GENIVAR

PAVEMENT REPORT

DATE: February 2, 2010

FILE: WE 09 093 00 WE

TO: **Reynold Cabigting, P.Eng.**
GENIVAR
10 Prairie Way
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Tel: (204) 477-6650

FROM: Silvestre S. Urbano Jr., P.Eng.
GENIVAR
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FAX:

PAGES:

RE: **Pavement Recommendations for existing Elmwood/Kildonan Pool Parking Lot in Winnipeg, MB.**

PAVEMENT RECOMMENDATIONS

A pavement investigation was conducted to assess the general subsurface conditions for the existing Elmwood/Kildonan parking lot. It was requested that pavement recommendations for the existing structure be provided. Nine testholes drilled between 4.6m and 6.1m depth revealed a general soil profile of a layer of fill followed by an upper clay layer over a silt layer and the thick lower clay layer, which extended to the depth explored. Detailed descriptions of the testhole logs are attached as well as a site plan and laboratory test results. No seepage and caving conditions were observed during our investigation. *However, seepage and caving conditions from the silt layer should be anticipated during the wet season.*

The pavement recommendation for light duty and heavy-duty traffic at the existing parking lot is discussed below. Based on the SPT test and approximate C_u, the considered value of a Resilient Modulus with an approximate CBR of 1.9 is 10.4 MPa (1520 psi). A CBR of 1.9 was selected since the subgrade (grey-black clay or clay fill) was closely followed by a soft silt layer. Based on the Equivalent Single Axle Load (ESAL) of about 26,910 for light duty and 261,705 for heavy duty, the recommended pavement construction at this site should be as follows:

Pavement Thicknesses

	Light Duty Traffic	Heavy Duty	% Compaction
Asphaltic Concrete	50 mm	75 mm	98% Marshall
Base Course	150mm	175mm	100% Std Proctor
Subbase(Class"C")	300mm	500mm	100% Std Proctor

The granular base course and subbase materials should include organic-free, non-frozen, aggregate conforming to the City of Winnipeg gradation limits (CW 3110). The subbase material is preferably 50mm crushed max. limestone aggregate. The subgrade (clay fill/clay) should be compacted to 95% STD Proctor Density. The existing granular fill at the parking lot could be reused as subbase material provided that it is free from organic.

Where soft silt/clay but dry spots are encountered at the subgrade level, construction traffic should be restricted. Soft spots should be covered with geotextile followed by geogrid and the recommended pavement structure. Any saturated subgrade conditions should be dried off quickly by excavation of sump pit or installation of permanent subdrains (600mm below the subgrade level) connected to positive outlet (catch basin) prior to placing the granular fill structure. Otherwise, the procedure of subcutting and replacing with 150mm down crush limestone over a non-woven geotextile with geogrid will be attempted. The depth of the subcut would entirely depend on the saturation of the subgrade. At these locations, the placing of granular fill should follow the geotextile specifications for soft grounds spot.

Sieve analysis and compaction testing of the granular base and subgrade materials should be conducted by qualified geotechnical personnel to ensure that the materials supplied and percent compactions are in accordance with design specifications. For the hot mix asphaltic concrete, gradation analysis of the aggregates (i.e. stone, fines and additive), compaction testing and sampling of at least one representative hot mix asphalt mixture (during construction) for laboratory Marshall testing should be undertaken. This would provide data to confirm that the asphaltic concrete pavement complies with the project specification. Hot mix asphaltic concrete should not be placed at ambient temperatures lower than $+4^{0}$C. During placement, the temperature of the paving mix should be in the range of $+120^{0}$C to $+150^{0}$C and compaction should not take place at paving mix temperatures lower than $+85^{0}$C.

The combined aggregate gradation limits and physical requirements of the asphaltic concrete should be in accordance with the City of Winnipeg specification.

