

# **APPENDIX 'A'**

# **GEOTECHNICAL REPORT**

June 10, 2024

KGS Group  
895 Waverley Street  
Winnipeg, Manitoba, R3T 5P4

Attention: Mr. Craig Rowbotham, P.Eng.  
Municipal Assistant Department Head

**Re: 2024 City of Winnipeg Local Street Renewal Program  
Report of Geotechnical Investigations and Test Results – Rev 1**

Dear Mr. Rowbotham

This letter summarizes KGS Group’s geotechnical results for the 2024 City of Winnipeg (COW) Street Renewal Program in Winnipeg, Manitoba. KGS Group’s scope of service for this project was outlined in our proposal no. 24-000-0214 titled “2024 COW Local Street Renewal Program – Geotechnical Services” dated February 23, 2023.

KGS Group was retained to complete pavement and subsurface investigations for approximately 6.2 km of local streets at 14 sites included in the 2024 project scope. Of the 14 sites, four (4) were identified as minor rehabilitations, four (4) were identified as major rehabilitations, three (3) were identified as asphalt rehabilitation, and three (3) were identified as reconstructions. Pavement coring and granular base investigations were completed for all 14 sites, with subgrade drilling investigations completed for the three (3) sites classified as reconstruction. This report details the results of the geotechnical investigation activities completed for the 2024 City of Winnipeg Local Steet Renewal Program. This report has been updated to includes final California Bearing Ration (CBR) testing results and composite sample depths.

## 1.0 GEOTECHNICAL INVESTIGATIONS

Coring and subsequent identification of base materials was conducted at each of the 14 sites, with subgrade drilling and soil sampling completed at Gerrond Bay, Wicklow Place, and Wicklow Street (sites 6, 10, and 11B respectively) which are identified as reconstruction. The scope of work required for each site investigation such as the need for subgrade investigations, number of test holes, and test hole locations were determined in accordance with the City of Winnipeg Appendix B – COW Site Investigation Requirements. Test hole locations for each site are shown in the attached Figures 1 through 14, with location descriptions and approximate coordinates provided in Table 1.

## 1.1 Coring and Sampling

Pavement coring was completed at each of 14 sites using a surface mounted coring machine fitted with a 150 mm diameter core barrel. Upon completion of coring, KGS Group measured the granular base thickness via hand excavation / auguring and visually classified the material. Each test location was then backfilled to the bottom of pavement with excavated fill and patched to surface with asphalt cold patch. Individual cores were placed in pre-labeled bags and retained for photographs. Table 2 attached summarizes coring results in detail. Individual core photos can be found in Appendix A.

## 1.2 Subgrade Drilling and Sampling

Subgrade drilling and soil sampling were conducted along the streets set for reconstruction, this included Gerrond Bay, Wicklow Place, and Wicklow Street (sites 6, 10, and 11B respectively) as per the City of Winnipeg RFP 751-2023 Appendix B – Project Locations and Technical Scoping. Eight (8) test holes were advanced between the three (3) reconstruction project sites:

- Gerrond Bay: three (3) test holes
- Wicklow Place: two (2) test holes
- Wicklow Street: three (3) test holes

Test holes were advanced using a geotechnical drill rig. All test holes were advanced to a depth of 3.0 m (10 ft) below ground surface (BGS), with soil samples collected at depths of 0.6, 0.9, 1.2, 1.6, 2.0 and 2.5 m below the pavement surface. Groundwater conditions and test hole squeezing were observed throughout drilling and summarized within Table 3 below. All test holes were backfilled with auger cuttings to the base of pavement and patched to surface with asphalt cold mix.

**TABLE 3: OBSERVED GROUNDWATER AND SLOUGHING CONDITIONS**

Site No, Name	Test Hole ID	Depth of Water Seepage During Drilling (m)	Depth to Water Upon Completion (m)	Depth of Squeezing / Sloughing (m)
6, Gerrond Bay	TH24-28	1.2	3.0	2.4
	TH24-29	1.4	None	2.4
	TH24-30	1.2	2.4	2.7
10, Wicklow Place	TH24-44	None	None	2.1
	TH24-45	None	None	2.1
11A, Wicklow Street	TH24-52	1.7	None	None
	TH24-53	None	None	None
	TH24-54	0.8	0.8	None

Test holes logs for Gerrond Bay, Wicklow Place, and Wicklow Street (sites 6, 10, and 11B respectively) are attached in Appendix B.

## 1.3 Laboratory Testing

Laboratory testing was completed on select soil samples from Gerrond Bay, Wicklow Place, and Wicklow Street (sites 6, 10, and 11B respectively). Testing was completed in a Canadian Council of Independent Laboratories (CCIL) certified laboratory. Testing for each site included five (5) moisture contents per test hole, with an additional three (3) Atterberg Limits, three (3) particle size analysis, one (1) moisture-density relationship (standard Proctor) test, and one (1) California Bearing Ratio (CBR) test completed per project site. A bulk composite soil sample was collected from the upper 0.3 to 1.8 m (1 to 6 ft) of each test hole for the Proctor and CBR testing. Laboratory test results for are summarized and attached in Appendix C.

## 2.0 INVESTIGATION RESULTS

### 2.1 Pavement Structure and Stratigraphy

Table 2 attached provides a summary of the coring and test hole results. Site specific summaries are presented in the following sections.

#### **SITE 1: WESTGROVE WAY**

A core investigation was conducted along Westgrove Way, involving the extraction of 10 core: five (5) from mid-slab locations and five (5) from joint locations. The pavement surface was composed of concrete with thicknesses ranging from 140 to 203 mm. A granular base was identified at TH24-01, TH24-06, and TH24-07 with thicknesses varying between 38 and 51 mm, while the remaining cores revealed no base material, exposing a clay subgrade beneath the pavement. Detailed core locations are illustrated in Figure 1.

#### **SITE 2: CADIZ BAY**

A core investigation was conducted along Cadiz Bay, involving the extraction of three (3) core: two (2) from mid-slab locations and one (1) from a joint location. The pavement surface was composed of concrete with thicknesses ranging from 133 to 150 mm. A granular base was identified at TH24-11 with a thickness of 76 mm, while the remaining cores revealed no base material, exposing a clay subgrade beneath the pavement. Detailed core locations are illustrated in Figure 2.

#### **SITE 3: FREEMONT BAY**

A core investigation was conducted along Freemont Bay, involving the extraction of six (6) core: three (3) from mid-slab locations and three (3) from joint locations. The pavement surface was composed of concrete with thicknesses ranging from 150 to 180 mm. Granular base was identified at TH24-14, TH24-15, TH24-16, and TH24-17 with thicknesses varying between 10 and 75 mm, while the remaining cores revealed no base material exposing a clay subgrade beneath the pavement. Detailed core locations are illustrated in Figure 3.

#### SITE 4: NORMANDY DRIVE

A core investigation was conducted along Normandy Drive, involving the extraction of five (5) core: three (3) from mid-slab locations and two (2) from joint locations. The pavement surface was composed of concrete with thicknesses ranging from 135 to 150 mm. Crushed limestone base was identified at all core locations, with thicknesses varying between 55 and 152 mm. Detailed core locations are illustrated in Figure 4.

#### SITE 5: GIBRALTAR BAY

A core investigation was conducted along Gibraltar Bay, involving the extraction of three (3) core: two (2) from mid-slab locations and one (1) from a joint location. The pavement surface was composed of concrete with thicknesses ranging from 140 to 150 mm. Crushed limestone base was identified at all the core locations, with a thickness of 50 mm. Detailed core locations are illustrated in Figure 5.

#### SITE 6: GERROND BAY

A core investigation was conducted along Gerrond Bay, involving the extraction of three (3) core: two (2) from mid-slab locations and one (1) from a joint location. Additional soil investigations were conducted at each of the three (3) test hole locations and were advanced to a depth of 3.0 m (10 ft) below pavement surface using a truck mounted drill rig equipped with 125 mm solid stem augers. The general stratigraphy encountered within the test holes consisted of concrete pavement with granular base overlying fat clay. A further description of each layer is provided below, with test hole logs provided in Appendix B and test hole locations shown in Figure 6.

**Concrete** – The pavement surface consisted of concrete with varying thicknesses of 128 to 204 mm.

**Lean Clay (CL)** – Granular base material was encountered directly below the concrete in all test holes and varied in thickness between 101 to 280 mm. The fill material was brown, low plasticity, with silt, fine to medium sand and frozen. The maximum aggregate size observed was between 30 and 40 mm.

One (1) Particle size analysis test completed on sample TH24-29 S1 and indicated 9% gravel, 19% sand, 35% silt, and 37% clay, classifying the material as Lean Clay.

**Fat Clay (CH)** – Fat clay was encountered below the clayey sand and extended to the full exploration depth of 3.0 m (10 ft). The clay was generally brown, with silt, and damp to wet below frozen material.

Undrained shear strengths for the clay were estimated during drilling using a handheld Torvane and ranged from 40 kPa to > 100 kPa, classifying the clay as firm to very stiff in terms of consistency, and generally increased with depth. Three (3) Atterberg limits tests were completed on the clay with results indicating liquid limits of 68 to 97, plastic limits of 22 to 30, and plasticity indices between 46 and 74, classifying the material as of high plasticity. Two (2) particle size analysis tests were completed and indicated 10% gravel, 2 to 11% sand, 22 to 39% silt, and 50 to 70% clay. Moisture contents ranged from 35 to 50%, and generally increased with depth.

**Additional Laboratory Testing** – One (1) moisture-density relationship test (standard Proctor) and one (1) CBR test were completed on a composite sample consisting of clay collected from the upper 0.9 m to 1.8 m (3 to 6 ft) below base of fill material in all test holes. Results indicated a maximum dry density of 1490 kg/m<sup>3</sup>, an optimum moisture content of 23%, and a CBR of 2.0 remolded to 95% of the SPDD at optimum moisture content. All laboratory test reports can be found attached in Appendix C.

## SITE 7: ELDRIDGE AVENUE

A core investigation was conducted along Eldridge Avenue, involving the extraction of six (6) core from exclusively mid-slab locations. The pavement surface was composed of asphalt with thicknesses ranging from 100 to 185 mm. Granular base was identified at TH24-32, TH24-33, TH24-34, TH24-35, and TH24-36 with thicknesses of 40 and 185 mm, while the remaining core revealed no base material, exposing a clay subgrade beneath the pavement. Detailed core locations are illustrated in Figure 7.

## SITE 8: GHENT COVE

A core investigation was conducted along Ghent Cove, involving the extraction of three (3) core: two (2) from mid-slab locations and one (1) from a joint location. The pavement surface was composed of concrete with thicknesses ranging from 130 to 180 mm. Crushed limestone base was identified at all the core locations, with thicknesses of 30 and 50 mm, overlaying a sandy subgrade material. Detailed core locations are illustrated in Figure 8.

## SITE 9: WOODGROVE STREET

A core investigation was conducted along Woodgrove Street, involving the extraction of three (3) core from only mid-slab locations. The pavement surface was composed of asphalt with thicknesses ranging from 60 to 75 mm. No base material was identified at any of the core locations, exposing a sandy clay subgrade beneath the pavement. Detailed core locations are illustrated in Figure 9.

## SITE 10: WICKLOW PLACE

A core investigation was conducted along Wicklow Place, involving the extraction of two (2) core from mid-slab locations. Subgrade drilling was conducted at each of the two (2) test holes and were advanced to a depth of 3.0 m (10 ft) below pavement surface using a truck mounted drill rig equipped with 125 mm solid stem augers. The general stratigraphy encountered within the test holes consisted of asphalt over concrete pavement with crushed limestone base, overlying fat clay. A further description of each layer is provided below, with test hole logs provided in Appendix B and test hole locations shown in Figure 10.

**Pavement Surface** – The pavement surface consisted of an asphalt top with varying thicknesses of 52 to 61 mm, overlying concrete pavement with varying thicknesses of 52 and 61 mm.

**Crushed limestone Gravel Fill** – Crushed limestone base material was encountered directly below the pavement surface in both test holes and was varying in thickness between 73 and 107 mm. The fill material was brown, fine to medium with well graded sand, and frozen. The maximum aggregate size observed was between 30 and 40 mm.

**Fat Clay (CH)** – Fat clay was encountered below the crushed limestone and extended to the full exploration depth of 3.0 m (10 ft). The clay was generally brown in color, with silt and damp below frozen material.

Undrained shear strengths for the clay were estimated during drilling using a handheld Torvane and ranged from 35 to greater than 100 kPa classifying the clay as firm to stiff, and generally increased with depth. Three (3) Atterberg limits tests were completed on the clay and indicated liquid limits of 78 to 96, plastic limits of 23 to 32,

and plasticity indices between 54 and 64, classifying the material as of high plasticity. Three (3) particle size analysis tests completed on the clay indicated 0% gravel, 1 to 3% sand, 25 to 31% silt, and 66 to 74% clay. Moisture contents ranged from 35 to 50%, and generally increased with depth.

**Additional Laboratory Testing** – One (1) moisture-density relationship test (standard Proctor) and one (1) CBR test were completed on a composite sample consisting of clay collected from the upper 0.9 to 1.8 m (3 to 6 ft) below base of fill material in all test holes. Results indicated a maximum dry density of 1,500 kg/m<sup>3</sup>, an optimum moisture content of 24%, and a CBR of 2.2 remolded to 96% of the SPDD at optimum moisture content. All laboratory test reports can be found attached in Appendix C.

### **SITE 11A: WICKLOW STREET**

A core investigation was conducted along Wicklow Street, involving the extraction of six (6) core from exclusively mid-slab locations. The pavement surface was composed of asphalt with thicknesses ranging from 60 to 195 mm. Granular base was identified at all the core locations, with thicknesses varying between 40 and 120 mm overlying sandy subgrade material. Detailed core locations are illustrated in Figure 11.

### **SITE 11B: WICKLOW STREET**

A core investigation was conducted along Wicklow Street, involving the extraction of three (3) core: two (2) from mid-slab locations and one (1) from a joint location. Additional soil drilling was conducted within each of the three (3) test holes and were advanced to a depth of 3.0 m (10 ft) below pavement surface using a track mounted drill rig equipped with 125 mm solid stem augers. In general, site stratigraphy consisted of asphalt pavement over granular base, overlying clay. A further description of each layer is provided below, with test hole logs provided in Appendix B and test hole locations shown in Figure 10.

**Asphalt** – The pavement surface consisted of asphalt pavement of varying thickness of 50 to 100 mm.

**Gravel Fill** – Crushed limestone base material was encountered directly below the pavement surface in all test hole locations and was varying in thickness between 207 and 256 mm. The fill material was brown, fine gravel. The maximum aggregate size observed was between 15 and 25 mm.

**Lean Clay (CL)** – Lean clay was encountered below the granular base and extended to a depth of 1.5 m (5 ft). The lean clay was generally grey to brown in color, moist to wet, some silt and trace fine sand and gravel.

Undrained shear strengths for the clay were estimated during drilling using a handheld Torvane and ranged from 25 kPa to 90 kPa, classifying the clay as soft to stiff in terms of consistency. Two (2) Atterberg limits were completed on silty clay soil samples and indicated liquid limits of 29 to 38, plastic limits of 15 to 17, and plasticity indices between 12 and 23, classifying the material as low plasticity. Two (2) particle size analysis tests were completed and indicated 0 to 6% gravel, 6 to 18% sand, 58 to 63% silt, and 18 to 31% clay. Moisture contents ranged from 19 to 38%, and generally increased with depth.

**Silty Clay (CL-ML)** – Silty clay was encountered below the lean clay and extended to the full depth of exploration 3.0 m (10 ft). The silty clay was generally brown to grey in color, moist, and low plastic.

Undrained shear strengths for the clay were estimated during drilling using a handheld Torvane and ranged from 50 kPa to 80 kPa, classifying the clay as firm to stiff. One (1) Atterberg limits test was completed on the silty clay

and indicated a liquid limit of 21, plastic limit of 17, and plasticity index of 4, classifying the material as of low plasticity. One (1) particle size analysis test was completed and indicated 1% gravel, 13% sand, 73% silt, and 14% clay. Moisture contents ranged from 22 to 44%, and generally increased with depth.

**Additional Laboratory Testing** – One (1) moisture-density relationship test (standard Proctor) and one (1) CBR test were completed on a composite sample consisting of clay collected from the upper 0.9 to 1.8 m (3 to 6 ft) below base of fill material in all test holes. Results indicated a maximum dry density of 1,680 kg/m<sup>3</sup>, an optimum moisture content of 19.5%, and a CBR of 4.2 remolded to 95% of the SPDD at optimum moisture content. All laboratory test reports can be found attached in Appendix C.

