Metal Products (511)	Rosco Metal Products (511)	Canada Brown Steel Tank Co.	Superior Tire and Equipment	Park Avenue Tile Inc./ Wyatt Rental Ltd.
1649 St. Matthews Avenue	No Listing (ends at Valour Rd)	No listing (ends at Ashburn St.)	No Listing (ends at St. James St.)	No Listing	No Listing	No Listing	No listing	No Listing
890 St. James Street	No Listing	No Listing			No Listing	Catholic Women's League of Canada	Not Available	Crown Wallpaper Company
892 St. James Street	No Listing	No Listing			No Listing	No Listing	Not Available	Vacant
894 St. James Street	No Listing	No Listing			No Listing	Beaver Lumber Company	Not Available	St. James Rehabilitation Physiotherapy Centre Ltd.
900 St. James Street	No Listing	No Listing	Building products and Coal Co. (north end) Concrete Plant	Building products and Coal Co. (north end) Concrete Plant	No Listing	Vacant	Not Available	Gem Communications and others
902 St. James Street	No Listing	No Listing			No Listing	Associates Finance Co.	Not Available	Percy's Wholesale Consumer Electronics
902-A St. James Street	No Listing	No Listing			No Listing	No Listing	Not Available	Instaframe Galleries
904 St. James Street	No Listing	Single story multi-tenant commercial strip building. (Partial listing from south to north - building contains total of 16 units.)			No Listing	Herzing Institutes Computer programming	The Snackery Restaurant	Mattress Giant Super Store
914 St. James Street\	No Listing	No Listing	No Listing	No Listing	No Listing	Shodor Industries Bldg. supplies	Shodor Industries Bldg. Supplies	Shodor Shower Door Specialties
916 St. James Street	No Listing	No Listing	No Listing	No Listing	No Listing	Lanair Ltd Auto Parts	Vacant	Signs Now
918 St. James Street	No Listing	No Listing	No Listing	No Listing	No Listing	Kodak Canada Ltd.	Kodak Canada Ltd.	Kellet Copy Centres
922 St. James Street	No Listing	No Listing	No Listing	No Listing	No Listing	A&T Marketing Group	BOES Ltd.	Boes Ltd.
924 St. James. Street	No Listing	No Listing	No Listing	No Listing	No Listing	M-S Industrial Refrigeration	Copy Duplicating Products	Best Windows and Doors
937 St James Street	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	Trapper John's Trading Post	Safeway Credit Union Ltd.
947 St. James Street	No Listing	Canada General Electric / Canada Westinghouse Supply	Canada General Electrical	Canada General Electrical	Canada General Electrical	Canada General Electric Co. Ltd.	Canadian General Electric Co. Ltd.	Staples
1501 St. Matthews Avenue	No Listing (ends at Valour Rd)	No listing (ends at Ashburn St.)	No Listing	No Listing	No Listing	No Listing	Mills Paint and Wall covering	
953 St. James Street	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	St. James square Offices
1450 Ellice Avenue	No Listing	Canada Westinghouse Company (1460)	Canada Westinghouse Company (1460)	Canada Westinghouse Company (1460)	Canada Westinghouse Company (1460)	Westinghouse Canada Ltd.	Westinghouse Canada Ltd. (1460)	Westinghouse Energy Service (1460)
1441 Ellice Avenue	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing
1445 Ellice Avene	No Listing	Security Storage Co. (warehouse)	Security Storage Co. (1465)/ Soo- Security Motorways Ltd.	Security Storage Co. (1465)/ Soo- Security Motorways Ltd.	Security Storage Co. (moving vans)	No Listing	No Listing	No Listing
1017 St. James Street	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	Denny's Restaurant
1017 St. James Street	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	Manhattan Bagel
1027 St. James Street	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing
1065 St. James Street	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	No Listing	Brick Warehouse Corporation
1465 St. Matthews Avenue	No Listing (ends at Valour Rd)	No listing (ends at Ashburn St.)	No Listing (ends at St. James St.)	No Listing	Stonewall Motors (1445)	Stadium Ford (1445)	Stadium Ford Sales (1445)	Toys R Us (1445)
727 Empress Street	Not Reviewed	Not Reviewed	Not Reviewed	Not Reviewed	Not Reviewed	Not Reviewed	Not Reviewed	Not Reviewed
1340 St. Matthews Avenue	No Listing (ends at Valour Rd)	No listing (ends at Ashburn St.)	No Listing	No Listing	No Listing	No Listing	City of Wpg Hydro Substation	City of Winnipeg Hydro
1360 St. Matthews Avenue	No Listing (ends at Valour Rd)	No listing (ends at Ashburn St.)	City of Wpg Fire Hall (1360)	City of Wpg Fire Hall (1360)	City of Wpg Fire Hall (1360)	City of Wpg Fire Hall	City of Wpg Fire hall	City of Wpg Fire Training Centre