CONCRETE PAD

For any concrete pad, sidewalk, curbs, the pavement structure should consist of 200mm reinforced concrete followed by 300mm of compacted (98% Standard Proctor Density) base course over the compacted subgrade. If a silt layer was encountered as subgrade, the application of woven geotextile over the silt layer is recommended. Exterior, grade supported concrete slabs will be subjected to some seasonal vertical movements related to frost. Exterior concrete slabs should not be tied into rigid structures.

To minimize the movements, consideration should be given to the use of rigid synthetic insulation, outward laterally (minimum 1.8m length and about 100mm thick) and beneath the structure. In addition, localized subsurface drainage should be provided around the structure.

CLOSURE

The findings and recommendations provided in this report were prepared by GENIVAR (the Consultant) in accordance with generally accepted professional engineering principles and practices. The recommendations are based on the results of field and laboratory investigations and are reflective only of the actual testhole(s) and/or excavation(s) examined. If conditions encountered during construction appear to be different than those shown by the testhole(s) and/or excavation(s) at this site, the Consultant should be notified immediately in order that the recommendations can be reviewed and modified as necessary to address actual site conditions.

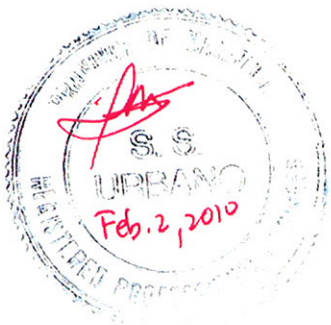
This report is limited in scope to only those items that are specifically referenced in this report. There may be existing conditions that were not recorded in this report. Such conditions were not apparent to the Consultant due to the limitations imposed by the scope of work. The Consultant, therefore, accepts no liability for any costs incurred by the Client for subsequent discovery, manifestation or rectification of such conditions.

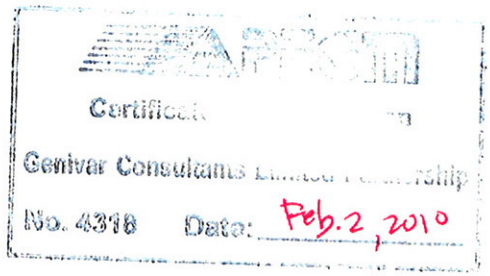
This report is intended solely for the Client named as a general indication of the visible or reported physical condition of the items addressed in the report at the time of the geotechnical investigation. The material in this report reflects the Consultant's best judgment in light of the information available to it at the time of preparation.