## SITE 12: NASSAU STREET SOUTH

A core investigation was conducted along Nassau Street South, involving the extraction of three (3) core: two (2) from mid-slab locations and one (1) from a joint location. The pavement surface was composed of concrete with thicknesses ranging from 165 to 185 mm. No base was identified at any of the core locations, exposing a clay subbase beneath the pavement. Detailed core locations are illustrated in Figure 13.

## SITE 13: MONTGOMERY AVENUE

A core investigation was conducted along Montgomery Avenue, involving the extraction of three (3) core: two (2) from mid-slab locations and one (1) from a joint location. The pavement surface was composed of concrete with thicknesses ranging from 180 to 195 mm. Crushed limestone base was identified at TH24-58 and TH24-59 with thicknesses of 55 and 90 mm, while the remaining core revealed no base material, exposing a clay subbase beneath the pavement. Detailed core locations are illustrated in Figure 14.

## 3.0 CLOSURE

Should you have any questions regarding the enclosed information or require additional information, please contact the undersigned.

## STATEMENT OF LIMITATIONS AND CONDITIONS

### Limitations

This report has been prepared for KGS Group in accordance with the agreement between KGS Group's Geotechnical and Municipal departments (the "Agreement"). This report represents KGS Group's professional judgment and exercising due care consistent with the preparation of similar reports. The information, data, recommendations and conclusions in this report are subject to the constraints and limitations in the Agreement and the qualifications in this report. This report must be read as a whole, and sections or parts should not be read out of context.



This report is based on information made available to KGS Group by KGS Group. Unless stated otherwise, KGS Group has not verified the accuracy, completeness or validity of such information, makes no representation regarding its accuracy and hereby disclaims any liability in connection therewith. KGS Group shall not be responsible for conditions/issues it was not authorized or able to investigate or which were beyond the scope of its work. The information and conclusions provided in this report apply only as they existed at the time of KGS Group's work.

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Any use a third party makes of this report or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

### Geotechnical Investigation Statement of Limitations

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

Prepared By:



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Geotechnical Engineer in Training

AB/JL/DM/cs  
Attached

Approved By:



Trevor Schellenberg, P.Eng.  
Geotechnical Engineer



# FIGURES

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Test Hole Location Plans

**FIGURE 1: TEST HOLE LOCATIONS FOR WESTGROVE WAY**



FIGURE 2: TEST HOLE LOCATIONS FOR CADIZ BAY



FIGURE 3: TEST HOLE LOCATIONS FOR FREEMONT BAY

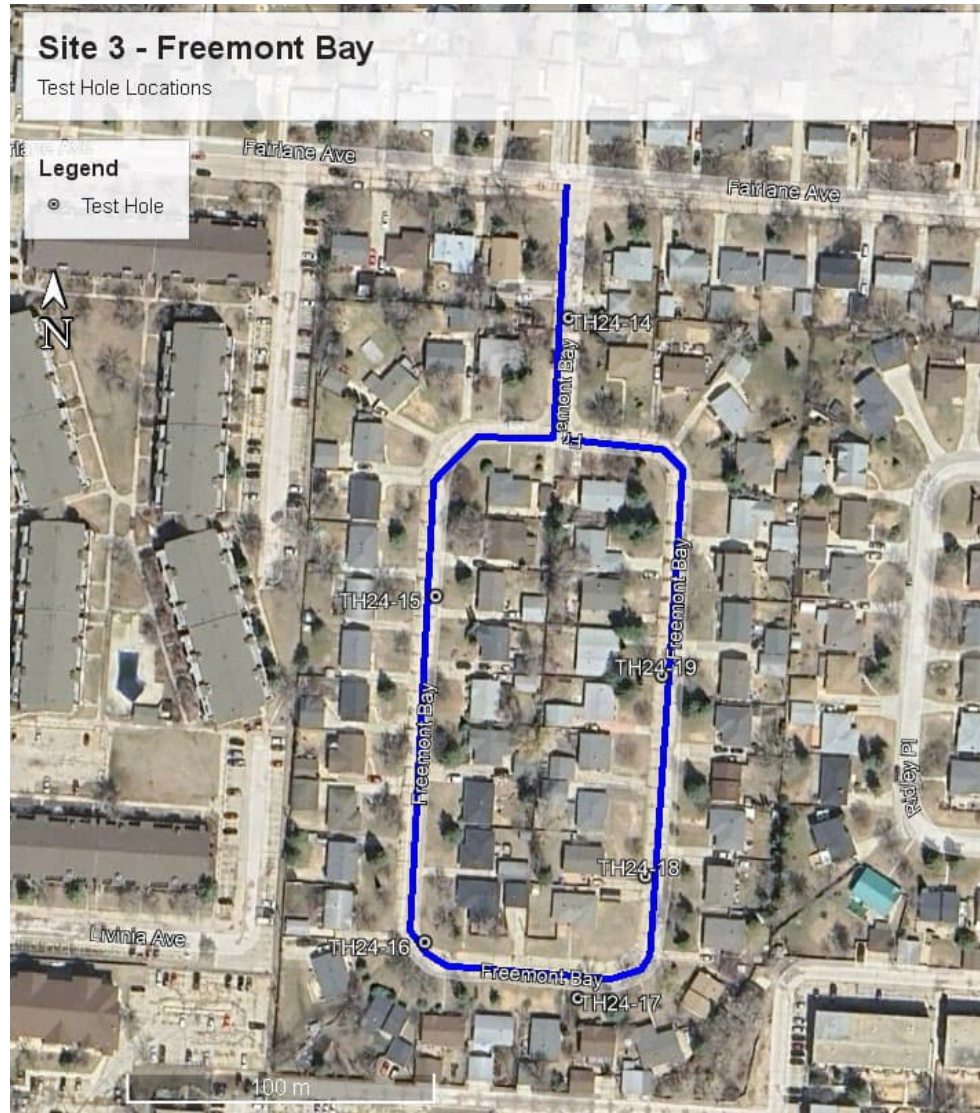


FIGURE 4: TEST HOLE LOCATIONS FOR NORMANDY DRIVE

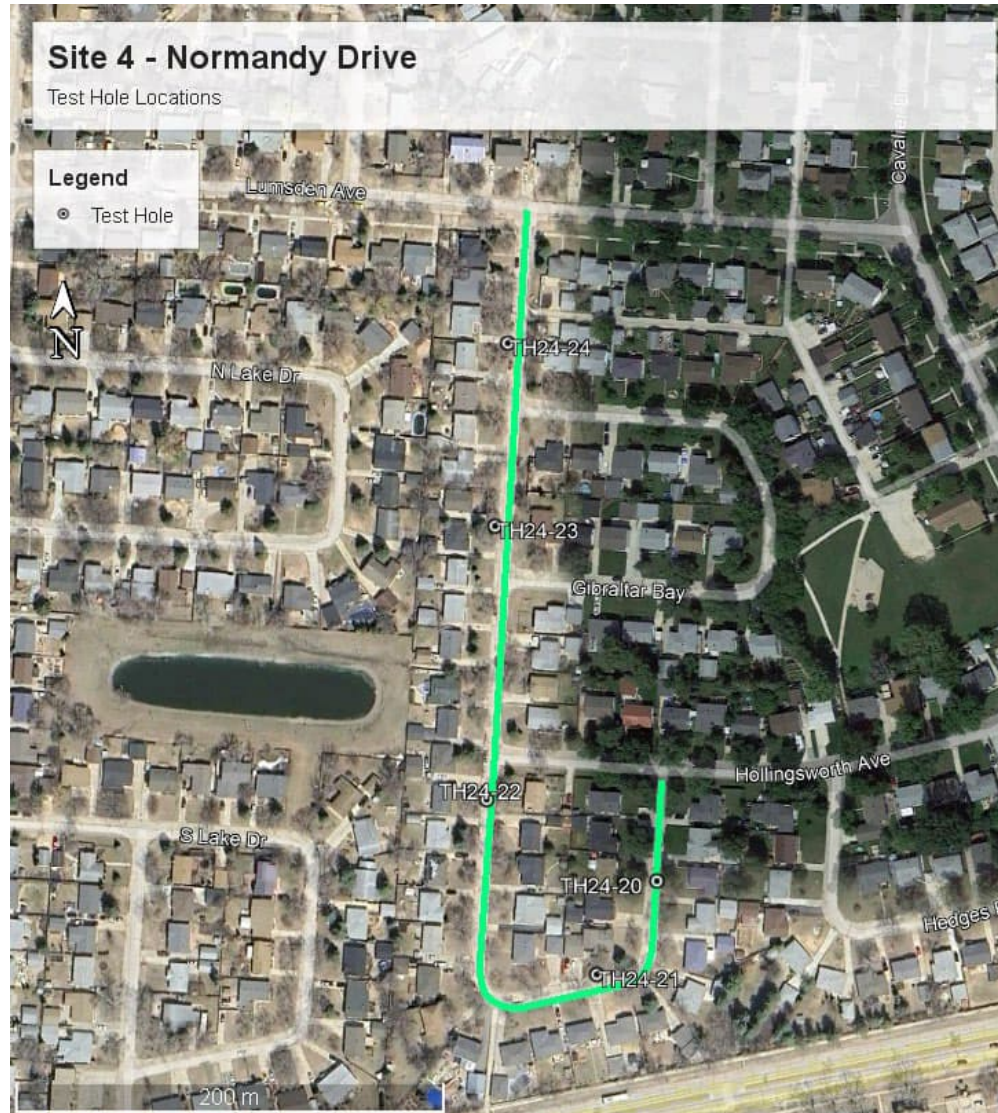
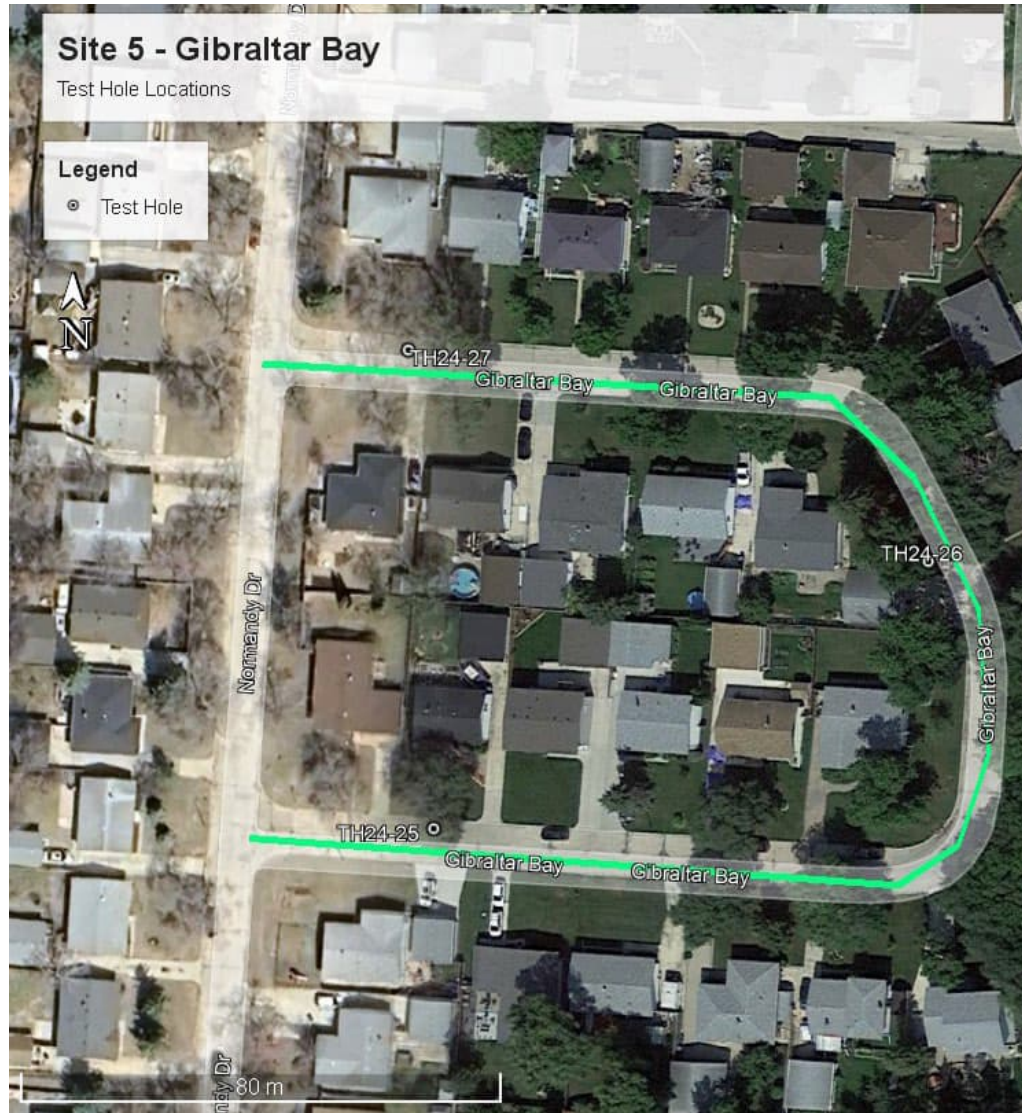