Table 3
Manitoba Conservation Listed Contaminated Sites
Preliminary Phase I ESA of Polo Park Infrastructure Improvements

Street Address	Operating Entity
1695 Ellice Avenue	Value Village Stores
1700 Ellice Avenue	MTS Mobility, R.W. Cunningham Distribution
1760 Ellice Avenue	DOT Printers
1777 Ellice Avenue	Gendis Inc.
1880 Ellice Avenue	Precision Automotive Centre
480 Madison Street	Manitoba Hydro Major Projects
700 St. James Street	Canadian Tire
614 St. James Street	Polo Park Esso

Note: The above information was obtained from the September 2013 version of the Manitoba Conservation Contaminated Sites List.

Table 4 Summary of Site Inspection Findings Preliminary Phase I ESA of Polo Park Infrastructure Improvements	
Potential Environmental Issues	**Comments**
On-Site Contamination	None of the properties assessed are listed as Impacted Sites, and none appear to store or use any significant quantity of potential contaminants of concern.
Soil Management	Most areas are asphalt and concrete surfaced. Area between Madison Street and St. James Street is undeveloped soil cover.
Historic Land Use	Primarily light industrial and commercial since 1950s. Rail Line operated from pre-1920s to late 1990s.
Adjacent and/or Local Property Impacts	No current operations of potential concern in the area of the subject site. Historic operations included operation of a rail line in the corridor between St. James Street and Madison Street.
Chemical Storage and Use	No information available with respect to individual site operations.
Electromagnetic Frequencies	Manitoba Hydro substation and overhead power lines are present at the west edge of the study and in the former rail line corridor, immediately north of the subject area.
Noise	No specific concerns identified. General traffic noise primary observation.
Odours	No significant odours observed.
Pesticides and Herbicides	Limited area of vegetation development with no apparent use of pesticides or herbicides.
Sewer Discharges	No indoor inspection performed so no information available.
Storage Tanks	No external aboveground storage tanks visible and no indication of operating underground storage tanks were noted. Indoor inspection was not performed.
Waste Management	Some dumping of concrete and asphalt debris noted in former rail line corridor. General municipal waste bins observed on some site. No information available with respect to individual site operations.

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APPENDIX C

HISTORICAL AERIAL PHOTOGRAPHS

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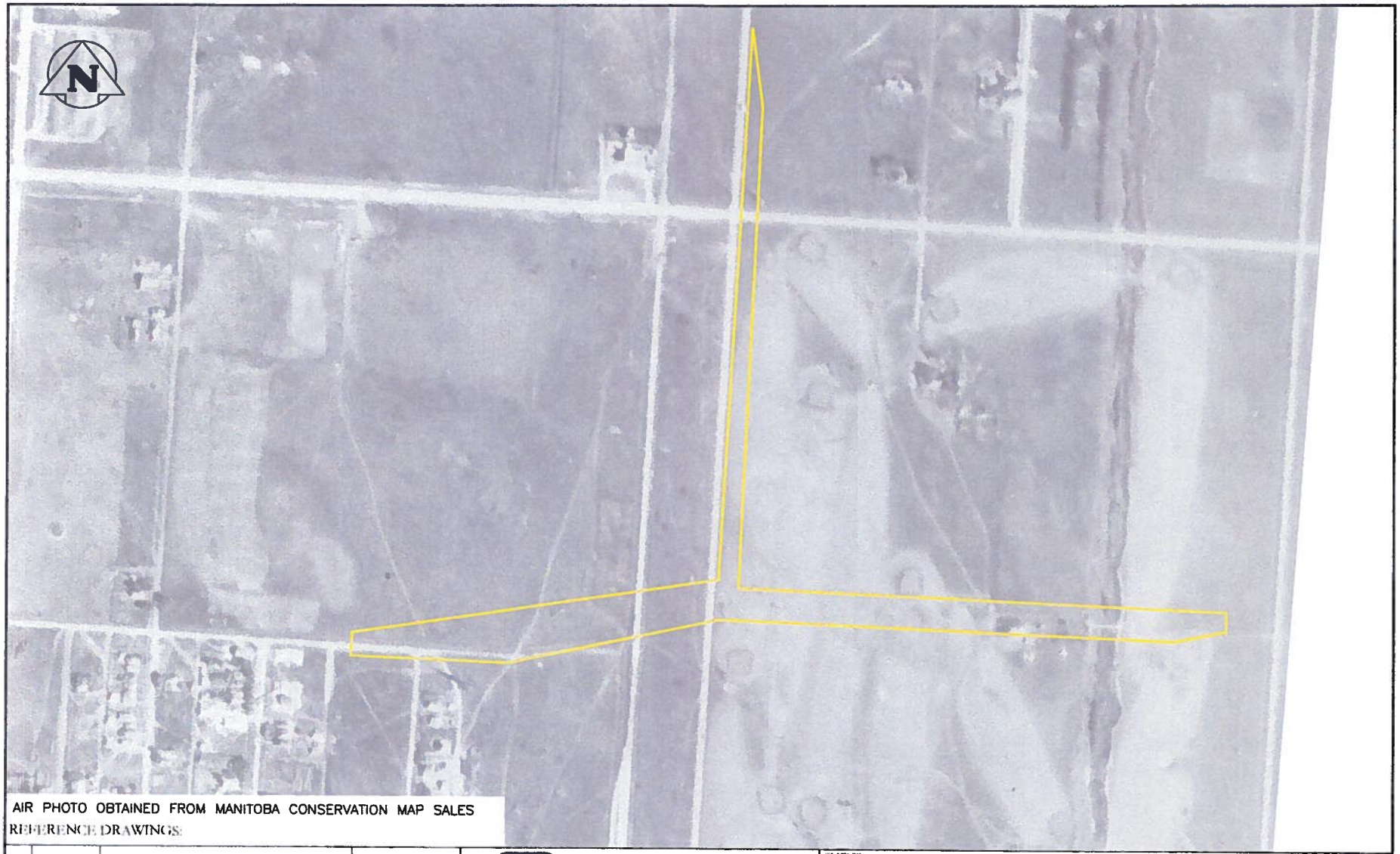