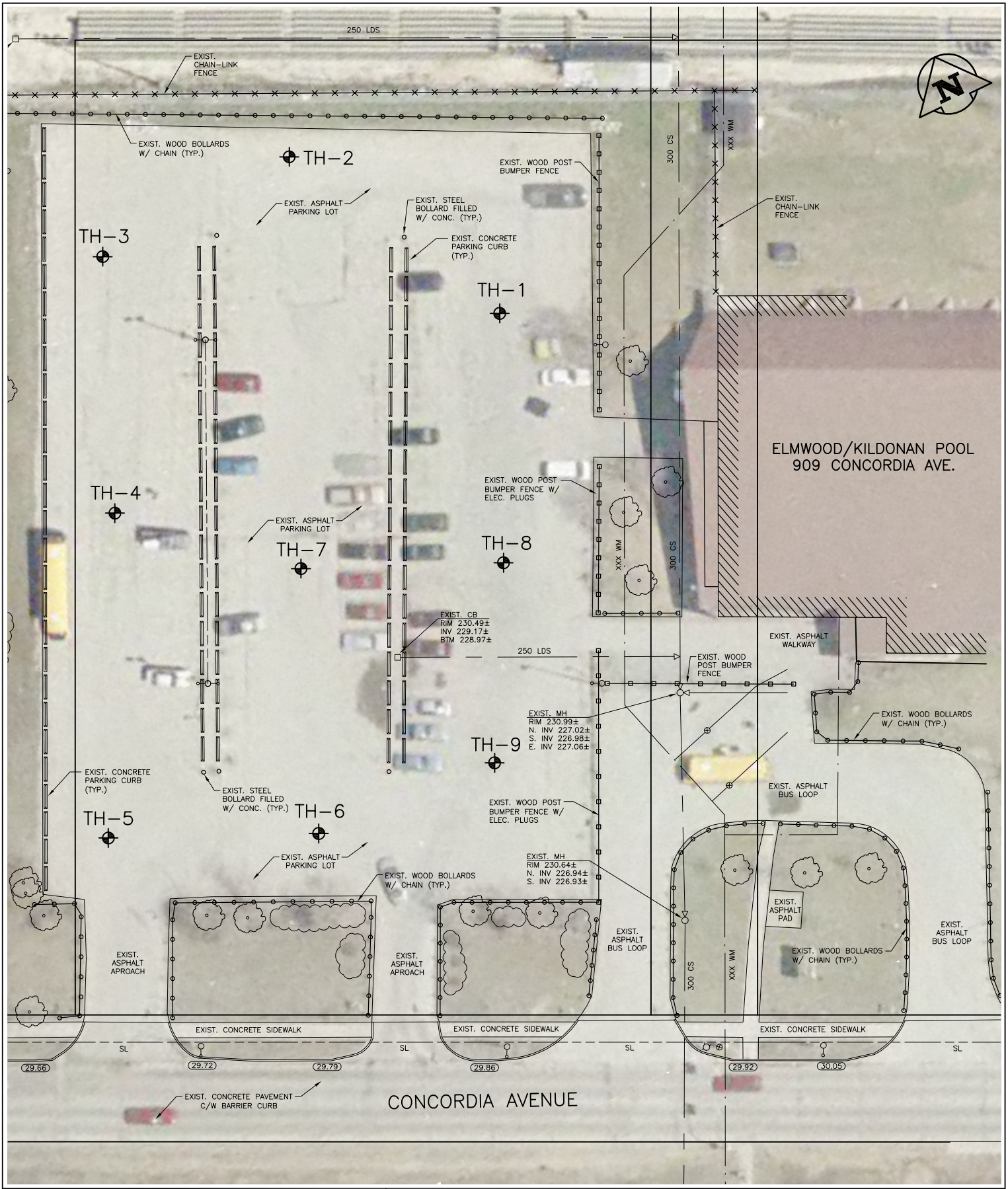
This report and the information and data contained herein are to be treated as confidential and may be used only by the Client and its officers and employees in relation to the specific project that it was prepared for. Any use a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. The Consultant accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The report has been written to be read in its entirety, do not use any part of this report as a separate entity.

All files, notes, source data, test results and master files are retained by the Consultant and remain the property of the Consultant.







GENIVAR
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ELMWOOD/KILDONAN POOL
PARKING LOT RECONSTRUCTION PROJECT

TESTHOLE PLAN

DATE: (YY/MM/DD)	10/01/13
APPROVED:	S.S.U.
DRAWN BY:	R.C.
PROJ. NO.	DWG. NO.
WE09093	

GENIVAR

Project No: WE-09-093-00-WE

TH-1

Project: Elmwood/Kildonan Pool Parking Lot

Client: City of Winnipeg

Enclosure:

Location: Winnipeg, MB.

Engineer: SSU

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Description	Depth/Elev.,m
0	0	Ground Surface	100
		FILL 75mm thick of ASPHALT over 150mm of GRANULAR FILL (base course material) over 530mm of CLAY FILL, mixed brown and black clay	99.3
		CLAY stiff, grey-black, fissured	
		SILT soft, tan-brown, clayey, moist to wet	98.3
		CLAY stiff, brown, fissured. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING.	
20	6	End of Testhole	94

SAMPLE

PP(kPa): 50, 150, 250, 350

Depth (m)	PP(kPa)	SPT, N
2	200	
5	40	
6	200	
10	125	
19	100	
20	100	

Water Content %: Wp |------0------| Wl; 10, 30, 50, 70, 90

Drill Method: S/S Auger

Drill Date: 7/09/09

Hole Size: 125mm

GENIVAR
10 Prairie Way
Winnipeg, MB.
R2J 3J8

Elevation:

Checked by: SSU

Sheet: 1 of 1

GENIVAR

Project No: WE-09-093-00-WE

TH-2

Project: Elmwood/Kildonan Pool Parking Lot

Client: City of Winnipeg

Enclosure:

Location: Winnipeg, MB.

