APPENDIX ‘B’

GEOTECHNICAL REPORT

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April 7, 2022

KGS Group
865 Waverley Street
Winnipeg, Manitoba R3T 5P4

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

Re: 2022 Redwood Avenue Reconstruction – Winnipeg, Manitoba
Report of Geotechnical Investigation and Test Results

Dear Mr. Rowbotham

This letter summarizes KGS Group's geotechnical results for the 2022 Redwood Avenue Reconstruction Project in Winnipeg, Manitoba. KGS Group's scope of services for this project was outlined in our proposal no. 22-000-0100 titled "2022 Redwood Avenue Reconstruction - Geotechnical" dated February 3, 2022.

KGS Group was retained to complete subsurface investigations along Redwood Avenue. This report details the results of the investigation.

1.0 PAVEMENT INVESTIGATIONS

1.1 Coring and Sampling

Coring and sampling were completed at five (5) locations along Redwood Avenue between Main Street and Salter Street, in accordance with the City of Winnipeg RFP 476-2021 Appendix B – CoW Site Investigation Requirements for Public Works Street Projects. Figure 1 shows the locations of the test holes and Table 1 provides the location descriptions and coordinates of the test holes.

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FIGURE 1: TEST HOLE LOCATION PLAN

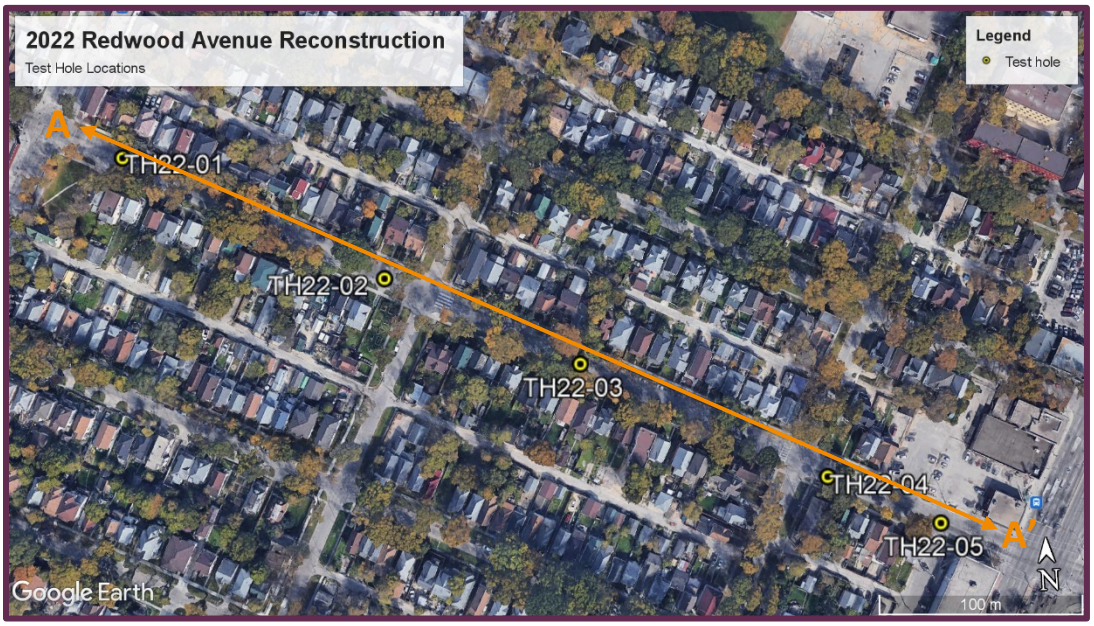

TABLE 1: TEST HOLE LOCATION DESCRIPTIONS AND COORDINATES

Location ID	Locations	Approximate UTM Coordinates[1]		Surface Elevation (m)
		Northing (m)	Easting (m)	
TH22-01	Redwood Ave - 2m from EB curb, 36m E of Salter St.	5,531,321	633,725	231.27
TH22-02	Redwood Ave - 2m from EB curb, 14m W of Aikins St.	5,531,259	633,852	231.44
TH22-03	Redwood Ave - 2m from EB curb, 79m E of Aikins St.	5,531,215	633,947	231.01
TH22-04	Redwood Ave - 2m from EB curb, 15m E of Charles St.	5,531,157	634,067	231.14
TH22-05	Redwood Ave - 2m from EB curb, 25m W of Main St.	5,531,133	634,122	231.06

Notes: 1. Test hole locations were recorded in the field using a handheld GPS unit with accuracy of ±5m.