AIR PHOTO OBTAINED FROM MANITOBA CONSERVATION MAP SALES

REFERENCE DRAWINGS:

NO.	DATE	DESCRIPTION	ISSUED BY
		ISSUED FOR CONSTRUCTION	

REVISIONS/ISSUE

TETRA TECH

AUTHORIZED BY: BKH
DATE: 13.11.22
CLIENT DRAWING NO.

CLIENT
CITY OF WINNIPEG

DRAWING DESCRIPTION
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POLO PARK INFRASTRUCTURE
IMPROVEMENTS - ST MATTHEWS AVENUE

DESIGNED BY:	BKH	DRAWN BY:	SP	DRAWING NO.	REV.
REVIEWED BY:	BKH	SCALE:	1:5000	1391640100-SKT-V0001	00

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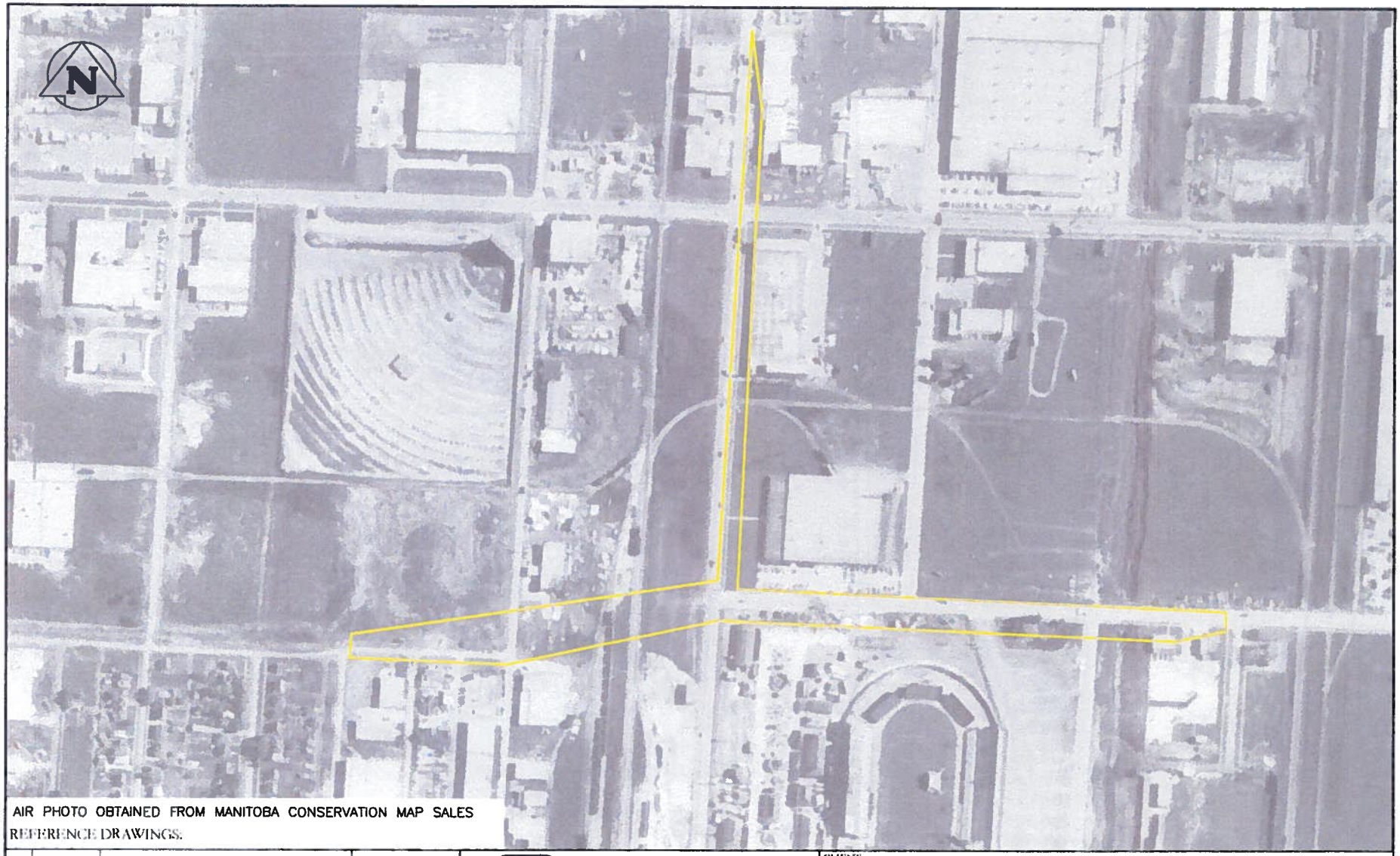