Engineer: SSU

SUBSURFACE PROFILE

SAMPLE

Depth (ft / m)	Symbol	Description	Depth/Elev.,m	PP(kPa)	SPT, N	Water Content %
0 / 0		Ground Surface	100			
0–7 / 0–2		***FILL*** 62.5mm thick of ASPHALT over 175mm of GRANULAR FILL (base course material) over 2.0M of CLAY FILL, mixed brown and black clay			14	
7 / 2			97.8	125		
7–15 / 2–4.5		***CLAY*** stiff, brown, fissured. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING.				
15 / 4.5		End of Testhole	95.5			

PP(kPa): 50 150 250 350

Water Content %: Wp |------0------| Wl 10 30 50 70 90

Drill Method: S/S Auger

Drill Date: 7/09/09

Hole Size: 125mm

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Winnipeg, MB.
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Project No: WE-09-093-00-WE

TH-3

Project: Elmwood/Kildonan Pool Parking Lot

Client: City of Winnipeg

Enclosure:

Location: Winnipeg, MB.

Engineer: SSU

SUBSURFACE PROFILE

Depth (ft / m)	Symbol	Description	Depth/Elev.,m
0 / 0		Ground Surface	100
0 – 3 / 0 – 1		***FILL*** 62.5mm thick of ASPHALT over 212mm of GRANULAR FILL (base course material) over 780mm of CLAY FILL, mixed brown and black clay	99
3 – 5 / 1 – 1.5		***SILT*** soft, tan-brown, clayey, moist to wet	98.4
5 – 15 / 1.5 – 4.5		***CLAY*** stiff, brown, fissured. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING.	95.5
15 / 4.5		End of Testhole	

SAMPLE

PP(kPa): 50, 150, 250, 350

SPT, N

Water Content %: Wp |------0------| Wl; 10, 30, 50, 70, 90

PP(kPa) values: 200, 100

Drill Method: S/S Auger

Drill Date: 7/09/09

Hole Size: 125mm

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Winnipeg, MB.
R2J 3J8

Elevation:

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Project No: WE-09-093-00-WE

TH-4

Project: Elmwood/Kildonan Pool Parking Lot

Client: City of Winnipeg

Enclosure:

Location: Winnipeg, MB.

Engineer: SSU

SUBSURFACE PROFILE

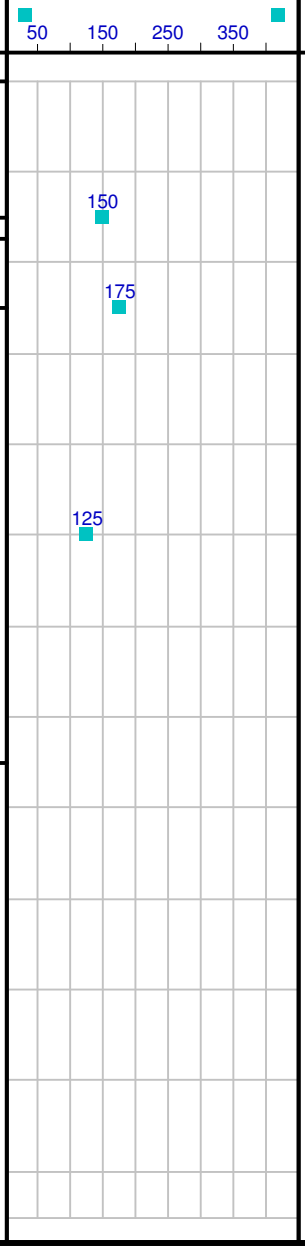
Depth (ft / m)	Description	Depth/Elev.,m
0 / 0	Ground Surface	100
	FILL 62.5mm thick of ASPHALT over 250mm of GRANULAR FILL (base course material) over 600mm of CLAY FILL, mixed brown and black clay	99.2
4 / 1	***CLAY*** stiff, grey-black, fissured	98.6
6 / 2	***SILT*** soft, tan-brown, clayey, moist to wet	
10 / 3	***CLAY*** stiff, brown, fissured. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING.	
15 / 5	End of Testhole	95.5