FIGURE 5: TEST HOLE LOCATIONS FOR GIBRALTAR BAY



**FIGURE 6: TEST HOLE LOCATIONS FOR GERROND BAY**

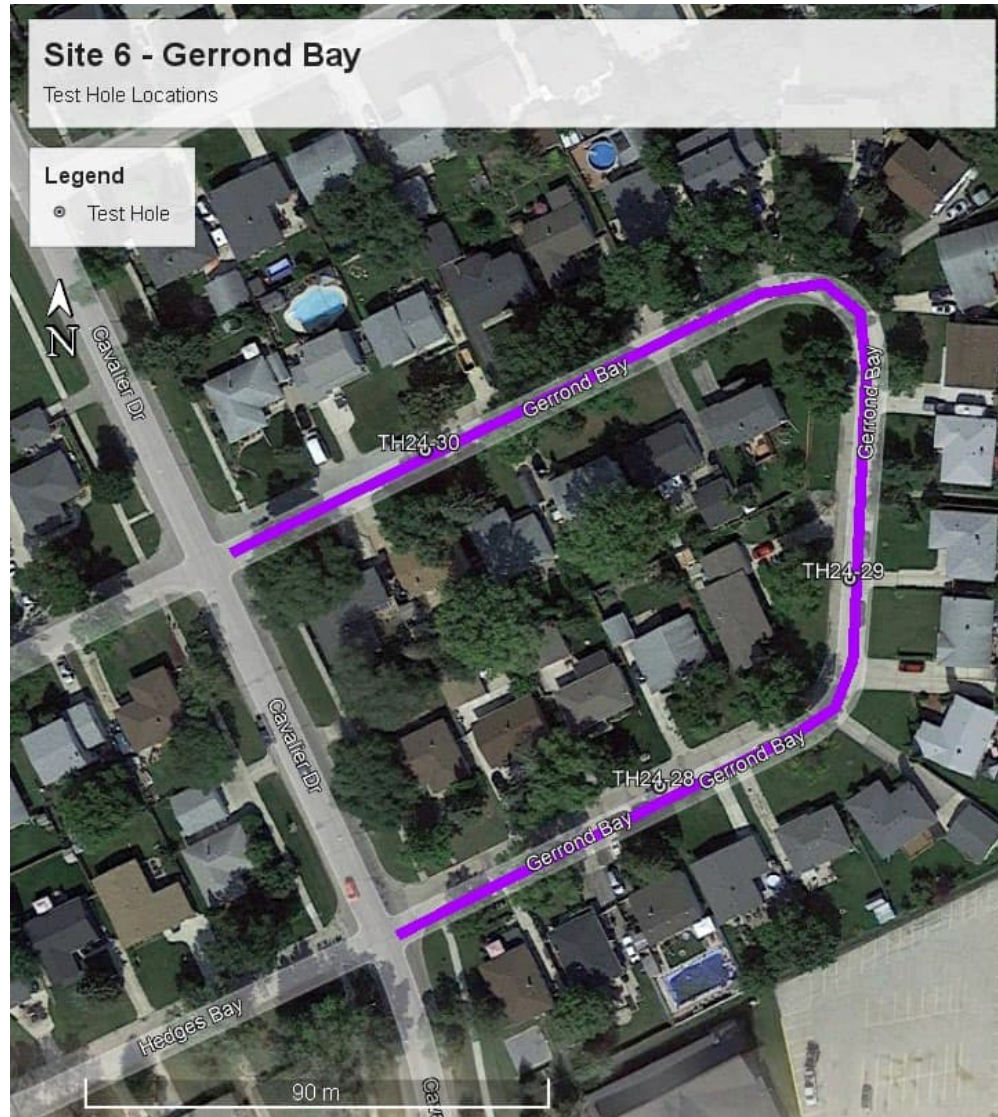
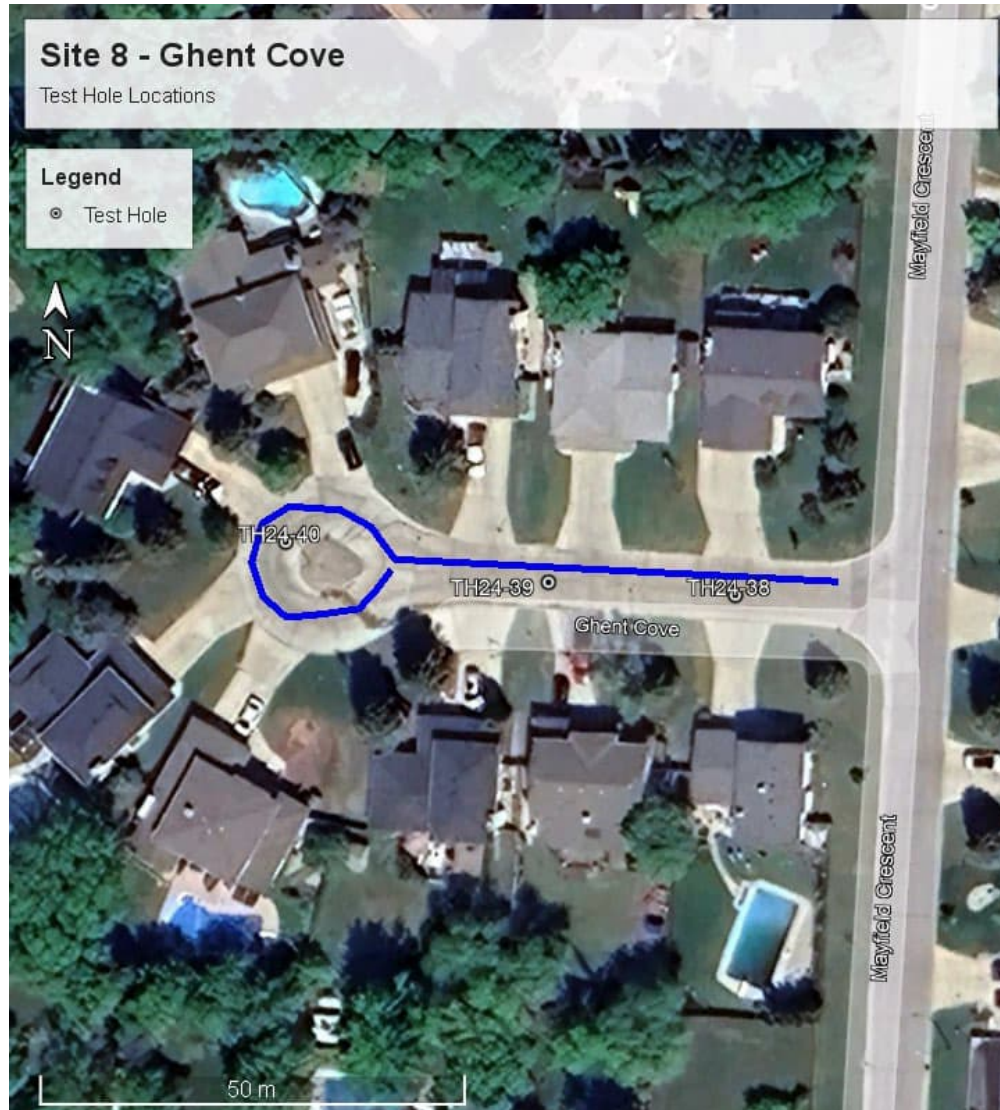




FIGURE 7: TEST HOLE LOCATIONS FOR ELDRIDGE AVEUNE



FIGURE 8: TEST HOLE LOCATIONS FOR GHENT COVE



**FIGURE 9: TEST HOLE LOCATIONS FOR WOODGROVE STREET**

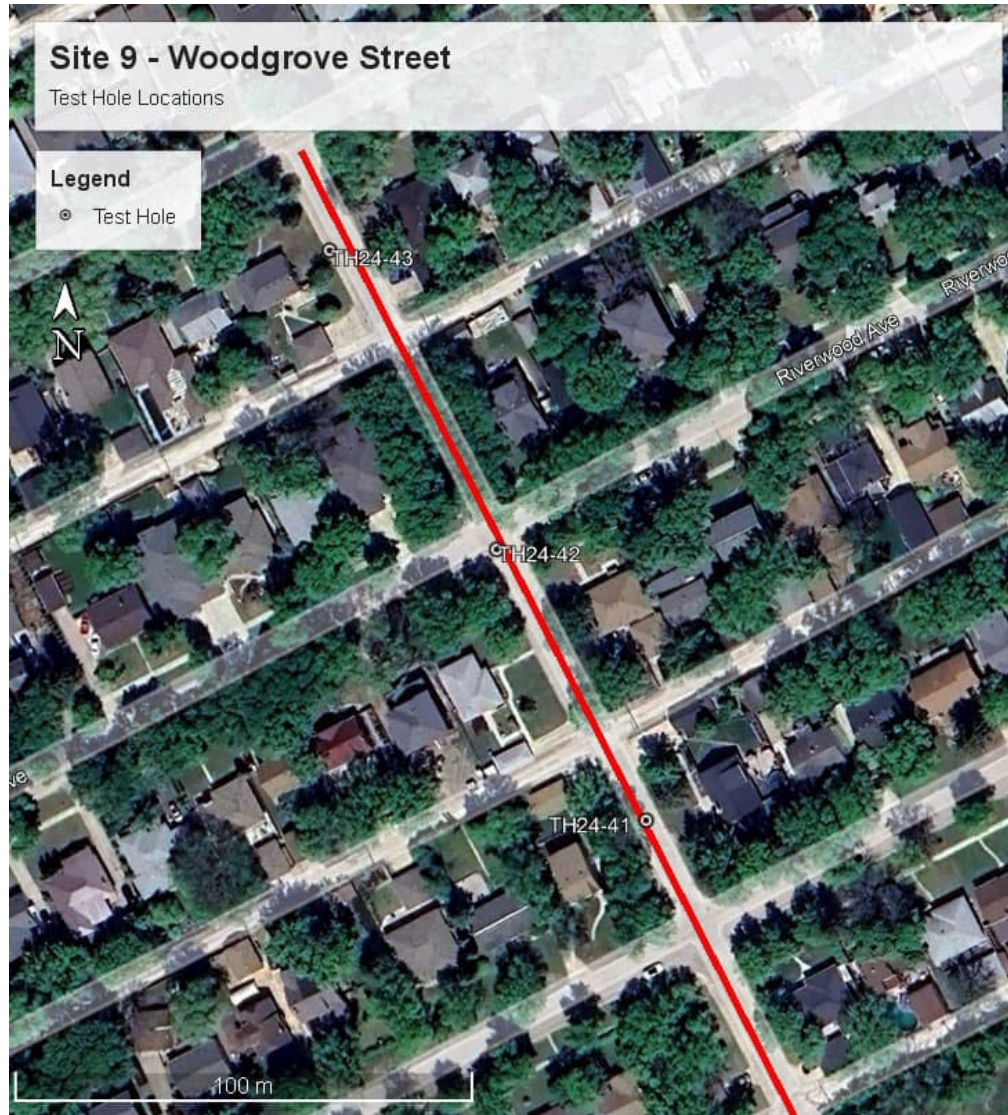


FIGURE 10: TEST HOLE LOCATIONS FOR WICKLOW PLACE

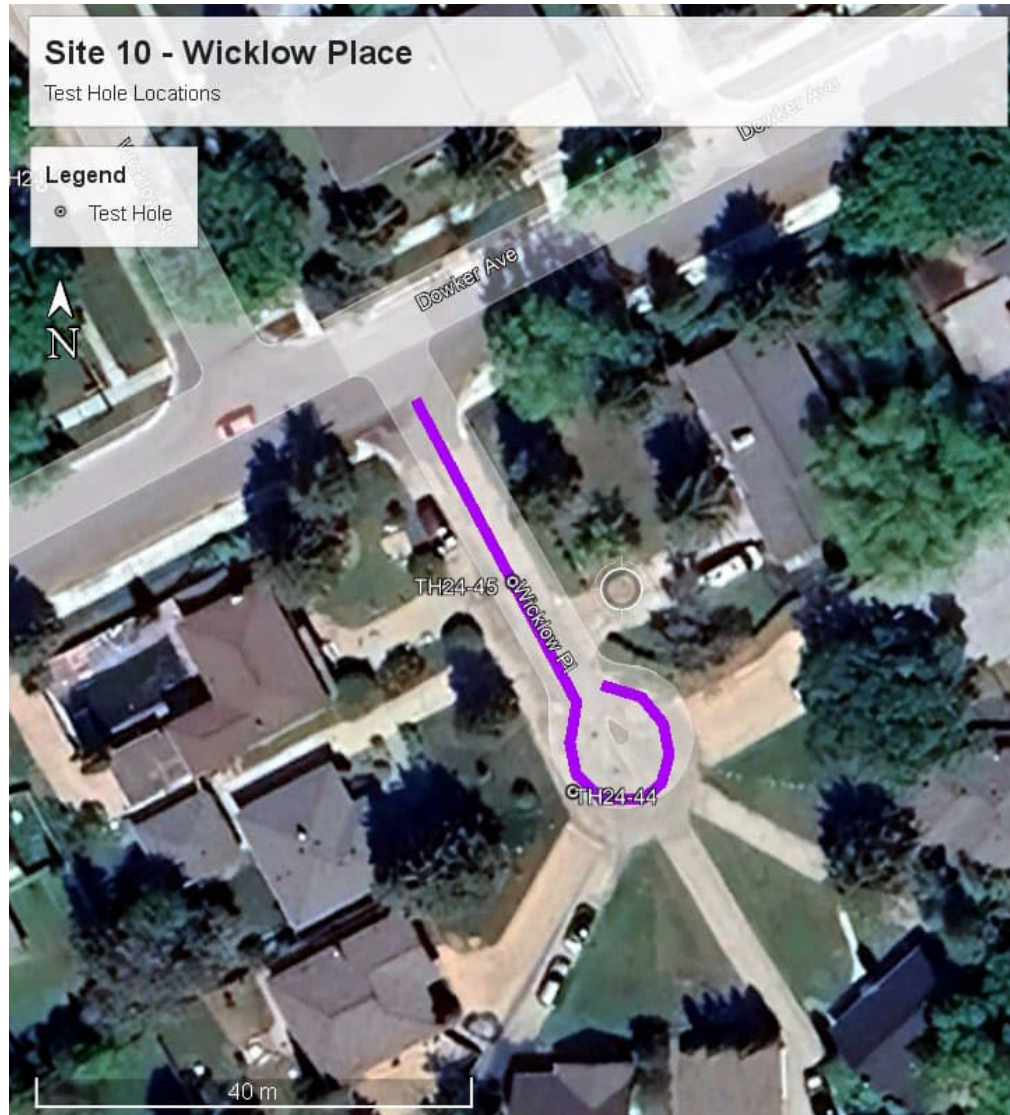


FIGURE 11: TEST HOLE LOCATIONS FOR WICKLOW STREET (REHAB)

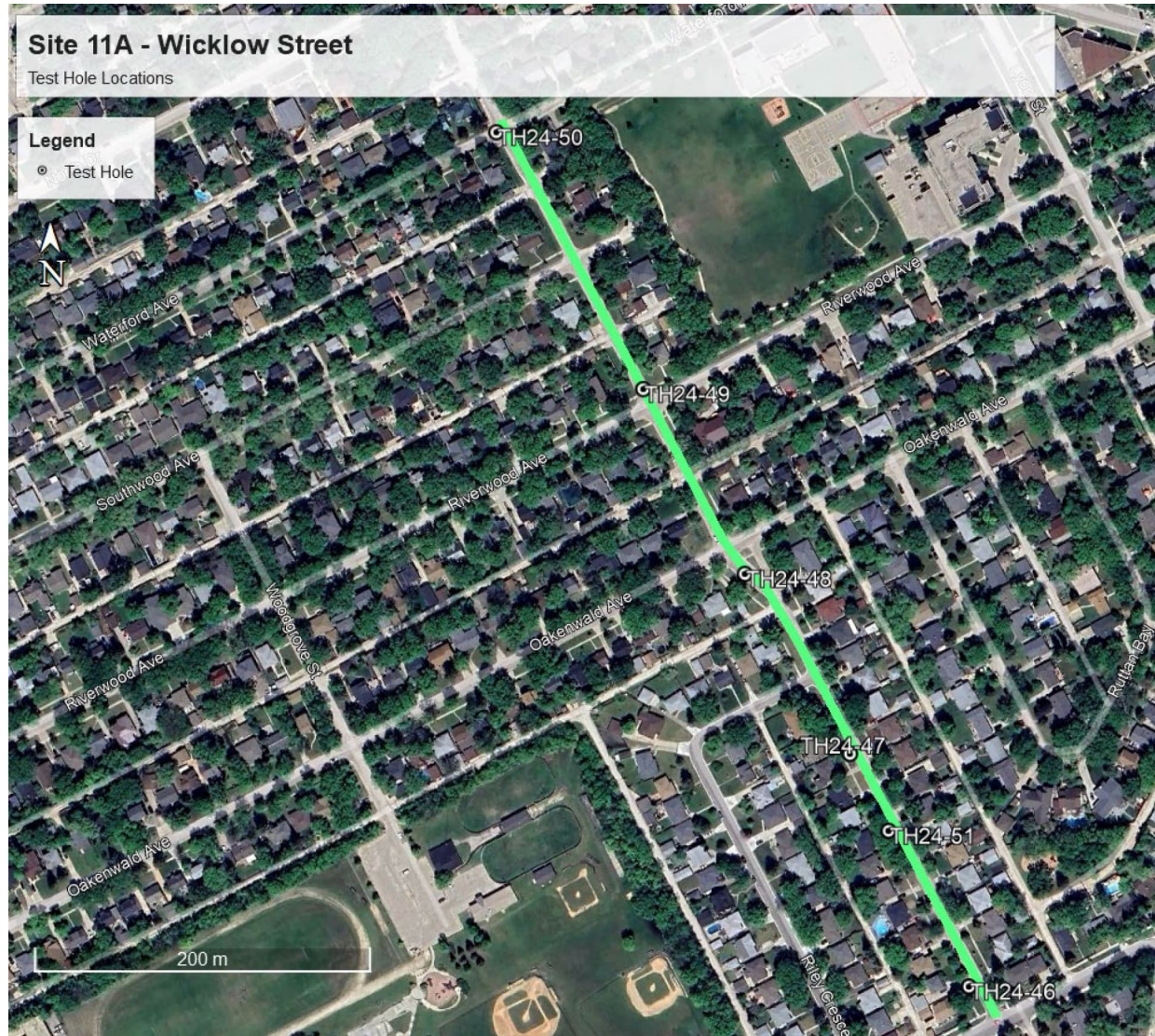


FIGURE 12: TEST HOLE LOCATIONS FOR WICKLOW STREET (RECONSTRUCTION)