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		ISSUED FOR CONSTRUCTION	

REVISIONS/ISSUE

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AUTHORIZED BY: BKH
DATE: 13.11.22
CLIENT DRAWING NO.

CLIENT
CITY OF WINNIPEG

DRAWING DESCRIPTION
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POLO PARK INFRASTRUCTURE
IMPROVEMENTS - ST MATTHEWS AVENUE

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REVIEWED BY:	BKH	SCALE:	1:5000	1391640100-SKT-V0002	00

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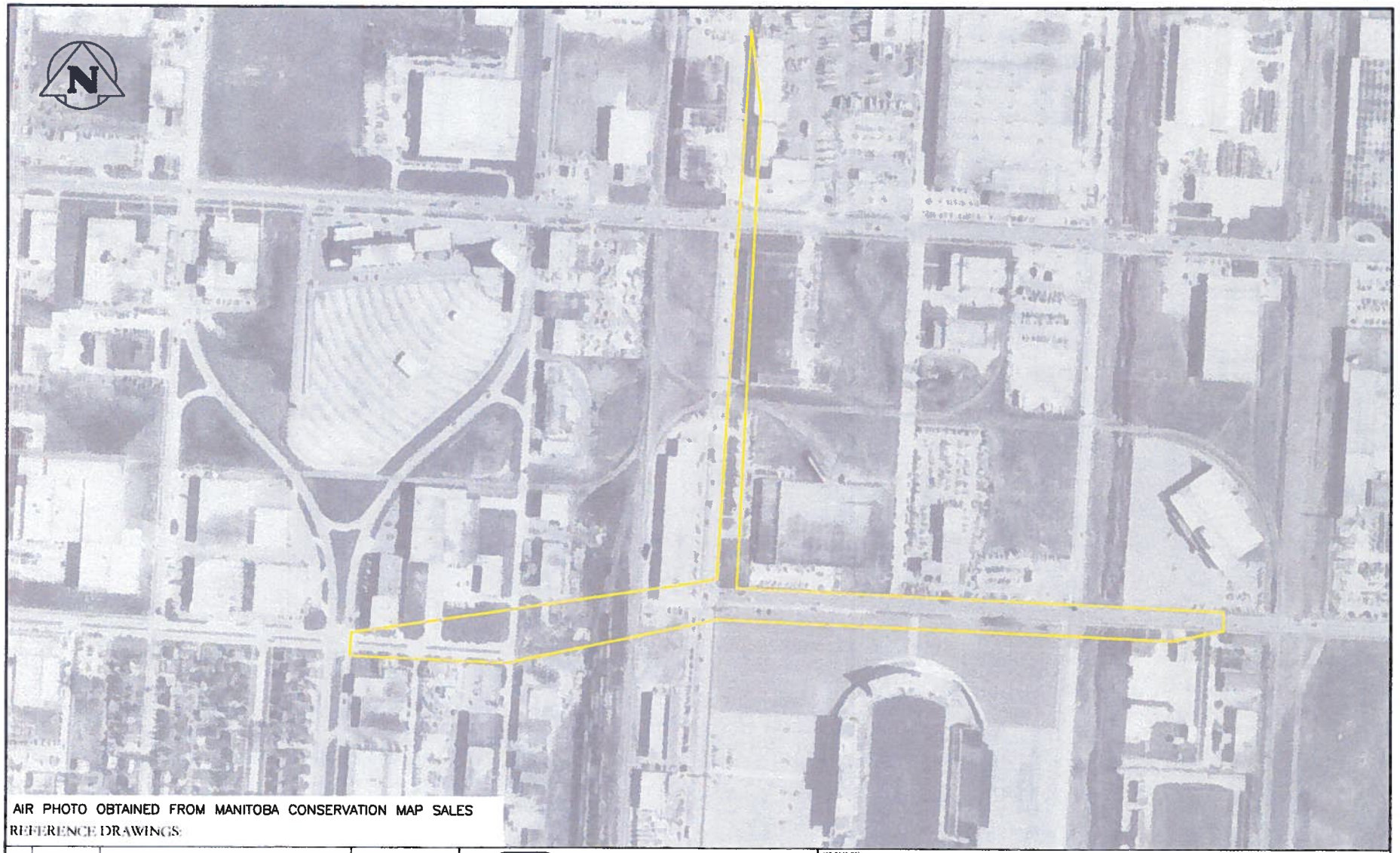