SAMPLE

PP(kPa): 50, 150, 250, 350

SPT, N

Water Content %: Wp |------0------| Wl; 10, 30, 50, 70, 90



Drill Method: S/S Auger

Drill Date: 7/09/09

Hole Size: 125mm

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Sheet: 1 of 1

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Project No: WE-09-093-00-WE

TH-5

Project: Elmwood/Kildonan Pool Parking Lot

Client: City of Winnipeg

Enclosure:

Location: Winnipeg, MB.

Engineer: SSU

SUBSURFACE PROFILE

Depth (ft / m)	Description	Depth/Elev.,m
0 / 0	Ground Surface	100
	FILL 50mm thick of ASPHALT over 560mm of GRANULAR FILL (base course with traces of subbase material) over 150mm of CLAY FILL, mixed brown and black clay	99.3
	SILT soft, tan-brown, clayey, moist to wet	98.6
	CLAY stiff, brown, fissured. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING.	
20 / 6	End of Testhole	94

SAMPLE

PP(kPa): 50, 150, 250, 350

Depth	PP(kPa)	SPT, N
5	200	
10	100	
15	100	
20	100	

Water Content %: Wp |------0------| Wl; 10, 30, 50, 70, 90

Drill Method: S/S Auger

Drill Date: 7/09/09

Hole Size: 125mm

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Elevation:

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Sheet: 1 of 1

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Project No: WE-09-093-00-WE

TH-6

Project: Elmwood/Kildonan Pool Parking Lot

Client: City of Winnipeg

Enclosure:

Location: Winnipeg, MB.

Engineer: SSU

SUBSURFACE PROFILE

Depth (ft / m)	Description	Depth/Elev.,m
0 / 0	Ground Surface	100
	FILL 75mm thick of ASPHALT over 200mm of GRANULAR FILL (base course material) over 480mm of CLAY FILL, mixed brown and black clay	99.3
	SILT soft, tan-brown, clayey, moist to wet	98.6
	CLAY stiff, brown, fissured. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING.	95.5
15 / 5	End of Testhole	

SAMPLE

PP(kPa): 50 150 250 350

SPT, N: 8

Water Content %: Wp |------0------| Wl — 10 30 50 70 90

Drill Method: S/S Auger

Drill Date: 7/09/09

Hole Size: 125mm

GENIVAR
10 Prairie Way
Winnipeg, MB.
R2J 3J8

Elevation:

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Sheet: 1 of 1

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Project No: WE-09-093-00-WE

TH-7

Project: Elmwood/Kildonan Pool Parking Lot

Client: City of Winnipeg

Enclosure:

Location: Winnipeg, MB.

Engineer: SSU

SUBSURFACE PROFILE

Depth (ft / m)	Symbol	Description	Depth/Elev.,m
0 / 0		Ground Surface	100
0 – 2 / 0 – 0.6		***FILL*** 75mm thick of ASPHALT over 225mm of GRANULAR FILL (base course material)	99.3
2 – 5 / 0.6 – 1.5		***SILT*** soft, tan-brown, clayey, moist to wet	98.6
5 – 20 / 1.5 – 6		***CLAY*** stiff, brown, fissured; grey-brown at 6.1m. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING.	94
20 / 6		End of Testhole	

SAMPLE

PP(kPa): 50, 150, 250, 350

SPT, N

Water Content %: Wp |------0------| Wl; 10, 30, 50, 70, 90

Drill Method: S/S Auger

Drill Date: 7/09/09

Hole Size: 125mm

GENIVAR
10 Prairie Way
Winnipeg, MB.
R2J 3J8

Elevation:

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Sheet: 1 of 1

GENIVAR

Project No: WE-09-093-00-WE

TH-8

Project: Elmwood/Kildonan Pool Parking Lot

Client: City of Winnipeg

Enclosure:

Location: Winnipeg, MB.