Test holes were advanced to sufficient depth below the pavement surfacing to explore subgrade and subsurface soil, moisture and groundwater conditions. Test holes TH22-01 to TH22-03 were only drilled to depths of 1.5 m (5 ft) due to limited utility locate information in the area north of Aikins Street. Test holes TH22-04 and TH22-05

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were drilled to the planned depths of 3.0 m (10 ft). Test holes were backfilled with auger cuttings and patched at the surface with 100 mm of asphalt cold patch.

Subsurface soil samples were retrieved every 0.3 m (1 ft) throughout the subgrade investigations. Bulk samples of the pavement subgrade material was also retrieved from each test hole to be used for moisture-density relationship (standard Proctor) and California Bearing Ratio (CBR) tests.

1.2 Laboratory Testing

Laboratory tests were completed on select soil samples. Testing was completed in a Winnipeg, Manitoba laboratory certified by the Canadian Council of Independent Laboratories (CCiL). Laboratory testing included 30 moisture contents, four (4) Atterberg Limits, four (4) particle size analysis. One composite sample of subgrade soil collected from TH22-03, TH22-04 and TH22-05 was tested for standard Proctor, and CBR.

2.0 INVESTIGATION RESULTS

2.1 Pavement Surfacing

Coring and sampling were completed for five (5) test holes along Redwood Avenue. The 150 mm diameter cores obtained of the existing pavement were measured in the field, and pavement types and thicknesses are shown in Table 2 below. Upon completion of coring, KGS measured the base and investigated the subgrade below the pavement structure using a truck mounted drill rig.

TABLE 2: PAVEMENT SURFACING THICKNESSES

Location ID	Pavement Type	Pavement Thickness (mm)	Subgrade / Base Type	Base Thickness (mm)
TH22-01	Asphalt over Concrete	101 over 180	Clay (CH)	-
TH22-02	Asphalt over Concrete	25 over 203	Clay (CH)	-
TH22-03	Asphalt over Concrete	76 over 177	Gravel (GP)	104
TH22-04	Asphalt over Concrete	114 over 152	Sandy Gravel (GP)	38
TH22-05	Asphalt over Concrete	76 over 229	Clay (CH)	-

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Five (5) test holes were drilled rather than the six (6) as mentioned in the proposal because the project team agreed that sufficient data would be collected from five (5) evenly spaced test holes along Redwood Ave., and would also allow the drilling investigation be completed in less time.

A photo log of the road surfacing cores is attached in Appendix A.

2.2 Stratigraphy

The attached Figure 2, Section A-A', provides a profile of the stratigraphy encountered between each test hole and summary test hole logs are attached in Appendix B. The results of the laboratory testing are incorporated with soil type descriptions listed below. A summary table of index tests and the laboratory test reports are attached in Appendix C. Descriptions of the general stratigraphy encountered in the test holes are summarized below.

Asphalt – Asphalt surfacing was encountered at all five (5) test hole locations. The asphalt was black with 25 mm (max) diameter sub-rounded aggregate and ranged in thickness from 25 to 114 mm.

Concrete – Concrete was encountered underlying the asphalt in all five (5) test holes. The concrete was grey with 40 mm (max) rounded aggregate and ranged in thickness from 152 to 229 mm.

Poorly Graded Gravel (GP) – 40mm (1.6 in) of poorly graded gravel base was observed underlying the concrete pavement in test holes TH22-03 and TH22-04. The gravel was brown in colour, damp, compact and frozen.

Clay (CH) – High plasticity clay was encountered below the surfacing pavement in test holes TH22-01, TH22-02 and TH22-05 and underlying the poorly graded gravel in TH22-03 and TH22-04. The clay was dark brown in colour, moist and frozen.

Undrained shear strength of the clay was estimated in the field during drilling using a handheld Torvane and ranged from 50 to 90 kPa below the frost. Two (2) Atterberg limits completed on clay soil samples from a depth of 0.3 m (1 ft) classified the material as having high plasticity. An Atterberg limit on a sample from 0.9 m (3 ft) was classified as having low plasticity. Grain size analyses completed on the same samples indicated 0% gravel, 2% sand, 36 to 76% silt and 22 to 62% clay. Moisture contents ranged from 26 to 51%.

A standard Proctor was completed on a composite sample from test holes TH22-03, TH22-04 and TH22-05 from depths ranging from 0.30 to 0.91 m. The test indicated a standard proctor maximum dry density (SPMDD) of 1,520 kg/m^3 and an optimum moisture content of 24.5%. The CBR-value for the same sample recompacted to 95% of the SPMDD at 0.1% above optimum, was measured to be 2.