AIR PHOTO OBTAINED FROM MANITOBA CONSERVATION MAP SALES

REFERENCE DRAWINGS:

NO.	DATE	DESCRIPTION	ISSUED BY
		ISSUED FOR CONSTRUCTION	

REVISIONS/ISSUE

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AUTHORIZED BY: BKH
DATE: 13.11.22
CLIENT DRAWING NO.

CLIENT
CITY OF WINNIPEG

DRAWING DESCRIPTION
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POLO PARK INFRASTRUCTURE
IMPROVEMENTS - ST MATTHEWS AVENUE

DESIGNED BY:	BKH	DRAWN BY:	SP	DRAWING NO.	REV.
REVIEWED BY:	BKH	SCALE:	1:5000	1391640100-SKT-V0003	00

AL (11" x 8.5")

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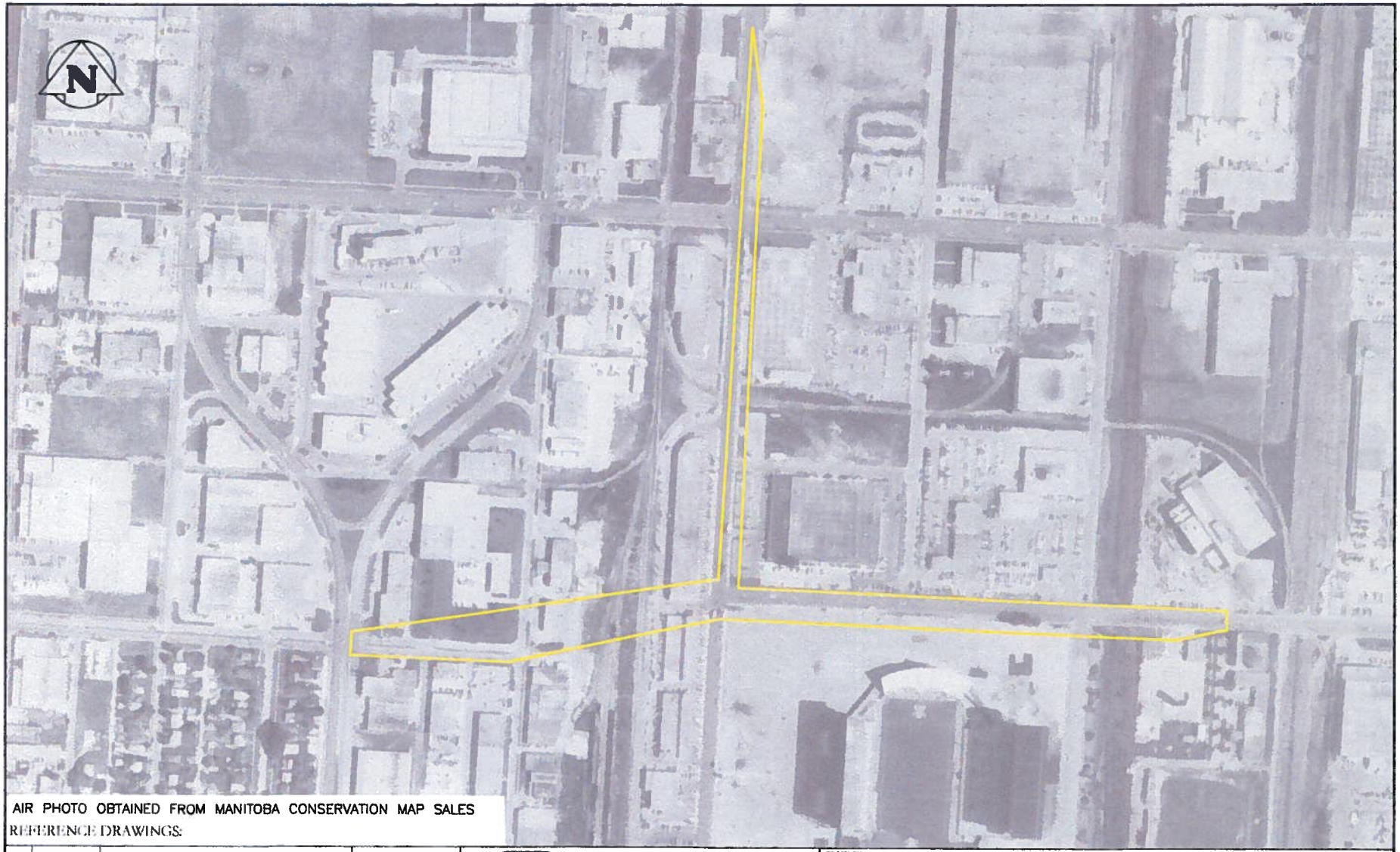