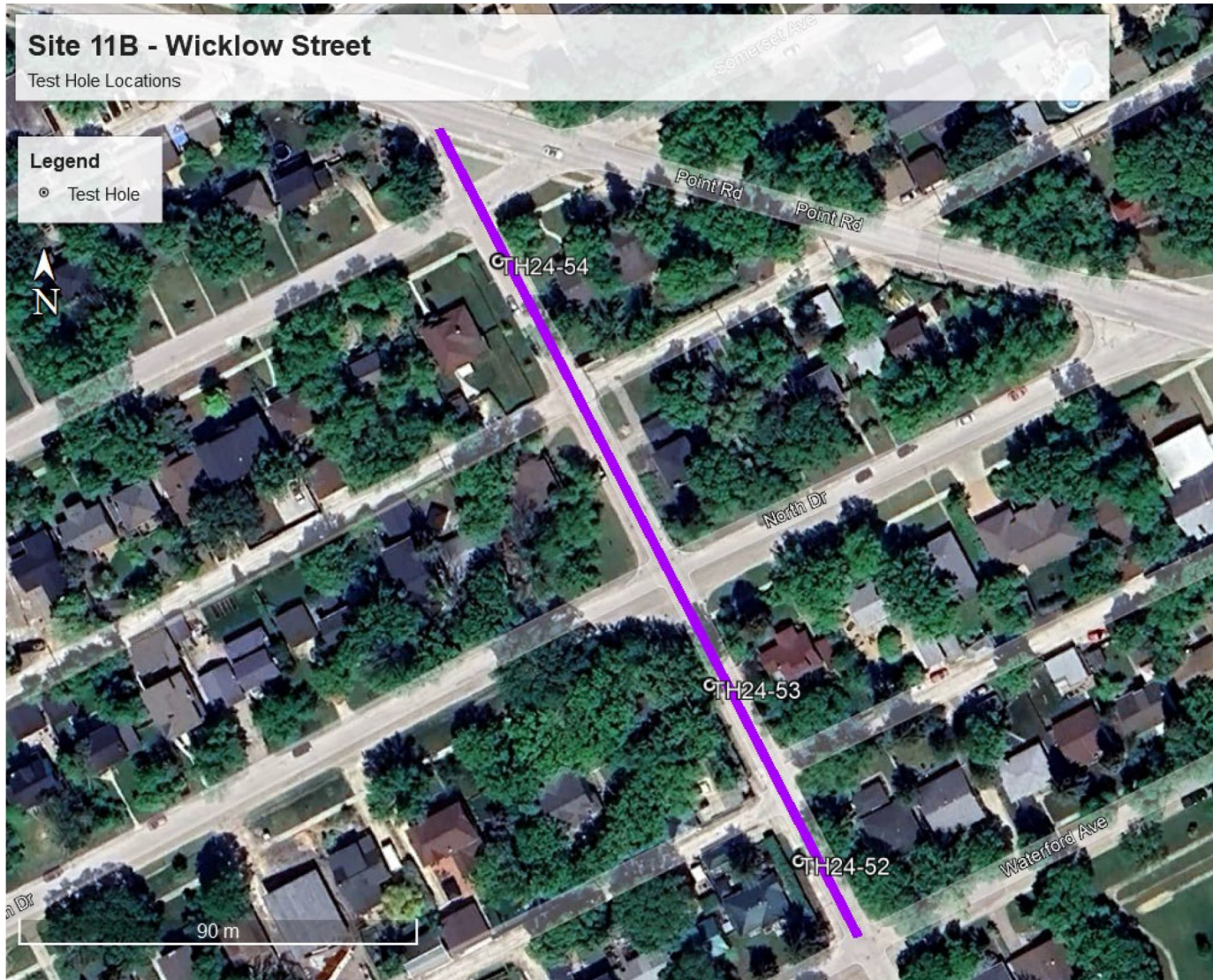


FIGURE 13: TEST HOLE LOCATIONS FOR NASSAU STREET SOUTH

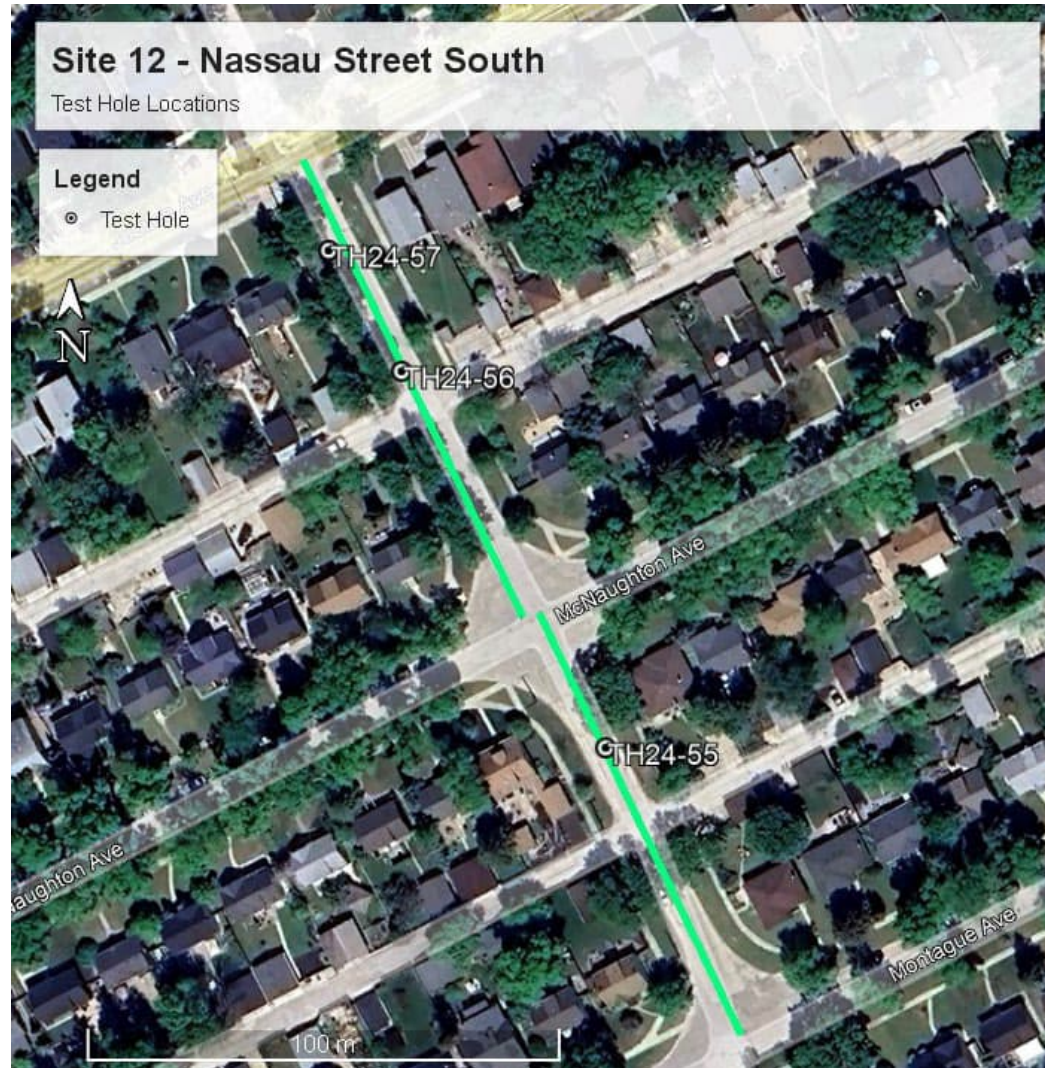


FIGURE 14: TEST HOLE LOCATIONS FOR MONTGOMERY AVENUE





# **TABLES**

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Location Descriptions and Coordinates  
Summary of Core Results

**TABLE 1: TEST HOLE LOCATIONS**

Site	Street Name	Test Hole ID	LOCATION DISCRPTION	Nothing [m]	Easting [m]
1	Westgrove Way	TH24-01	234 Westgrove Way; 1m from centreline, northwest bound lane.	5524153	620801
		TH24-02	218 Westgrove Way; 0.6m from centreline, southeast bound lane.	5524218	620740
		TH24-03	197 Westgrove Way; 2m from curb, southeast bound lane.	5524311	620687
		TH24-04	160 Westgrove Way; on centreline.	5524431	620692
		TH24-05	124 Westgrove Way; 0.6m from centreline, north bound lane.	5524518	620696
		TH24-06	104 Westgrove Way, east bound lane.	5524591	620705
		TH24-07	3 Briarbrook Bay; 1m from centreline, west bound lane.	5524593	620818
		TH24-08	60 Westgrove Way; 0.6m from BOC, east bound lane.	5524578	620882
		TH24-09	3 Westgrove way; 2m from BOC, east bound lane.	5524513	620995
		TH24-10	Infront of community centre fence; 2m from curb, west bound lane.	5524512	621076
2	Cadiz Bay	TH24-11	62 Cadiz Bay; 1.3m from centreline, east bound lane.	5524255	621431
		TH24-12	35 Cadiz Bay; 0.6 m from centreline, north bound lane.	5524313	621398
		TH24-13	6 Cadiz Bay; 1.1m from centreline, northeast bound lane.	5524395	621427
3	Freemont Bay	TH24-14	202 Freemont Bay; 1.5 m from centreline, south bound lane.	5527320	621692
		TH24-15	113 Freemont Bay; 1m from centreline, north bound lane.	5527230	621653
		TH24-16	125 Freemont Bay; 0.1m from centreline, north bound lane.	5527121	621654
		TH24-17	138 Freemont Bay; east bound lane 1.5 m from curb.	5527100	621700
		TH24-18	147 Freemont Bay; 1.6 m from curb, north bound lane.	5527141	621711
		TH24-19	155 Freemont Bay; 1m from curb, south bound Lane.	5527187	621723
4	Normandy Drive	TH24-20	126 Normandy Drive; 1.4 m from CL east bound lane.	5528126	621767
		TH24-21	105 Normandy Drive; Gutter line west bound lane.	5528082	621740
		TH24-22	62 Normandy Drive; south bound lane.	5528162	621687
		TH24-23	34 Normandy Drive; 0.45m from centreline.	5528289	621688
		TH24-24	14 Normandy Drive; 1.3m from centreline north bound lane.	5528374	621692
5	Gibraltar Bay	TH24-25	74 Gibraltar Bay; 1m from curb west bound lane.	5528266	621725
		TH24-26	35 Gibraltar Bay, 0.5 m from centreline north bound lane.	5528312	621806

Site	Street Name	Test Hole ID	LOCATION DISCRIPTION	Nothing [m]	Easting [m]
		TH24-27	7 Gibraltar Bay; 1.5 m from centreline west bound.	5528352	621720
6	Gerrond Bay	TH24-28	11 Gerrond Bay; 60 m east of Cavalier Drive, 2m offset from curb	5528187	622066
		TH24-29	35 Gerrond Bay; 120 m east of Cavalier Drive, 3m offset from curb	5528228	622102
		TH24-30	75 Gerrond Bay; 45 m east of Cavalier Drive; 2m offset from curb.	5528251	622019
		TH24-31	Charleswood Church; 1.5 m from edge of asphalt, aligned with east edge of the Charleswood church, west bound lane.	5523684	624678
7	Eldridge Street	TH24-32	3650 Eldridge Street; 1.2m from edge of asphalt, west bound lane.	5523683	624770
		TH24-33	3635 Eldridge Street; 1m from edge of asphalt, west bound lane.	5523681	624841
		TH24-34	3619 Eldridge Street; 0.8m from edge of asphalt, northeast bound lane	5523678	624899
		TH24-35	3603 Eldridge Street; 1.2m from centreline, west bound lane.	5523682	624992
		TH24-36	3578 Eldridge Street; 0.3m from edge of asphalt, north bound Lane.	5523670	625112
		TH24-37	3555 Eldridge Street; Issues occurred throughout coring; no sampling occurred.	5523675	625238
		8	Ghent Cove	TH24-38	2 Ghent Cove; 2m from curb, southwest bound lane.
TH24-39	34 Ghent Cove; 6m from centerline, northwest bound lane.			5523786	625157
TH24-40	18 Ghent Cove; 0.8m from centreline south bound lane.			5523790	625126
9	Woodgorve Street	TH24-41	857 Woodgrove Street; 1m from curb, northwest bound.	5522815	633039
		TH24-42	900 Woodgrove Street; 1.6m from curb, SE bound lane.	5522860	632982
		TH24-43	948 Woodgrove Street; 0.7 from centreline, SE bound lane.	5522936	632966
10	Wicklow Place	TH24-44	909 Wicklow Place; 30m south of Dowker avenue, 1m offset from curb.	5522603	633469
		TH24-45	901 Wicklow Place; 15m south of Dowker avenue, 2m offset from curb.	5522622	633463
11A	Wicklow Street	TH24-46	867 Wicklow Street; 1.5m form curb, northwest bound lane.	5522657	633421
		TH24-47	827 Wicklow Street; 2.1m from curb, southeast bound lane.	5522793	633347
		TH24-48	800 Wicklow Street; 3m from BOC, northwest bound lane.	5522898	633282
		TH24-49	733 Riverwood Avenue; northeast 1.8m from curb & para ramp	5523006	633219
		TH24-50	902 Wicklow Street; 1.6 m from curb, southeast bound lane.	5523156	633128
		TH24-51	840 Wicklow Street; 1.0 m from curb, southeast bound lane.	5522748	633371
11B	Wicklow Street	TH24-52	903 Waterford Avenue; 2 m from curb, southeast bound lane.	5523178	633115

Site	Street Name	Test Hole ID	LOCATION DISCRIPTION	Nothing [m]	Easting [m]
		TH24-53	900 North Drive; 0.5 m from curb, southeast bound lane.	5523217	633094
		TH24-54	900 Somerset Avenue; 0.5 m from curb, southeast bound lane	5523311	633044
12	Nassau Street South	TH24-55	516 Nassau Street South; 0.8 m from centreline, west bound lane.	5524445	634207
		TH24-56	546 Nassau Street South; Garage by the back lane, 1m from centreline, east bound lane.	5524523	634162
		TH24-57	546 Nassau Street South; 1m from centreline, east bound lane.	5524548	634146
13	Montgomery Avenue	TH24-58	266 Montgomery Avenue; 1.5m from centreline, northeast bound lane	5524794	634856
		TH24-59	254 Montgomery Avenue; 0.8m from centreline, southwest bound lane.	5524815	634900
		TH24-60	243 Montgomery Avenue; 0.5m from centreline, southwest bound lane.	5524854	634952

**TABLE 02: TEST HOLE RESULTS**

Site	Street Name	Test Hole ID	Pavement Type	Location	Core Thickness [mm]	Base Material	Base Thickness [mm]	Depth to Sub-Grade [mm]	Subgrade Material
1	Westgrove Way	TH24-01	Concrete	Mid-slab	160	Granular	38	198	Clay
		TH24-02	Concrete	Joint	155	Clay	0	155	Clay
		TH24-03	Concrete	Mid-slab	165	Clay	0	165	Clay
		TH24-04	Concrete	Joint	140	Clay	0	191	Clay
		TH24-05	Concrete	Mid-slab	145	Sandy clay	0	196	Clay
		TH24-06	Concrete	Joint	203	Granular	51	203	Clay
		TH24-07	Concrete	Mid-slab	155	Granular	51	155	Clay
		TH24-08	Concrete	Joint	147	Gravelly clay	0	147	Clay
		TH24-09	Concrete	Mid-slab	172	Clay	0	172	Clay
		TH24-10	Concrete	Joint	170	Clay	0	170	Clay
2	Cadiz Bay	TH24-11	Concrete	Mid-slab	133	Granular	76	209	Clay
		TH24-12	Concrete	Joint	150	Clay	0	150	Clay
		TH24-13	Concrete	Mid-slab	140	Gravelly clay	0	140	Clay
3	Freemont Bay	TH24-14	Concrete	Mid-slab	179	Granular	51	230	Clay
		TH24-15	Concrete	Mid-slab	159	Granular	10	169	Clay
		TH24-16	Concrete	Joint	160	Granular	75	235	Clay
		TH24-17	Concrete	Mid-slab	180	Granular	40	220	Clay
		TH24-18	Concrete	Joint	150	Clay	0	150	Clay
		TH24-19	Concrete	Joint	178	Clay	0	178	Clay
4	Normandy Drive	TH24-20	Concrete	Mid-slab	150	Crushed limestone	64	214	Clay
		TH24-21	Concrete	Joint	150	Crushed limestone	152	302	Clay
		TH24-22	Concrete	Mid-slab	150	Crushed limestone	57	207	Clay
		TH24-23	Concrete	Joint	135	Crushed limestone	55	190	Clay
		TH24-24	Concrete	Mid-slab	150	Crushed limestone	60	210	Clay
5	Gibraltar Bay	TH24-25	Concrete	Mid-slab	150	Crushed limestone	50	200	Clay
		TH24-26	Concrete	Mid-slab	140	Crushed limestone	50	190	Clay
		TH24-27	Concrete	Joint	150	Crushed limestone	50	200	Clay
6	Gerrond Bay	TH24-28	Concrete	Mid slab	128	Crushed limestone	101	229	Clay