Clay (CL) – A 1.2 m (3.9 ft) thick layer of low plasticity clay was encountered at a depth of 0.6 below grade in test hole TH22-05. The clay was light brown in colour, moist, soft, frozen and contained trace sand.

An Atterberg limit completed on the clay soil from a depth of 0.6 m (2 ft) classified the soil as having low plasticity. A grain size analysis completed on the same sample indicated 0% gravel, 1% sand, 79% silt and 20% clay. Moisture contents ranged from 22 to 28%.

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Silt (ML) – Low plasticity silt was encountered below the clay in test holes TH22-01 and TH22-03. The silt was light brown in colour, damp to moist, soft, frozen and contained trace clay and trace sand. Moisture contents in the silt ranged from 23 to 48%.

3.0 CLOSURE

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

Prepared By:

Trevor Schellenberg, P.Eng.
Geotechnical Engineer

Approved By:

Taunya Ernst, P.Eng., P.E., P.G.
Senior Geotechnical Engineer

KH/te/cs
Attached

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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.

Third Party Use of Report

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.

FIGURE 2

Section A-A’

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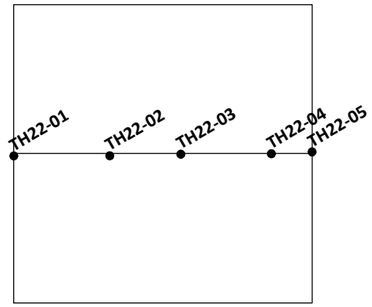

NW
A

SE
A'

ELEVATION (metres)

232.0
231.5
231.0
230.5
230.0
229.5
229.0
228.5
228.0
227.5

TH22-01
231.27 m

TH22-02
231.44 m

TH22-03
231.01 m

TH22-04
231.14 m

TH22-05
231.06 m

50
83
88
88
65

0 50 100 150 200 250 300 350 400 450 500 550

DISTANCE ALONG PROFILE (metres)

0 29
Horizontal Scale (meters)
Vertical Exaggeration: 48x

Lithology Graphics

- Asphalt
- Concrete
- Clay (CH, high plasticity)
- Silt (ML)
- Poorly Graded Gravel (GP)
- Clay (CL, low plasticity)

Legend

TH22-01 — Test Hole ID

Test Hole Lithology

- Water Level During Drilling
- Water Level Upon Completion
- Water Level Static/Remeasured
- SPT, N-Value
  > > ▲ N-value greater than 100
- Torvane Cu (kPa)
- Moisture Content (%)

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2022 Redwood Reconstruction Project - Geotech

A-A'

Apr 2022

Figure 02

FENCE W/O WELL DATA PLOT C:\USERS\KGAUTHIER\ONEDRIVE - KGS GROUP\FMS\22-0535-006\22-0535-006 REDWOOD AVE_GEOTECHNICAL LOGS.GPJ

APPENDIX A

Core Photo Log

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Photo 1: TH22-01 Core Surface

Photo 2: TH22-01 Core Profile

Photo 3: TH22-02 Core Surface

Photo 4: TH22-02 Core Profile

Photo 5: TH22-03 Core Surface

Photo 6: TH22-03 Core Profile

Photo 7: TH22-04 Core Surface

Photo 8: TH22-04 Core Profile

Photo 9: TH22-05 Core Surface

Photo 10: TH22-05 Core Profile

APPENDIX B

Test Hole Logs

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TEST HOLE LOG

HOLE NO.
TH22-01

CLIENT	**KGS GROUP**	**PROJECT NO.**	22-0535-006
PROJECT	**2022 Redwood Reconstruction Project - Geotech**	**SURFACE ELEV.**	231.27 m
LOCATION	Winnipeg, Manitoba	**DATE DRILLED**	2-25-2022
DESCRIPTION	Redwood Ave - 2m from EB curb, 36m E of Salter St.	**UTM (m)**	N 5,531,321
DRILL RIG / HAMMER	Mobile B40 Truck Mounted Drill Rig		E 633,725 Zone 14
METHOD(S)	0.0 m to 0.3 m: Roadway coring 0.3 m to 1.5 m: 125 mm ø SSA		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	WATER LEVEL	SAMPLE TYPE	NUMBER / RUN
				ASPHALT - 101 mm, Black, sub-angular granular.	231.2			S1
				CONCRETE - 180 mm, Grey, sub-rounded granular (diameter < 40mm).	231.0			S2
231				**CLAY (CH)** - Dark brown, moist, stiff, high plasticity, and silt, trace sand, frozen. - LL=74, PL=24, PI=50 at 0.3 m. - PSA: 0% gravel, 2% sand, 38% silt, 60% clay at 0.3 m. - silty, trace sand, light brown, low plasticity below 0.6 m.	230.5			S3
				SILT (ML) - Light brown, damp to moist, soft, low plasticity, trace clay, frozen.				S4
	1							S5
230				- not frozen below 1.4 m.	229.7			S6
		5						
	2							
229								
	3	10						
228								
	4							