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CLIENT
CITY OF WINNIPEG

DRAWING DESCRIPTION
AERIAL PHOTO - CIRCA 1979
POLO PARK INFRASTRUCTURE
IMPROVEMENTS - ST MATTHEWS AVENUE

DESIGNED BY:	BKH	DRAWN BY:	SP	DRAWING NO.	REV.
REVIEWED BY:	BKH	SCALE:	1:5000	1391640100-SKT-V0004	00

AL (11" x 8.5")

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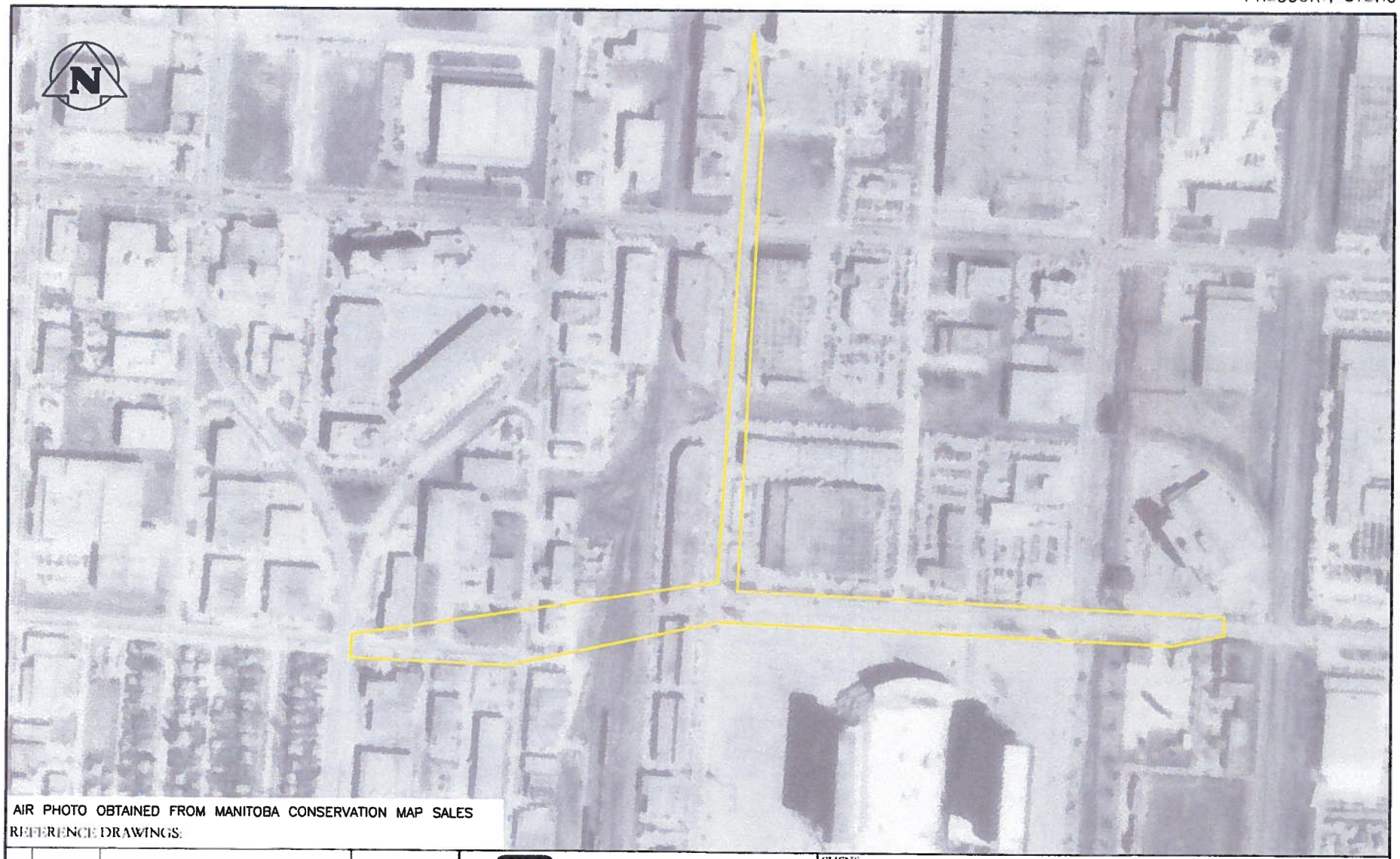