Site	Street Name	Test Hole ID	Pavement Type	Location	Core Thickness [mm]	Base Material	Base Thickness [mm]	Depth to Sub-Grade [mm]	Subgrade Material
		TH24-29	Concrete	Joint	177	Crushed limestone	280	457	Clay
		TH24-30	Concrete	Mid-slab	204	Crushed limestone	177	381	Clay
7	Eldridge Street	TH24-31	Asphalt	Mid-slab	114	Clay	0	114	Clay
		TH24-32	Asphalt	Mid-slab	102	Granular	102	204	Clay
		TH24-33	Asphalt	Mid-slab	114	Granular	114	228	Clay
		TH24-34	Asphalt	Mid-slab	150	Granular	80	230	Clay
		TH24-35	Asphalt	Mid-slab	185	Granular	55	240	Clay
		TH24-36	Asphalt	Mid-slab	100	Granular	40	140	Clay
		TH24-37 <sup>1</sup>	Asphalt	Mid-slab	NA	NA	NA	NA	NA
8	Ghent Cove	TH24-38	Concrete	Mid-slab	130	Crushed limestone	50	180	Sand
		TH24-39	Concrete	Joint	165	Crushed limestone	35	200	Sand
		TH24-40	Concrete	Mid-slab	180	Crushed limestone	30	210	Sand
9	Woodgorve Street	TH24-41	Asphalt	Mid-slab	75	Sandy clay	45	120	Clay
		TH24-42	Asphalt	Mid-slab	60	Sandy clay	60	120	Clay
		TH24-43	Asphalt	Mid-slab	65	Sandy clay	70	135	Clay
10	Wicklow Place	TH24-44	Asphalt/Concrete	Mid-slab	52/52	Crushed limestone	73	177	Clay
		TH24-45	Asphalt/Concrete	Mid-slab	61/61	Crushed limestone	107	229	Clay
11A	Wicklow Street	TH24-46	Asphalt	Mid-slab	80	Granular	105	185	Sand
		TH24-47	Asphalt	Mid-slab	60	Granular	120	180	Sand
		TH24-48	Asphalt	Mid-slab	195	Granular	40	235	Sand
		TH24-49	Asphalt	Mid-slab	105	Granular	40	145	Sand
		TH24-50	Asphalt	Mid-slab	80	Granular	80	160	Sand
		TH24-51	Asphalt	Mid-slab	178	Granular	70	248	Sand
11B	Wicklow Street	TH24-52	Asphalt	Mid-slab	49	Granular	256	305	Silty clay
		TH24-53	Asphalt	Mid-slab	98	Granular	207	305	Silty clay
		TH24-54	Asphalt	Joint	49	Granular	256	305	Lean clay
12	Nassau Street South	TH24-55	Concrete	Mid-slab	165	Clay	0	165	Clay
		TH24-56	Concrete	Joint	165	Clay	0	165	Clay
		TH24-57	Concrete	Mid-slab	185	Clay	0	185	Clay

Site	Street Name	Test Hole ID	Pavement Type	Location	Core Thickness [mm]	Base Material	Base Thickness [mm]	Depth to Sub-Grade [mm]	Subgrade Material
13	Montgomery Avenue	TH24-58	Concrete	Joint	185	Crushed limestone	90	275	Clay
		TH24-59	Concrete	Mid-slab	195	Crushed limestone	55	250	Clay
		TH24-60	Concrete	Mid-slab	180	Clay	0	180	Clay

1- Core data lost in process; test hole TH24-37 abandoned.

# APPENDIX A

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Core Photo Log





Photo 1: Westgrove Way TH24-01



Photo 2: Westgrove Way TH24-02



Photo 3: Westgrove Way TH24-03



Photo 4: Westgrove Way TH24-04



Photo 5: Westgrove Way TH24-05



Photo 6: Westgrove Way TH24-06



Photo 7: Westgrove Way TH24-07



Photo 8: Westgrove Way TH24-08



Photo 9: Westgrove Way TH24-09



Photo 10: Westgrove Way TH24-10



Photo 11: Cadiz Bay TH24-11



Photo 12: Cadiz Bay TH24-12



Photo 13: Cadiz Bay TH24-13



Photo 14: Freemont Bay TH24-14



Photo 14: Freemont Bay TH24-15



Photo 16: Freemont Bay TH24-16





Photo 17: Freemont Bay TH24-17



Photo 18: Freemont Bay TH24-18



Photo 19: Freemont Bay TH24-19



Photo 20: Normandy Drive TH24-20



Photo 21: Normandy Drive TH24-21



Photo 22: Normandy Drive TH24-22



Photo 23: Normandy Drive TH24-23



Photo 24: Normandy Drive TH24-24



Photo 25: Gibraltar Bay TH24-25



Photo 26: Gibraltar Bay TH24-26



Photo 27: Gibraltar Bay TH24-27



Photo 28: Gerrond Bay TH24-28



**Photo 29: Gerrond Bay TH24-29**



**Photo 30: Gerrond Bay TH24-30**



Photo 31: Eldridge Street TH24-31



Photo 32: Eldridge Street TH24-32





Photo 33: Eldridge Street TH24-33



Photo 34: Eldridge Street TH24-34



Photo 35: Eldridge Street TH24-35



Photo 36: Eldridge Street TH24-36

*Core data lost in process; test hole TH24-37 abandoned.*

**Photo 37: Eldridge Street TH24-37**



**Photo 38: Ghent Cove TH24-38**





Photo 41: Woodgrove Street TH24-41



Photo 42: Woodgrove Street TH24-42



Photo 43: Woodgrove Street TH24-43



Photo 44: Wicklow Place TH24-44



Photo 45: Wicklow Place TH24-45



Photo 46: Wicklow Street TH24-46



Photo 47: Wicklow Street TH24-47



Photo 48: Wicklow Street TH24-48





Photo 49: Wicklow Street TH24-49



Photo 50: Wicklow Street TH24-50



Photo 51: Wicklow Street TH24-51



Photo 52: Wicklow Street TH24-52



**Photo 53: Wicklow Street TH24-53**



**Photo 54: Wicklow Street TH24-54**



Photo 55: Nassau Street South TH24-55



Photo 56: Nassau Street South TH24-56



Photo 57: Nassau Street South TH24-57



Photo 58: Montgomery Avenue TH24-58



Photo 59: Montgomery Avenue TH24-59



Photo 60: Montgomery Avenue TH24-60

# APPENDIX B

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Test Hole Logs

<b>CLIENT</b>	<b>KGS GROUP</b>	<b>PROJECT NO.</b>	24-0535-004
<b>PROJECT</b>	<b>2024 COW Local Street Program</b>	<b>START DATE</b>	4-12-2024
<b>LOCATION</b>	Winnipeg, MB	<b>UTM (m)</b>	N 5,528,187
<b>DESCRIPTION</b>	Gerrond Bay, 45 E of Cavalier Drive, 2m offset from curb, mid-slab		E 622,066 Zone 14
<b>DRILL RIG / HAMMER</b>	Acker MP5 Truck Mounted Drill Rig		
<b>METHOD(S)</b>	0.0 m to 0.2 m: 150 mm Core 0.2 m to 3.0 m: 125 mm $\phi$ SSA		

DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	DRILLING/ DIGGING REMARKS	WATER LEVEL	SAMPLE TYPE	NUMBER / RUN	SPT (N) BLOWS/0.30 m $\Delta$			
							20	40	60	80
		<b>CONCRETE</b> - 204 mm.				C1				
		<b>LEAN CLAY (CL)</b> - 101 mm, Brown, low plasticity, with silt, some fine to medium sand, frozen.				S1				
		<b>CLAY (CH)</b> - Brown, high plasticity, with silt, frozen.				S2				
1.0		- Wet, stiff below 1.1 m.				S3				
		- LL=97, PL=30, PI=67 at 1.2 m.				S4				
5						S5				
2.0						S6				
3.0			- Squeezing below 2.4 m upon completion of drilling.							
4.0		Notes: 1. End of test hole at 3.0 m. 2. Test hole remained open to 3.0 m upon completion of drilling/digging. 3. Test hole backfilled with auger cuttings with cold mix asphalt patch.								

**WATER LEVELS**  
 ▽ During Drilling/Digging 1.22 m on 4-12-2024  
 ▽ Upon Completion 2.99 m on 4-12-2024

<b>CONTRACTOR</b> Maple Leaf Drilling Ltd.	<b>INSPECTOR</b> J. LOEWEN
<b>APPROVED</b> T. SCHELLENBERG	<b>DATE</b> 5-6-2024

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<b>CLIENT</b>	<b>KGS GROUP</b>	<b>PROJECT NO.</b>	24-0535-004
<b>PROJECT</b>	<b>2024 COW Local Street Program</b>	<b>START DATE</b>	4-12-2024
<b>LOCATION</b>	Winnipeg, MB	<b>UTM (m)</b>	N 5,528,228
<b>DESCRIPTION</b>	Gerrond Bay, 120m E of Cavalier Drive, 3m offset from curb, joint		E 622,101 Zone 14
<b>DRILL RIG / HAMMER</b>	Acker MP5 Truck Mounted Drill Rig		
<b>METHOD(S)</b>	0.0 m to 0.2 m: 150 mm Core 0.2 m to 3.0 m: 150 mm Core		

DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	DRILLING/ DIGGING REMARKS	WATER LEVEL	SAMPLE TYPE	NUMBER / RUN	 Cu TORVANE (kPa) ◇			qu POCKET PEN (kPa) ★			SPT (N) BLOWS/0.30 m Δ					
							20	40	60	80	20	40	60	80	20	40	60	80
		<b>CONCRETE</b> - 177 mm.				C1												
		<b>LEAN CLAY (CL)</b> - 280 mm, Brown, low plasticity, with silt, some fine to medium sand, trace gravel, frozen. - PSA: 9% gravel, 19% sand, 35% silt, 37% clay at 0.3 m.				S1												
		<b>CLAY (CH)</b> - Brown, high plasticity, with silt, frozen.  - With sand below 0.9 m. - LL=68, PL=22, PI=46 at 0.9 m. - PSA: 0% gravel, 11% sand, 39% silt, 50% clay at 0.9 m. - Damp, stiff below 1.1 m.  - Wet below 1.4 m.				S2												
1.0						S3												
						S4												
5						S5												
2.0						S6												
			- Squeezing below 2.4 m upon completion of drilling.															
3.0																		
10		Notes: 1. End of test hole at 3.0 m. 2. Test hole remained open to 3.0 m upon completion of drilling/digging. 3. Test hole backfilled with auger cuttings with cold mix asphalt patch.																

**WATER LEVELS**  
 ∇ During Drilling/Digging 1.40 m on 4-12-2024  
 ∇ Upon Completion Dry

<b>CONTRACTOR</b> Maple Leaf Drilling Ltd.	<b>INSPECTOR</b> J. LOEWEN
<b>APPROVED</b> T. SCHELLENBERG	<b>DATE</b> 5-6-2024

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<b>CLIENT</b>	<b>KGS GROUP</b>	<b>PROJECT NO.</b>	24-0535-004
<b>PROJECT</b>	<b>2024 COW Local Street Program</b>	<b>START DATE</b>	4-12-2024
<b>LOCATION</b>	Winnipeg, MB	<b>UTM (m)</b>	N 5,528,251
<b>DESCRIPTION</b>	Gerrond Bay, 60m E of Cavalier Dr., 1m offset from curb, mid-slab		E 622,019 Zone 14
<b>DRILL RIG / HAMMER</b>	Acker MP5 Truck Mounted Drill Rig		
<b>METHOD(S)</b>	0.0 m to 0.1 m: 150 mm Core 0.1 m to 3.0 m: 125 mm $\phi$ SSA		

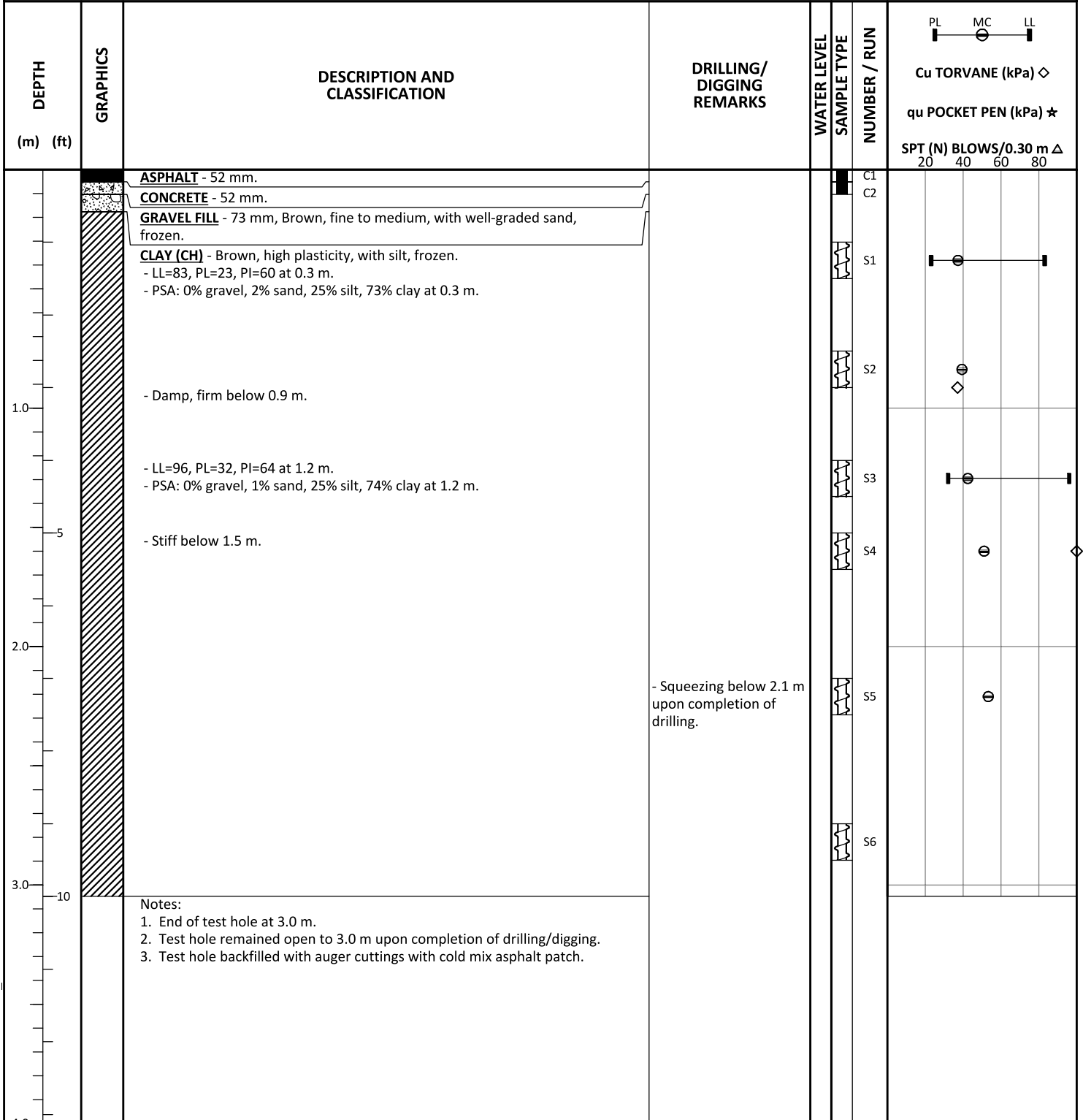
DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	DRILLING/ DIGGING REMARKS	WATER LEVEL	SAMPLE TYPE	NUMBER / RUN			
							Cu TORVANE (kPa) $\diamond$	qu POCKET PEN (kPa) $\star$	SPT (N) BLOWS/0.30 m $\Delta$
		<b>CONCRETE</b> - 128 mm.				C1			
		<b>LEAN CLAY (CL)</b> - 177 mm, Brown, low plasticity, with silt, some fine to medium sand, frozen.				S1			
		<b>CLAY (CH)</b> - Brown, high plasticity, with silt, frozen.  - LL=97, PL=23, PI=74 at 0.6 m. - PSA: 0% gravel, 3% sand, 22% silt, 75% clay at 0.6 m.				S2			
1.0		- Damp, stiff below 1.1 m.				S3			
		- Wet below 1.2 m.				S4			
5						S5			
2.0						S6			
3.0			- Squeezing below 2.7 m upon completion of drilling.						
10		Notes: 1. End of test hole at 3.0 m. 2. Test hole remained open to 3.0 m upon completion of drilling/digging. 3. Test hole backfilled with auger cuttings with cold mix asphalt patch.							