Engineer: SSU

SUBSURFACE PROFILE

Depth (ft / m)	Symbol	Description	Depth/Elev.,m
0 / 0		Ground Surface	100
		FILL 50mm thick of ASPHALT over 125mm of GRANULAR FILL (base course material) over 580mm of CLAY FILL, mixed, brown and black	99.3
5 / 1		***SILT*** soft, tan-brown, clayey, moist to wet	98.6
10 / 3		***CLAY*** stiff, brown, fissured. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING.	95.5
15 / 5		End of Testhole	

SAMPLE

PP(kPa): 50 150 250 350

SPT, N

Water Content %: Wp |------0------| Wl — 10 30 50 70 90

Drill Method: S/S Auger

Drill Date: 7/09/09

Hole Size: 125mm

GENIVAR
10 Prairie Way
Winnipeg, MB.
R2J 3J8

Elevation:

Checked by: SSU

Sheet: 1 of 1

GENIVAR

Project No: WE-09-093-00-WE

TH-9

Project: Elmwood/Kildonan Pool Parking Lot

Client: City of Winnipeg

Enclosure:

Location: Winnipeg, MB.

Engineer: SSU

SUBSURFACE PROFILE

Depth (ft / m)	Symbol	Description	Depth/Elev.,m
0 / 0		Ground Surface	100
		FILL 75mm thick of ASPHALT over 212mm of GRANULAR FILL (base course material) over 317mm of CLAY FILL, mixed, brown and black	99.5
4 / 1		***CLAY*** stiff, grey-black, fissured	98.7
6 / 2		***SILT*** soft, tan-brown, clayey, moist to wet	
10 / 3		***CLAY*** stiff, brown, fissured. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING.	
15 / 5		End of Testhole	95.5

SAMPLE

PP(kPa): 50 150 250 350

SPT, N

Water Content %: Wp |------0------| Wl — 10 30 50 70 90

Drill Method: S/S Auger

Drill Date: 7/09/09

Hole Size: 125mm

GENIVAR
10 Prairie Way
Winnipeg, MB.
R2J 3J8

Elevation:

Checked by: SSU

Sheet: 1 of 1

TBT ENGINEERING
CONSULTING GROUP

TBT Engineering Limited
110 Paramount Road, Winnipeg, MB R2X 2W3
PH: (204) 633-6008 FAX: (204) 633-6620
E-Mail: hmanalo@tbte.ca

Particle Size Analysis of Soils Test Report

To: Genivar
10 Prairie Way The Waters Business Park
Winnipeg, Manitoba R2J 3J8
Attention: Silvestre Urbano, P. Eng.
Project: Kildonan Pool Parking Lot Upgrading