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POLO PARK INFRASTRUCTURE
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AL (11" x 8.5")

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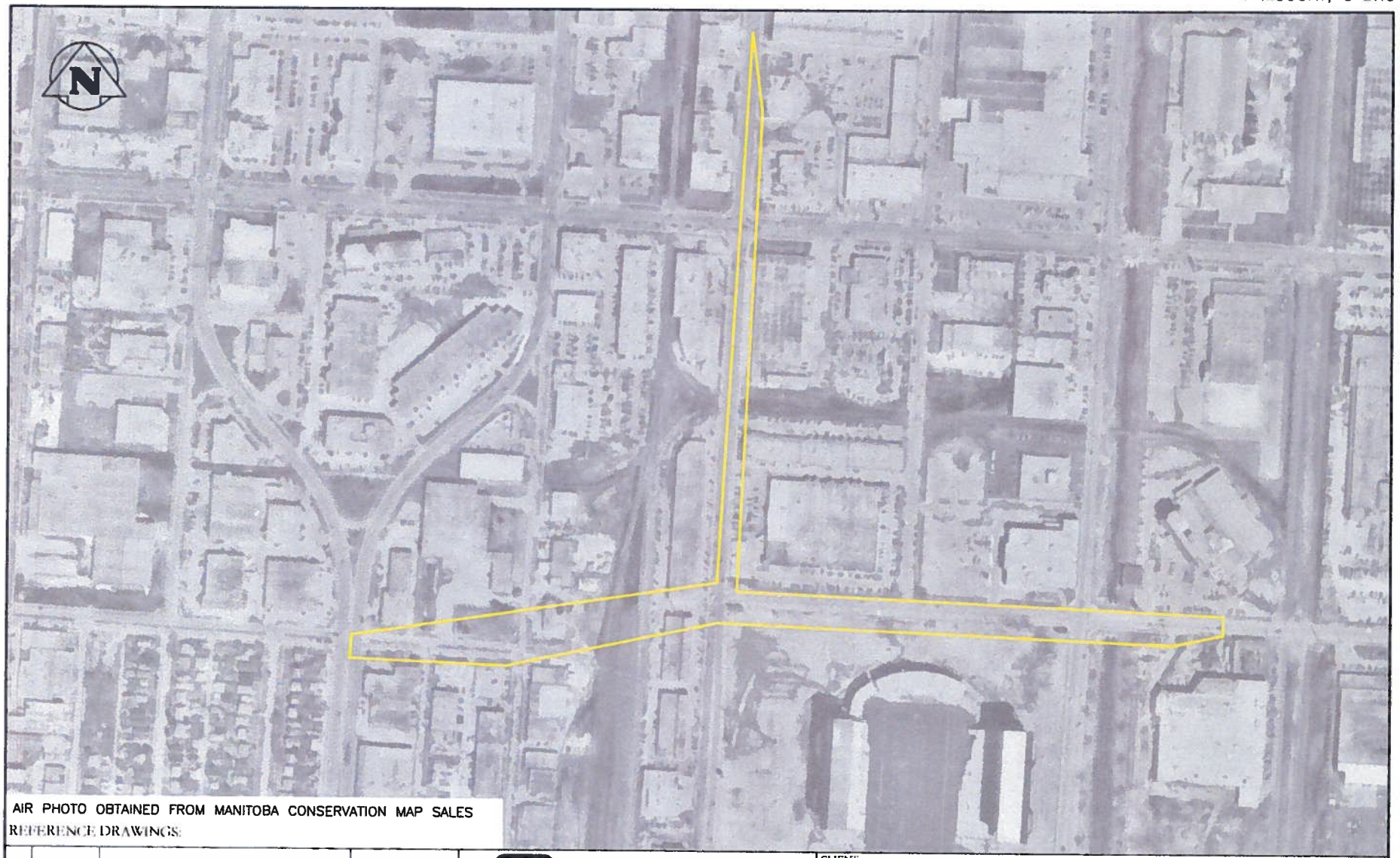

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DRAWING DESCRIPTION
AERIAL PHOTO - CIRCA 1997
POLO PARK INFRASTRUCTURE
IMPROVEMENTS - ST MATTHEWS AVENUE