**WATER LEVELS**  
 During Drilling/Digging 1.19 m on 4-12-2024  
 Upon Completion 2.41 m on 4-12-2024

<b>CONTRACTOR</b> Maple Leaf Drilling Ltd.	<b>INSPECTOR</b> J. LOEWEN
<b>APPROVED</b> T. SCHELLENBERG	<b>DATE</b> 5-6-2024



<b>CLIENT</b>	<b>KGS GROUP</b>	<b>PROJECT NO.</b>	24-0535-004
<b>PROJECT</b>	<b>2024 COW Local Street Program</b>	<b>START DATE</b>	4-12-2024
<b>LOCATION</b>	Winnipeg, MB	<b>UTM (m)</b>	N 5,522,622 E 633,463 Zone 14
<b>DESCRIPTION</b>	Wicklow Place, 15m S of Dowker ave, 2m offset from curb, mid-slab		
<b>DRILL RIG / HAMMER</b>	Acker MP5 Truck Mounted Drill Rig		
<b>METHOD(S)</b>	0.0 m to 0.1 m: 150 mm Core 0.1 m to 3.0 m: 125 mm $\phi$ SSA		

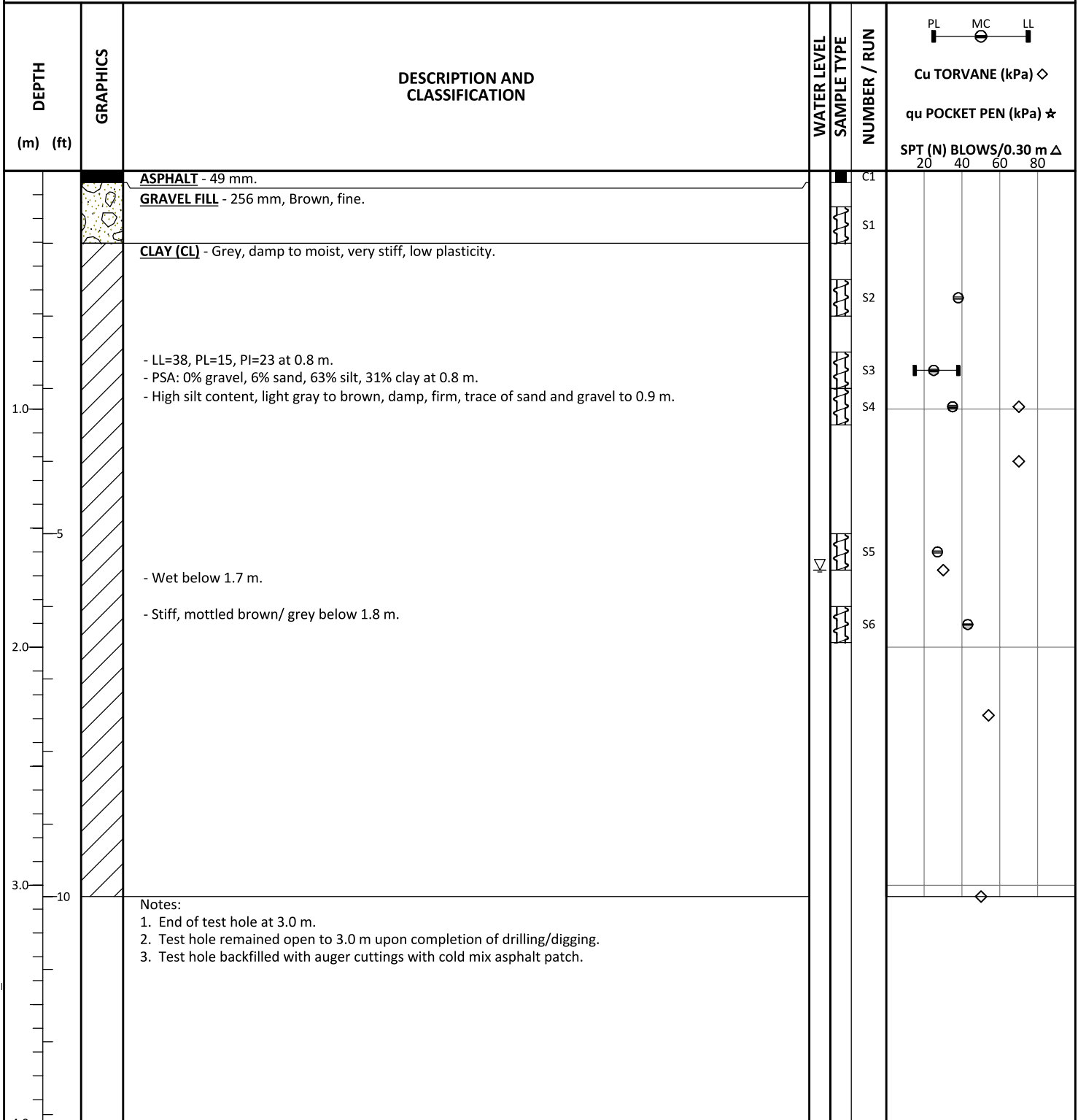


Notes:  
 1. End of test hole at 3.0 m.  
 2. Test hole remained open to 3.0 m upon completion of drilling/digging.  
 3. Test hole backfilled with auger cuttings with cold mix asphalt patch.

<b>WATER LEVELS</b> <input checked="" type="checkbox"/> During Drilling/Digging <input checked="" type="checkbox"/> Upon Completion	Dry	CONTRACTOR	INSPECTOR
	Dry	Maple Leaf Drilling Ltd.	J. LOEWEN
		APPROVED	DATE
		T. SCHELLENBERG	5-6-2024

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<b>CLIENT</b>	<b>KGS GROUP</b>	<b>PROJECT NO.</b>	24-0535-004
<b>PROJECT</b>	<b>2024 COW Local Street Program</b>	<b>START DATE</b>	5-16-2024
<b>LOCATION</b>	Winnipeg, MB	<b>UTM (m)</b>	N 5,523,178
<b>DESCRIPTION</b>	Wicklow Street, 165m S of Somerset ave, 2m offset from curb, mid-slab		E 633,115 Zone 14
<b>DRILL RIG / HAMMER</b>	MPP Scout Track Mounted Drill Rig		
<b>METHOD(S)</b>	0.0 m to 0.0 m: 150 mm Core 0.0 m to 3.0 m: 125 mm $\phi$ SSA		



<b>WATER LEVELS</b>	$\nabla$ During Drilling/Digging	1.68 m on 5-16-2024	<b>CONTRACTOR</b>	<b>INSPECTOR</b>
	$\nabla$ Upon Completion	Dry	Maple Leaf Drilling Ltd.	M. RODRIGUEZ
			<b>APPROVED</b>	<b>DATE</b>
			T. SCHELLENBERG	5-6-2024

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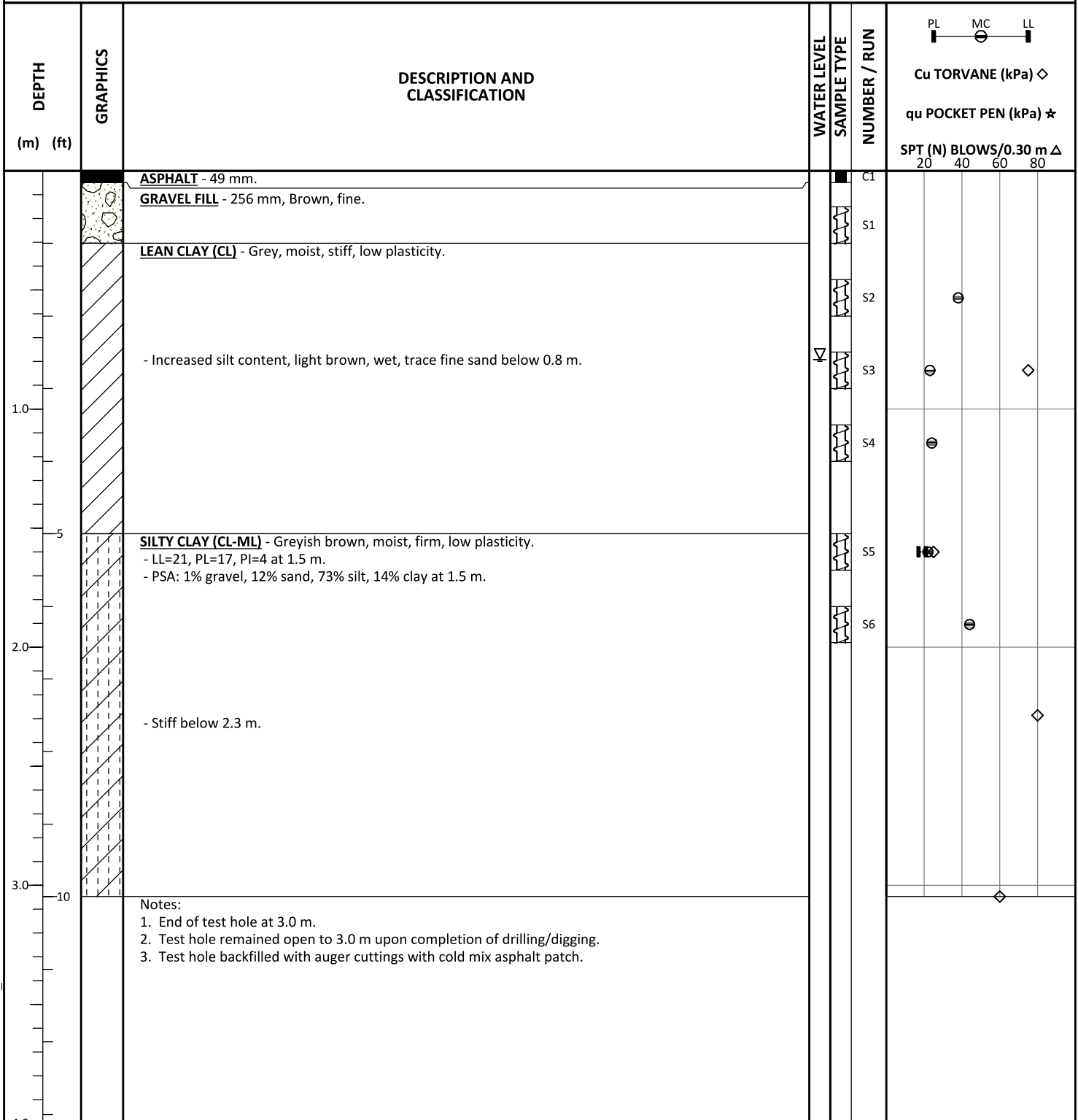
<b>CLIENT</b>	<b>KGS GROUP</b>	<b>PROJECT NO.</b>	24-0535-004
<b>PROJECT</b>	<b>2024 COW Local Street Program</b>	<b>START DATE</b>	5-16-2024
<b>LOCATION</b>	Winnipeg, MB	<b>UTM (m)</b>	N 5,523,217 E 633,094 Zone 14
<b>DESCRIPTION</b>	Wicklow Street, 115m S of Somerset ave, 0.5m offset from curb, mid-slab		
<b>DRILL RIG / HAMMER</b>	MPP Scout Track Mounted Drill Rig		
<b>METHOD(S)</b>	0.0 m to 0.1 m: 150 mm Core 0.1 m to 3.0 m: 125 mm $\phi$ SSA		

DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	WATER LEVEL	SAMPLE TYPE	NUMBER / RUN	PL MC LL			
						Cu TORVANE (kPa) $\diamond$	qu POCKET PEN (kPa) $\star$	SPT (N) BLOWS/0.30 m $\Delta$	
						20	40	60	80
		<b>ASPHALT</b> - 98 mm.			C1				
		<b>GRAVEL FILL</b> - 207 mm, Brown, fine, some fine sand.			S1				
		<b>LEAN CLAY (CL)</b> - Light brown, moist, stiff, low plasticity, some silt, trace fine sand and gravel.			S2				
1.0					S3				
		- Soft, with silt below 1.2 m. - LL=29, PL=17, PI=12 at 1.2 m. - PSA: 6% gravel, 18% sand, 58% silt, 18% clay at 1.2 m.			S4				
5		<b>SILTY CLAY (CL-ML)</b> - Grey, moist, firm, low plasticity.			S5				
2.0					S6				
		- Stiff below 2.1 m.							
3.0									
4.0		Notes: 1. End of test hole at 3.0 m. 2. Test hole remained open to 3.0 m upon completion of drilling/digging. 3. Test hole backfilled with auger cuttings with cold mix asphalt patch.							

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<b>WATER LEVELS</b>	<input checked="" type="checkbox"/> During Drilling/Digging	Dry	<b>CONTRACTOR</b>	<b>INSPECTOR</b>
	<input checked="" type="checkbox"/> Upon Completion	Dry	Maple Leaf Drilling Ltd.	M. RODRIGUEZ
			<b>APPROVED</b>	<b>DATE</b>
			T. SCHELLENBERG	5-6-2024

<b>CLIENT</b>	<b>KGS GROUP</b>	<b>PROJECT NO.</b>	24-0535-004
<b>PROJECT</b>	<b>2024 COW Local Street Program</b>	<b>START DATE</b>	5-16-2024
<b>LOCATION</b>	Winnipeg, MB	<b>UTM (m)</b>	N 5,523,311
<b>DESCRIPTION</b>	Wicklow Street, 5m S of Somerset ave, 0.5m offset from curb, joint		E 633,044 Zone 14
<b>DRILL RIG / HAMMER</b>	MPP Scout Track Mounted Drill Rig		
<b>METHOD(S)</b>	0.0 m to 0.0 m: 150 mm Core 0.0 m to 3.0 m: 125 mm $\phi$ SSA		










**WATER LEVELS**  
 ▽ During Drilling/Digging 0.79 m on 5-16-2024  
 ▽ Upon Completion 0.79 m on 5-16-2024



<b>CONTRACTOR</b> Maple Leaf Drilling Ltd.	<b>INSPECTOR</b> M. RODRIGUEZ
<b>APPROVED</b> T. SCHELLENBERG	<b>DATE</b> 5-6-2024

# KEY TO SYMBOLS

## LITHOLOGIC SYMBOLS

-  Asphalt
-  Clay (CH, high plasticity)
-  Clay (CL, low plasticity)
-  Silty Clay (CL-ML)
-  Concrete
-  Sandy Gravel
-  Poorly Graded Sand with Gravel (SP)

## SAMPLER SYMBOLS

-  Auger Grab
-  Core Barrel

## WELL CONSTRUCTION SYMBOLS

## ABBREVIATIONS

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>LL - Liquid Limit</li> <li>PL - Plastic Limit</li> <li>PI - Plastic Index</li> <li>MC - Moisture Content</li> <li>DD - Dry Density</li> <li>NP - Non-Plastic</li> <li>-200 - Percent Passing No. 200 Sieve</li> <li>TV - Torvane (kPa)</li> <li>PP - Pocket Penetrometer (kPa)</li> <li>PSA - Particle Size Analysis</li> <li>TOC - Top Of Casing</li> </ul> | <ul style="list-style-type: none"> <li>PN - Pneumatic Piezometer</li> <li>VW - Vibrating Wire Piezometer</li> <li>PID - Photoionization Detector</li> <li>ppm - Parts Per Million</li> <li>∇ - Water Level During Drilling</li> <li>∇ - Water Level Upon Completion of Drilling</li> <li>∇ - Water Level Remeasured/Static</li> </ul> |
|---|---|