TBTE Project No.: 09-543
Lab Sample No. 153

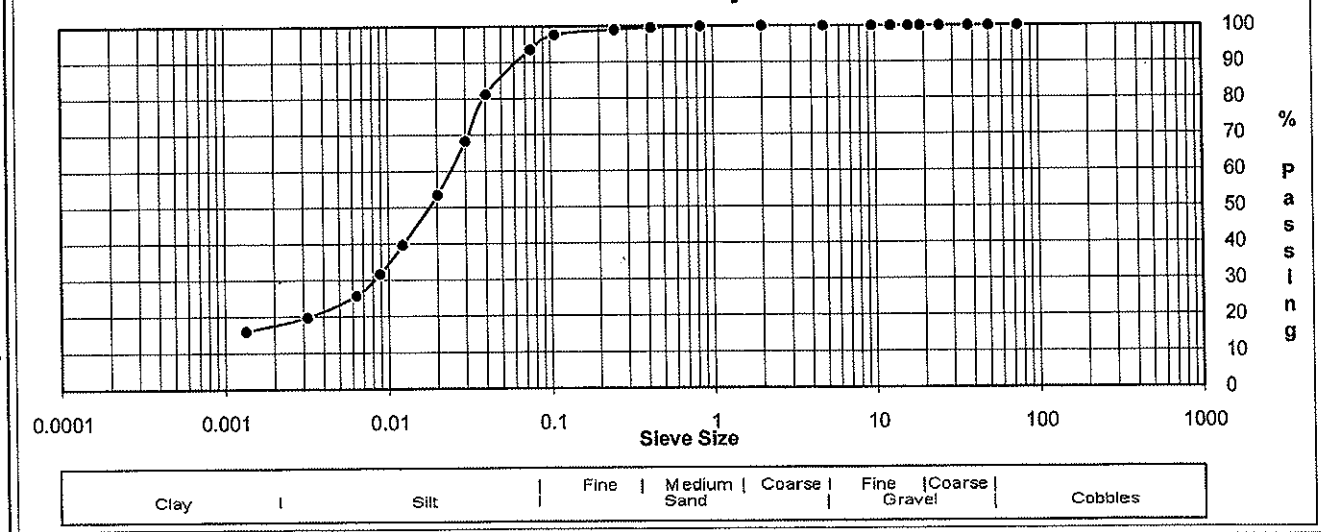
Date Sampled: - Date Received: 13-Jul-09
Sampled By: Client Date Tested: 16-Jul-09

Material Identification

B.H./T.H. No. TH7
Sample No. -
Depth 2.5 ft
Specific Gravity of Material: 2.65

Sieve Analysis		Hydrometer Analysis	
Sieve	% Passing	Diameter	% Finer
25 mm	100.0	0.040217	81.2
19 mm	100.0	0.030044	68.4
12.5 mm	100.0	0.020110	53.5
9.50 mm	100.0	0.012177	39.6
4.75 mm	100.0	0.008832	31.7
2.00 mm	100.0	0.006322	25.8
0.850 mm	99.9	0.003171	19.8
0.425 mm	99.5	0.001343	16.1
0.250 mm	99.0		
0.106 mm	97.7		
0.075 mm	93.6		

Grain Size Analysis



Soil Classification	% Composition		D10	-
		Gravel	D30	0.0080
Silt	6	Sand	D60	0.0240
	77	Silt	Cu	-
	17	Clay	Cc	-

Remarks: Test Method: ASTM D422, D2216, D4318, D2487
TBT Technician: Elena Oberez

REVIEWED BY: Hermie Manalo

TBT ENGINEERING
CONSULTING GROUP

TBT Engineering Limited
100 Paramount Road
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PH: (204) 633-6008 FAX: (204) 633-6620
E-Mail: hmanalo@tbte.ca

Natural Moisture Content Determination

To: GENIVAR
10 Prairie Way The waters Business Park
Winnipeg, Manitoba R2J 3J8
Attn: Silvestre Urbano, P. Eng
Project: Kildonan Pool Parking Lot Upgrading

TBTE Project No.: 09-536

Lab Sample No.	153	154	155	156	157	
Borehole:	29	29	29	29	29	
Sample ID:	TH7	TH7	TH7	TH7	TH7	
Depth:	2.5	5	10	15	20	
% Moisture	22.2	28.4	52.0	52.4	50.5	
Remarks:						

Lab Sample No.						
Borehole:						
Sample ID:						
Depth:						
% Moisture						
Remarks:						

Lab Sample No.						
Borehole:						
Sample ID:						
Depth:						
% Moisture						
Remarks:						

Test Procedure: ASTM D 2216
TBTE Technician: Elena Oberez

REVIEWED BY: Hermie Manalo