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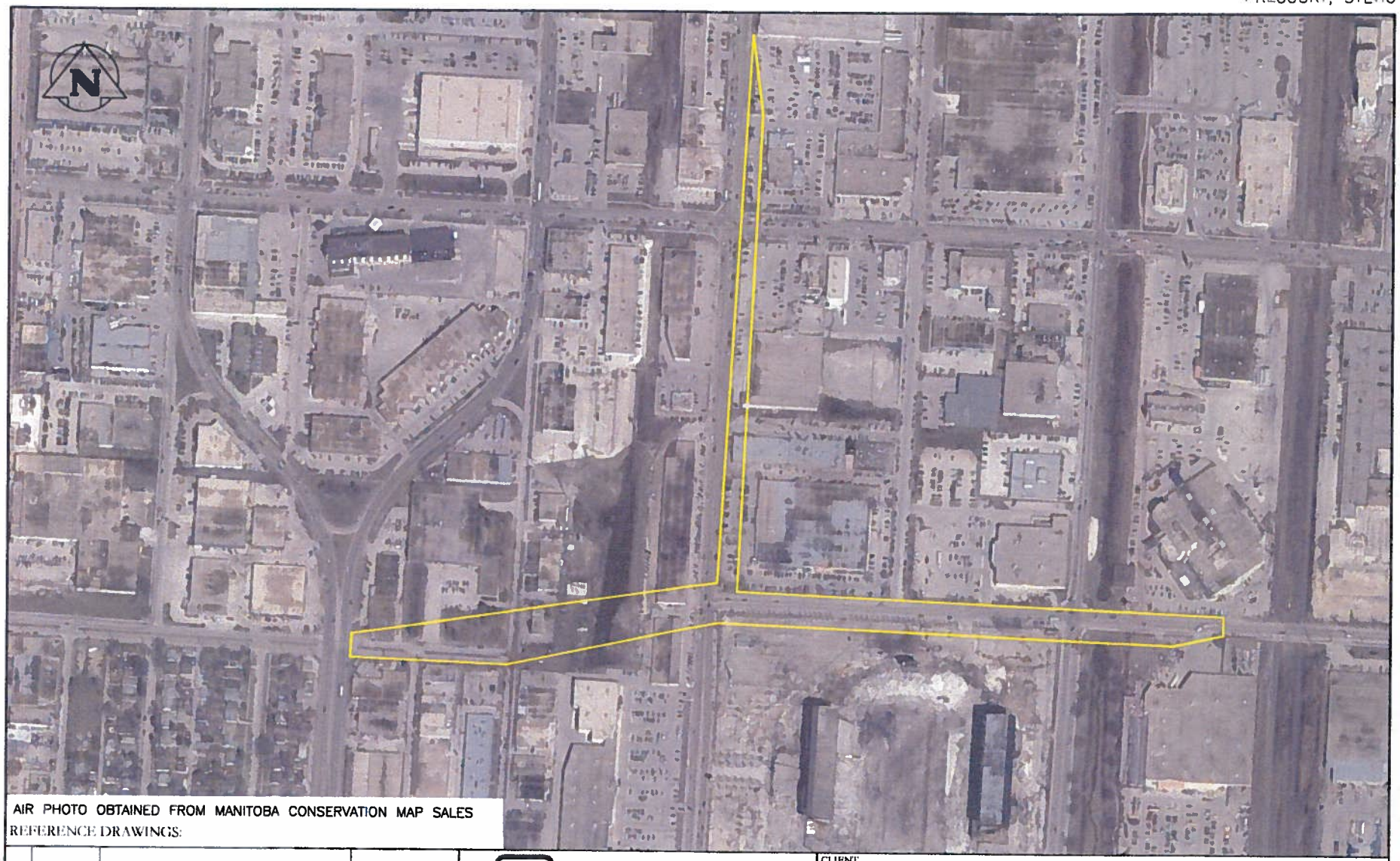

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DRAWING DESCRIPTION
AERIAL PHOTO - CIRCA 2013
POLO PARK INFRASTRUCTURE
IMPROVEMENTS - ST MATTHEWS AVENUE

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APPENDIX D

SITE PHOTOGRAPHS

Photo 1: View looking north along Madison Street, north of St. Matthews Avenue showing the car wash operation.

Photo 2: View looking west across former Oak Point Railway Branch right-of-way showing debris pile and rear of car wash operation through proposed St. Matthew Avenue extension.

Photo 3: View looking north at former Oak Point Railway Branch right-of-way from proposed St. Matthews Avenue extension.

Photo 4: View looking west from St. James Street along proposed St. Matthews Avenue extension.

Photo 5: View looking south at commercial strip mall development on west side of St. James Street, south of St. Matthews Avenue.

Photo 6: View looking northwest at commercial strip mall development on west side of St. James Street, north of St. Matthews Avenue.

Photo 7: View looking northeast at commercial development on northeast corner of St. James Street and St. Matthews Avenue (former General Electric facility).

Photo 8: View looking northeast at commercial development on northeast corner of St. James Street and Ellice Avenue (former Security Storage site).