# APPENDIX C

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Laboratory Testing

# SUMMARY OF INDEX TESTS

Test Hole ID	Smpl No.	Depth From (m)	Depth To (m)	Classification	Gravel (%)	Sand (%)	Silt/Clay (%)	LL	PL	PI	MC (%)	Dry Dens (kN/m <sup>3</sup> )	Spec Gvty	Saturation (%)	Proctor Max DD (kg/m <sup>3</sup> )	Proct Opt MC (%)	CBR Initial DD (kg/m <sup>3</sup> )	CBR Initial MC (%)	CBR % of Max DD	CBR % of Opt MC	CBR @2.54 mm	CBR % Swell
1.Gerrond Bay	S2-S4	0.8	2.4	CH											1490	23.0	1414	23.3	94.9	0.3	2	5.6
2.Wicklow Pl.	S1-S2	0.3	1.2	CH											1500	24.0	1427	23.9	95.1	-0.1	2.2	6.0
3.Wicklow St.	S4-S5	0.9	1.7	CL											1680	19.5	1602	19.6	95.4	0.1	4.2	1.4
TH24-28	S2	0.8	0.9	CH							40											
TH24-28	S3	1.2	1.4	CH				97	30	67	41											
TH24-28	S4	1.5	1.7	CH							43											
TH24-28	S5	2.1	2.3	CH							47											
TH24-28	S7	2.7	2.9	CH							47											
TH24-29	S1	0.3		CL	9	19	72				45											
TH24-29	S2	0.6	0.8	CH							48											
TH24-29	S3	0.9	1.1	CH	0	11	89	68	22	46	40											
TH24-29	S4	1.2	1.4	CH							37											
TH24-29	S5	1.8	2.0	CH							42											
TH24-30	S1	0.3	0.5	CH							38											
TH24-30	S2	0.6	0.8	CH	0	3	97	97	23	74	41											
TH24-30	S3	0.9	1.1	CH							48											
TH24-30	S4	1.2	1.4	CH							48											
TH24-30	S5	1.8	2.0	CH							44											
TH24-44	S1	0.3	0.5	CH							41											
TH24-44	S2	0.8	0.9	CH	0	3	97	78	24	54	41											
TH24-44	S3	1.2	1.4	CH							43											
TH24-44	S4	1.7	1.8	CH							43											
TH24-44	S5	2.1	2.3	CH							51											
TH24-45	S3	0.3	0.5	CH	0	2	98	83	23	60	37											
TH24-45	S4	0.8	0.9	CH							39											
TH24-45	S5	1.2	1.4	CH	0	1	99	96	32	64	42											
TH24-45	S6	1.5	1.7	CH							51											
TH24-45	S7	2.1	2.3	CH							53											
TH24-52	S2	0.5	0.6	CL							38											
TH24-52	S3	0.8	0.9	CL	0	5	95	38	15	23	25											
TH24-52	S4	0.9	1.1	CL							35											
TH24-52	S5	1.5	1.7	CL							27											
TH24-52	S6	1.8	2.0	CL							43											
TH24-53	S2	0.5	0.6	CL							24											
TH24-53	S3	0.9	1.1	CL							30											
TH24-53	S4	1.2	1.4	CL	6	18	76	29	17	12	19											
TH24-53	S5	1.5	1.7	CL-ML							23											
TH24-53	S6	1.8	2.0	CL-ML							39											
TH24-54	S2	0.5	0.6	CL							38											
TH24-54	S3	0.8	0.9	CL							23											
TH24-54	S4	1.1	1.2	CL							24											
TH24-54	S5	1.5	1.7	CL-ML	1	13	86	21	17	4	22											
TH24-54	S6	1.8	2.0	CL-ML							44											

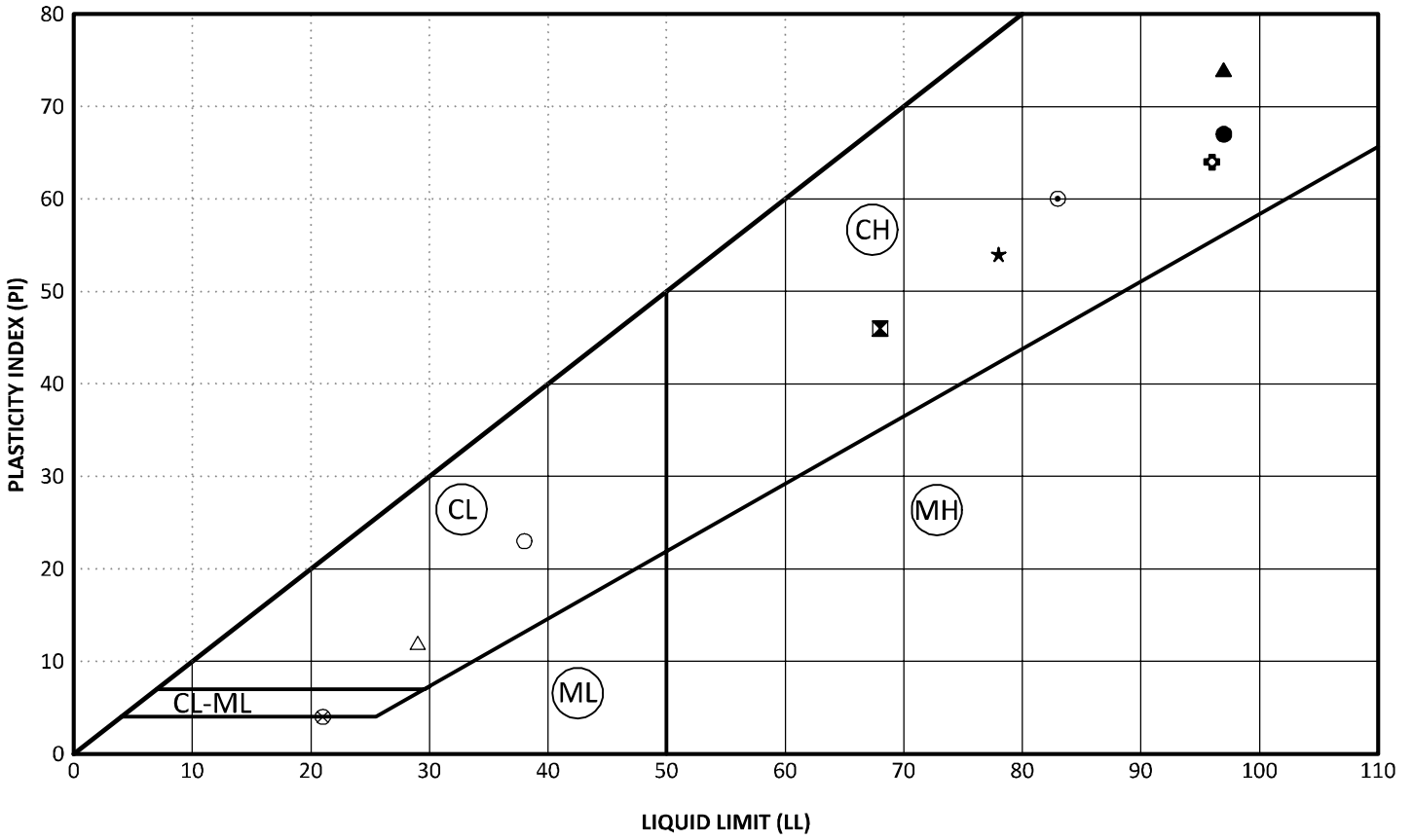
\* Moisture conditioned and remolded sample.  
 \*\* Assumed specific gravity.



**CLIENT** KGS GROUP  
**PROJECT NAME** 2024 COW Local Street Program

**PROJECT NO.** 24-0535-004  
**LOCATION** Winnipeg, MB

# ATTERBERG LIMITS



	HOLE	DEPTH (m)	SAMPLE #	LL	PL	PI	SAND (%)	SILT (%)	CLAY (%)	SILT & CLAY (%)	MC (%)	CLASSIFICATION
●	TH24-28	1.2	S3	97	30	67					41	CH
▣	TH24-29	0.9	S3	68	22	46	11	39	50	89	40	CH
▲	TH24-30	0.6	S2	97	23	74	3	22	75	97	41	CH
★	TH24-44	0.8	S2	78	24	54	3	31	66	97	41	CH
⊙	TH24-45	0.3	S3	83	23	60	2	25	73	98	37	CH
⊕	TH24-45	1.2	S5	96	32	64	1	25	74	99	42	CH
○	TH24-52	0.8	S3	38	15	23	5	63	31	95	25	CL
△	TH24-53	1.2	S4	29	17	12	18	58	18	76	19	CL
⊗	TH24-54	1.5	S5	21	17	4	13	73	14	86	22	CL-ML

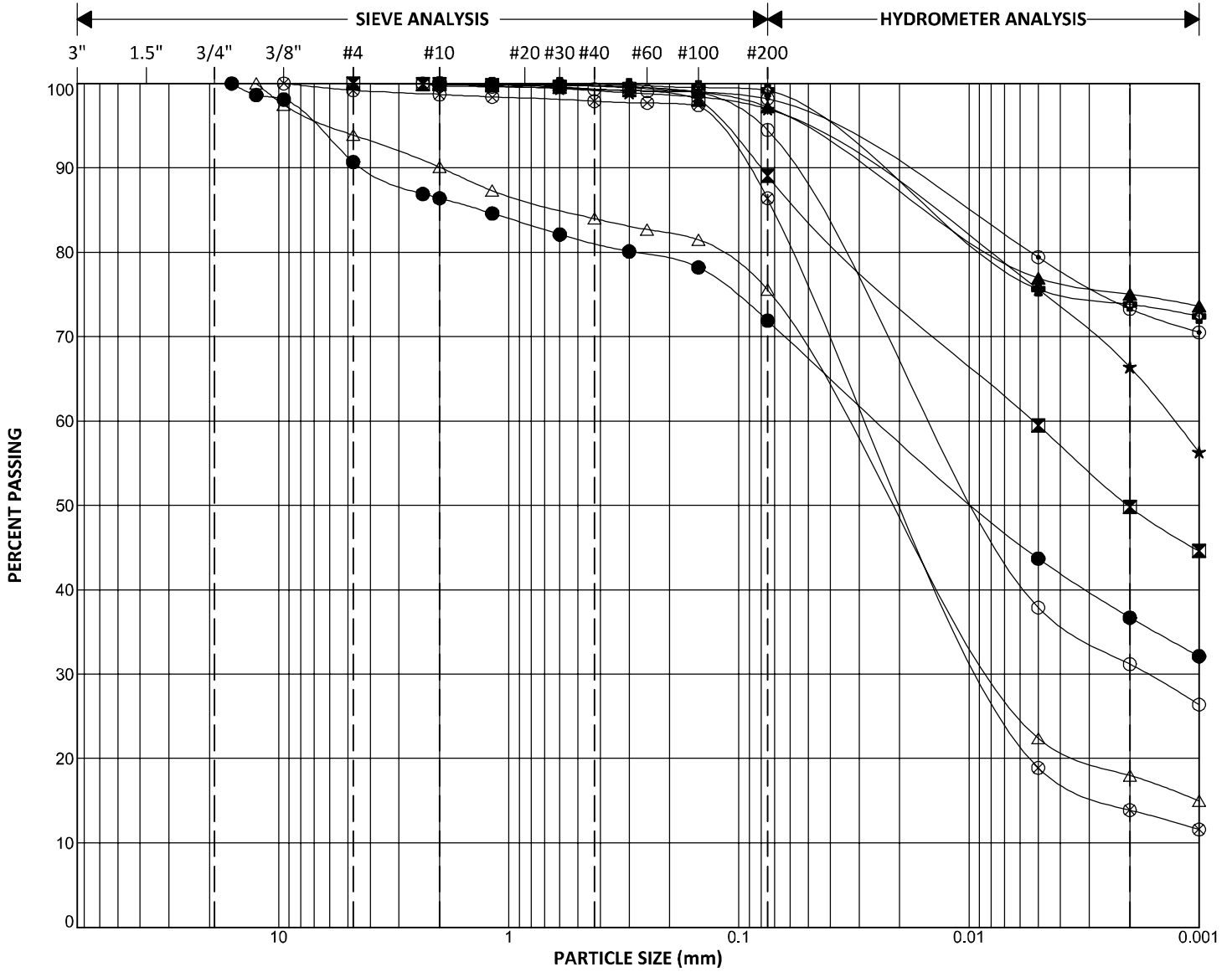
A-LINE PLOT (NO. CJ) U:\FMS\24-0535-00A\LOGS\_20240412.GPJ



**CLIENT** KGS GROUP  
**PROJECT NAME** 2024 COW Local Street Program

**PROJECT NO.** 24-0535-004  
**LOCATION** Winnipeg, MB

# GRAIN SIZE DISTRIBUTION



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

	HOLE	DEPTH (m)	SAMPLE #	GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)	SILT & CLAY (%)	Cu	Cc	CLASSIFICATION
●	TH24-29	0.3	S1	9	19	35	37	72			CL
⊠	TH24-29	0.9	S3	0	11	39	50	89			CH
▲	TH24-30	0.6	S2	0	3	22	75	97			CH
★	TH24-44	0.8	S2	0	3	31	66	97			CH
⊙	TH24-45	0.3	S3	0	2	25	73	98			CH
⊕	TH24-45	1.2	S5	0	1	25	74	99			CH
○	TH24-52	0.8	S3	0	5	63	31	95			CL
△	TH24-53	1.2	S4	6	18	58	18	76			CL
⊗	TH24-54	1.5	S5	1	13	73	14	86			CL-ML

SIEVE ANALYSIS U:\FMS\24-0535-004\LOGS\_20240412.GPJ



**CLIENT** KGS GROUP  
**PROJECT NAME** 2024 COW Local Street Program

**PROJECT NO.** 24-0535-004  
**LOCATION** Winnipeg, MB

# PROCTOR TEST REPORT

TO KGS Group Inc.  
 3rd Floor - 865 Waverley St.  
 Winnipeg, MB  
 R3T 5P4

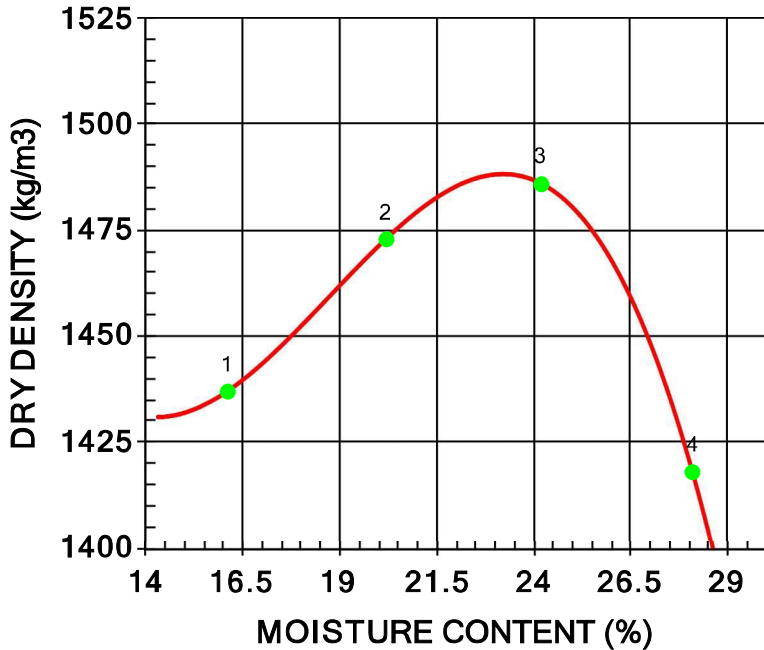
CLIENT KGS Group Inc.  
 C.C.

ATTN: Josiah Loewen

PROJECT 2024 COW Local Street Renewal  
 (24-0535-004.1001.02)

PROJECT NO. 123317024  
 PROCTOR NO. 1 DATE SAMPLED 2024.Apr.23 DATE RECEIVED 2024.Apr.23 DATE TESTED 2024.Apr.26

INSITU MOISTURE	42.6 %	COMPACTION STANDARD	Standard Proctor, ASTM
TESTED BY	Donald Eliazar		D698
MATERIAL IDENTIFICATION		COMPACTION PROCEDURE	A: 101.6mm Mold, Passing 4.75mm
MAJOR COMPONENT	Subgrade	RAMMER TYPE	Manual
SIZE	Clay	PREPARATION	Moist
DESCRIPTION		OVERSIZE CORRECTION METHOD	None
SUPPLIER	Exsiting Materials	RETAINED 4.75mm SCREEN	N/A %
SOURCE	Composite Sample, See Below		



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1668	1437	16.1
2	1770	1473	20.2
3	1845	1486	24.2
4	1816	1418	28.1

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1490	23.0
OVERSIZE CORRECTED		

**COMMENTS**

Stantec Sample No. 4211. Material tested was a composite sample obtained from TH24-28, S2 to S4.

# PROCTOR TEST REPORT

TO KGS Group Inc.  
 3rd Floor - 865 Waverley St.  
 Winnipeg, MB  
 R3T 5P4

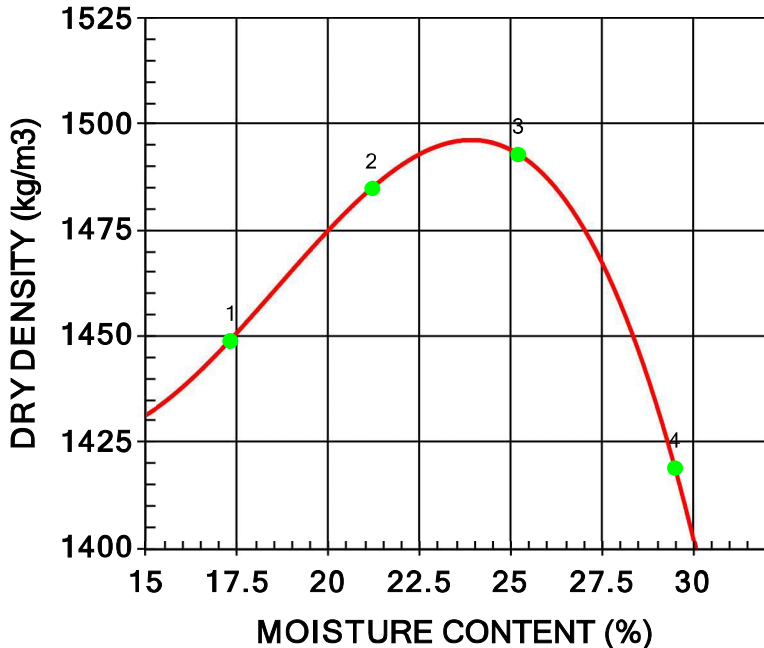
CLIENT KGS Group Inc.  
 C.C.

ATTN: Josiah Loewen

PROJECT 2024 COW Local Street Renewal  
 (24-0535-004.1001.02)

PROJECT NO. 123317024  
 PROCTOR NO. 2 DATE SAMPLED 2024.Apr.23 DATE RECEIVED 2024.Apr.23 DATE TESTED 2024.Apr.26

INSITU MOISTURE	33.7 %	COMPACTION STANDARD	Standard Proctor, ASTM
TESTED BY	KGS Group		D698
MATERIAL IDENTIFICATION		COMPACTION PROCEDURE	A: 101.6mm Mold, Passing 4.75mm
MAJOR COMPONENT	Subgrade	RAMMER TYPE	Manual
SIZE	Clay	PREPARATION	Moist
DESCRIPTION		OVERSIZE CORRECTION METHOD	None
SUPPLIER	Existing Materials	RETAINED 4.75mm SCREEN	N/A %
SOURCE	Composite Sample, See Below		



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1700	1449	17.3
2	1800	1485	21.2
3	1869	1493	25.2
4	1838	1419	29.5

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1500	24.0
OVERSIZE CORRECTED		

**COMMENTS**

Stantec Sample No. 4215. Material tested was a composite obtained from TH24-44 , S1 to S2 and TH24-45, S1 & S2.

# PROCTOR TEST REPORT

TO KGS Group Inc.  
 3rd Floor - 865 Waverley St.  
 Winnipeg, MB  
 R3T 5P4

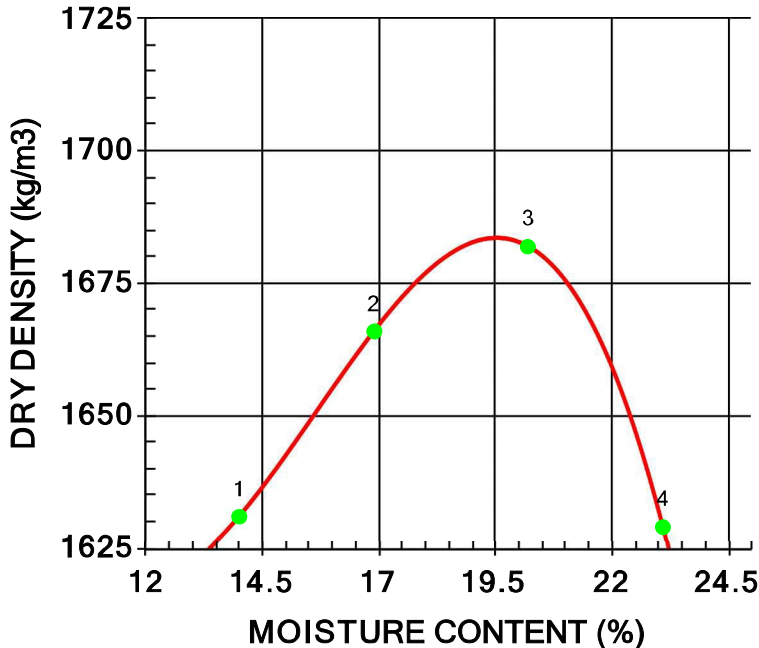
CLIENT KGS Group Inc.  
 C.C. KGS Group Inc.

ATTN: Josiah Loewen

PROJECT 2024 COW Local Street Renewal  
 (24-0535-004.1001.02)

PROJECT NO. 123317024  
 PROCTOR NO. 3 DATE SAMPLED 2024.May.21 DATE RECEIVED 2024.May.21 DATE TESTED 2024.May.31

INSITU MOISTURE	29.2 %	COMPACTION STANDARD	Standard Proctor, ASTM
TESTED BY	Madison Murphy		D698
MATERIAL IDENTIFICATION		COMPACTION PROCEDURE	A: 101.6mm Mold, Passing 4.75mm
MAJOR COMPONENT	Subgrade	RAMMER TYPE	Manual
SIZE	Silty Clay	PREPARATION	Moist
DESCRIPTION		OVERSIZE CORRECTION METHOD	None
SUPPLIER	Existing Materials	RETAINED 4.75mm SCREEN	N/A %
SOURCE	Composite Sample, See below		



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1859	1631	14.0
2	1947	1666	16.9
3	2022	1682	20.2
4	2005	1629	23.1

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1680	19.5
OVERSIZE CORRECTED		

**COMMENTS**

Stantec Sample No. 4295. Material tested was identified as a composite sample from TH24-52, 53 & 54 (S4 to S5).

## ASTM D1883 - CALIFORNIA BEARING RATIO (CBR) OF LABORATORY-COMPACTED SOILS

TO KGS Group Inc.  
 3rd Floor - 865 Waverley St.  
 Winnipeg, MB  
 R3T 5P4

PROJECT 2024 COW Local Street Renewal  
 (24-0535-004.1001.02)

PROJECT NO. 123317024

ATTN Josiah Loewen

REPORT NO. 1

DATE SAMPLED: Not Provided  
 SAMPLED BY: KGS Group Inc.

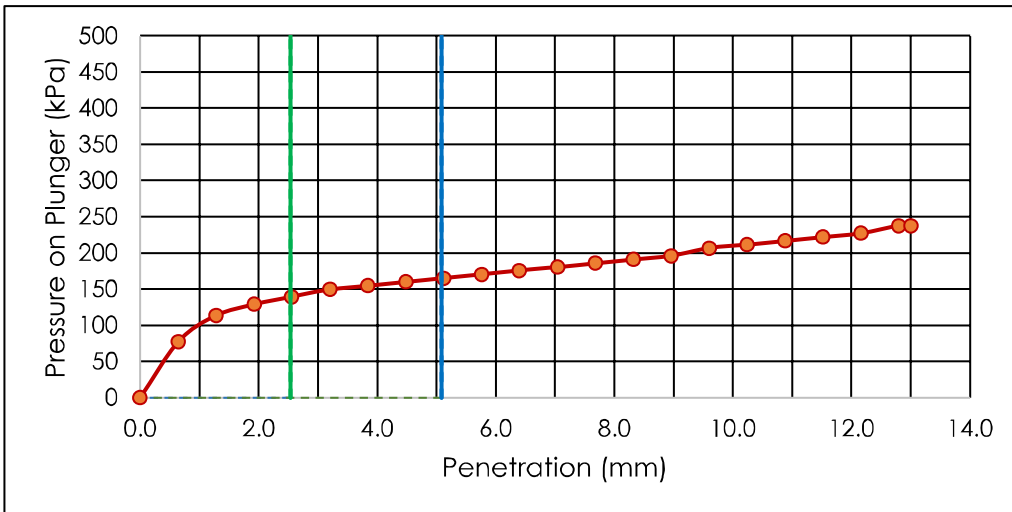
DATE RECEIVED: 2024.Apr.23  
 SUBMITTED BY: KGS Group Inc.

DATE TESTED: 2024.May.02  
 TESTED BY: Donald Eliazar

**MATERIAL IDENTIFICATION**

MATERIAL USE	Subgrade	SUPPLIER	Not Applicable
MAX. NOMINAL SIZE	< 4.75 mm	SOURCE	In Situ
MATERIAL TYPE	Clay	SAMPLE LOCATION	Composite Sample, TH24-28, S2 to S4
SPECIFICATION ID	Not Applicable	STANTEC SAMPLE NO.	4211

IMMERSION PERIOD	96 ± 2 hr	TARGET MAX. DRY DENSITY	1490 kg/m <sup>3</sup>
CONDITION OF SAMPLE	Soaked	TARGET OPTIMUM MOISTURE	23.0 %
SURCHARGE MASS	4.54 kg		
+19 mm OVERSIZE	0 %	AS-COMPACTED DRY DENSITY	1414 kg/m <sup>3</sup>
SWELL OF SAMPLE	5.64 %	AS-COMPACTED MOISTURE	23.2 %
POST-TEST MOISTURE	39.1 %	AS-COMPACTED % COMPACTION	95 %



**CBR VALUE AT 2.54 mm PENETRATION**  
2.0

**CBR VALUE AT 5.08 mm PENETRATION**  
1.6

**COMMENTS**

Sample prepared to 95% of the maximum dry density at the optimum moisture content as determined from ASTM D698.

REPORT DATE 2024.May.07

REVIEWED BY  Jason Thompson, C.E.T.  
 Principal - Manager of Materials Testing Services



## ASTM D1883 - CALIFORNIA BEARING RATIO (CBR) OF LABORATORY-COMPACTED SOILS

TO KGS Group Inc.  
 3rd Floor - 865 Waverley St.  
 Winnipeg, MB  
 R3T 5P4

PROJECT 2024 COW Local Street Renewal  
 (24-0535-004.1001.02)

PROJECT NO. 123317024

ATTN Josiah Loewen

REPORT NO. 2

DATE SAMPLED: Not Provided  
 SAMPLED BY: KGS Group Inc.

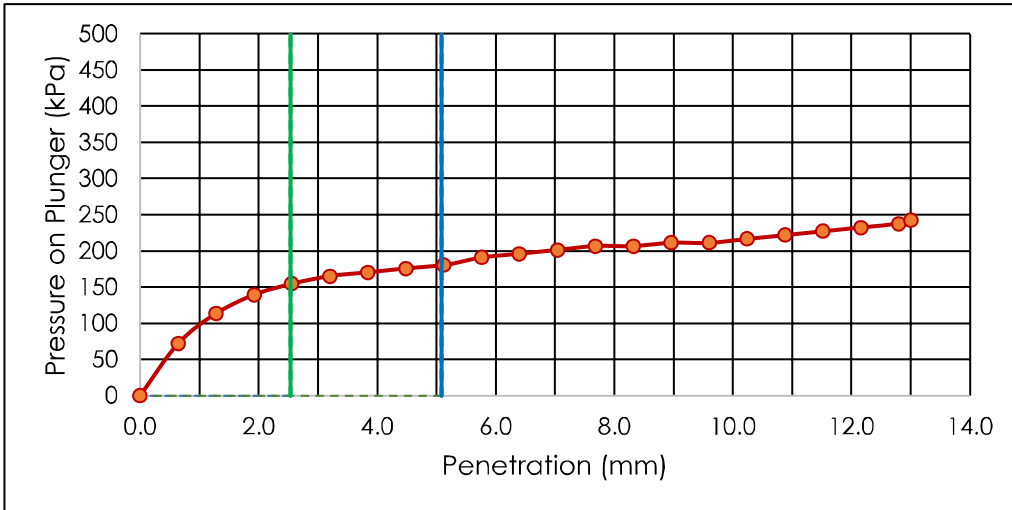
DATE RECEIVED: 2024.Apr.23  
 SUBMITTED BY: KGS Group Inc.

DATE TESTED: 2024.May.02  
 TESTED BY: Donald Eliazar

**MATERIAL IDENTIFICATION**

MATERIAL USE	Subgrade	SUPPLIER	Not Applicable
MAX. NOMINAL SIZE	< 4.75 mm	SOURCE	In Situ
MATERIAL TYPE	Clay	SAMPLE LOCATION	TH24-44, S1 to S2 & TH24-45, S1 & S2
SPECIFICATION ID	Not Applicable	STANTEC SAMPLE NO.	4215

IMMERSION PERIOD	96 ± 2 hr	TARGET MAX. DRY DENSITY	1490 kg/m <sup>3</sup>
CONDITION OF SAMPLE	Soaked	TARGET OPTIMUM MOISTURE	23.0 %
SURCHARGE MASS	4.54 kg		
+19 mm OVERSIZE	0 %	AS-COMPACTED DRY DENSITY	1427 kg/m <sup>3</sup>
SWELL OF SAMPLE	6.02 %	AS-COMPACTED MOISTURE	23.9 %
POST-TEST MOISTURE	37.0 %	AS-COMPACTED % COMPACTION	96 %



**CBR VALUE AT 2.54 mm PENETRATION**  
**2.2**

**CBR VALUE AT 5.08 mm PENETRATION**  
**1.8**

**COMMENTS**

Sample prepared to 95% of the maximum dry density at the optimum moisture content as determined from ASTM D698.

REPORT DATE 2024.May.07

REVIEWED BY  Jason Thompson, C.E.T.  
 Principal - Manager of Materials Testing Services

# ASTM D1883 - CALIFORNIA BEARING RATIO (CBR) OF LABORATORY-COMPACTED SOILS

TO KGS Group Inc.  
 3rd Floor - 865 Waverley St.  
 Winnipeg, MB  
 R3T 5P4

PROJECT 2024 COW Local Street Renewal  
 (24-0535-004.1001.02)

PROJECT NO. 123317024

ATTN Josiah Loewen

REPORT NO. 3

DATE SAMPLED: Not Provided  
 SAMPLED BY: KGS Group Inc.

DATE RECEIVED: 2024.May.21  
 SUBMITTED BY: KGS Group Inc.

DATE TESTED: 2024.Jun.03  
 TESTED BY: Donald Eliazar

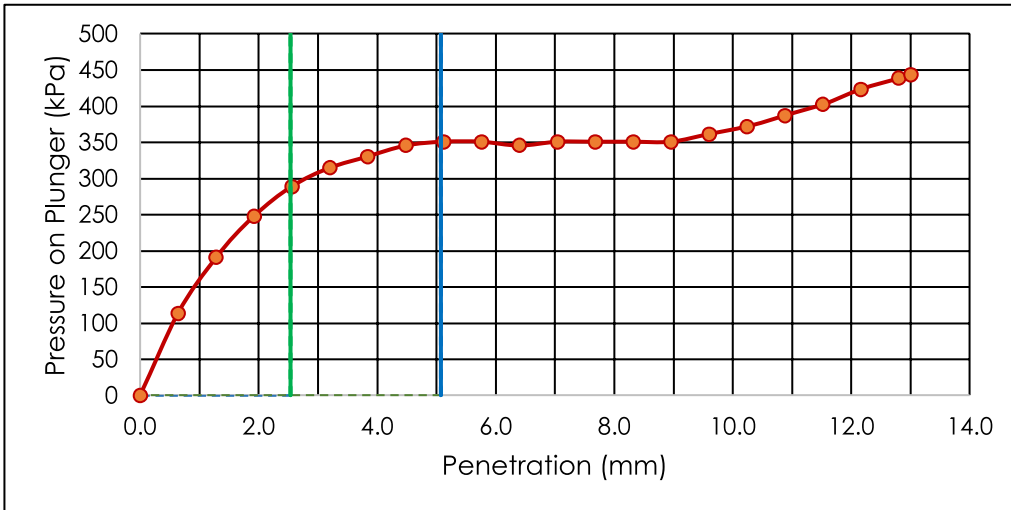
**MATERIAL IDENTIFICATION**

MATERIAL USE Subgrade  
 MAX. NOMINAL SIZE < 4.75 mm  
 MATERIAL TYPE Clay  
 SPECIFICATION ID Not Applicable

SUPPLIER Not Applicable  
 SOURCE In Situ  
 SAMPLE LOCATION Composite Sample  
 STANTEC SAMPLE NO. 4295

IMMERSION PERIOD 96 ± 2 hr  
 CONDITION OF SAMPLE Soaked  
 SURCHARGE MASS 4.54 kg  
 +19 mm OVERSIZE 0 %  
 SWELL OF SAMPLE 1.38 %  
 POST-TEST MOISTURE 21.0 %

TARGET MAX. DRY DENSITY 1680 kg/m<sup>3</sup>  
 TARGET OPTIMUM MOISTURE 19.5 %  
 AS-COMPACTED DRY DENSITY 1602 kg/m<sup>3</sup>  
 AS-COMPACTED MOISTURE 19.6 %  
 AS-COMPACTED % COMPACTION 95 %



**CBR VALUE AT 2.54 mm PENETRATION**  
**4.2**

**CBR VALUE AT 5.08 mm PENETRATION**  
**3.5**

**COMMENTS**

Sample prepared to 95% of the maximum dry density at the optimum moisture content as determined from ASTM D698.  
 Compiste sample consisting of material taken from; TH24-52 (S4 & S5), TH24-53 (S4 & S5), TH24-54 (S4 & S5).

REPORT DATE 2024.Jun.10

REVIEWED BY  Jason Thompson, C.E.T.  
 Principal - Manager of Materials Testing Services