PL MC LL
Cu TORVANE (kPa) ◆
qu POCKET PEN (kPa) ★
SPT (N) BLOWS/0.30 m ▲
20 40 60 80

Notes:
1. End of test hole at 1.5 m.
2. Test hole caved to 1.3 m upon completion of drilling.
3. Test hole backfilled with auger cuttings.
4. Test hole sealed at the surface with 100mm of asphalt cold patch.

WATER LEVELS	▽ **During Drilling/Digging**	on 2-25-2022 None Encountered
	▼ **Upon Completion**	on 2-25-2022 Dry

CONTRACTOR **Maple Leaf Drilling Ltd.**
INSPECTOR **K. GAUTHIER**
APPROVED
DRAFT
DATE

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TEST HOLE LOG

HOLE NO.
TH22-02

CLIENT	**KGS GROUP**	**PROJECT NO.**	22-0535-006
PROJECT	**2022 Redwood Reconstruction Project - Geotech**	**SURFACE ELEV.**	231.44 m
LOCATION	Winnipeg, Manitoba	**DATE DRILLED**	2-25-2022
DESCRIPTION	Redwood Ave - 2m from EB curb, 14m W of Aikins St.	**UTM (m)**	N 5,531,259
DRILL RIG / HAMMER	Mobile B40 Truck Mounted Drill Rig		E 633,852 Zone 14
METHOD(S)	0.0 m to 0.2 m: Roadway coring 0.2 m to 1.5 m: 125 mm ø SSA		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	WATER LEVEL	SAMPLE TYPE	NUMBER / RUN
				ASPHALT - 25 mm, Black, sub-angular granular (diameter < 25mm).	231.4			
				CONCRETE - 203 mm, Grey, rounded granular (diameter < 40mm).	231.2			S1
231				**CLAY (CH)** - Dark grey, moist, stiff, high plasticity, frozen.				S2
				- silty, brown below 0.8 m.				S3
	1							S4
230		5		- not frozen below 1.4 m.	229.9			S5
				Notes: 1. End of test hole at 1.5 m. 2. Test hole remained open to 1.5 m upon completion of drilling. 3. Test hole backfilled with auger cuttings. 4. Test hole sealed at the surface with 100mm of asphalt cold patch.				
	2							
229								
	3	10						
228								
	4							

PL MC LL
Cu TORVANE (kPa) ◆
qu POCKET PEN (kPa) ★
SPT (N) BLOWS/0.30 m ▲
20 40 60 80

WATER LEVELS
During Drilling/Digging on 2-25-2022 None Encountered
Upon Completion on 2-25-2022 Dry

CONTRACTOR **Maple Leaf Drilling Ltd.**
INSPECTOR **K. GAUTHIER**
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DATE

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TEST HOLE LOG

HOLE NO.
TH22-03

CLIENT	**KGS GROUP**	**PROJECT NO.**	22-0535-006
PROJECT	**2022 Redwood Reconstruction Project - Geotech**	**SURFACE ELEV.**	231.01 m
LOCATION	Winnipeg, Manitoba	**DATE DRILLED**	2-25-2022
DESCRIPTION	Redwood Ave - 2m from EB curb, 79m E of Aikins St.	**UTM (m)**	N 5,531,215
DRILL RIG / HAMMER	Mobile B40 Truck Mounted Drill Rig		E 633,947 Zone 14
METHOD(S)	0.0 m to 0.3 m: Roadway coring 0.3 m to 1.5 m: 125 mm ø SSA		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	WATER LEVEL	SAMPLE TYPE	NUMBER / RUN
				ASPHALT - 76 mm, Black, sub-angular granular (diameter < 25mm).	230.9			
				CONCRETE - 177 mm, Grey, rounded granular (diameter < 45mm).	230.8			S1
				POORLY GRADED GRAVEL (GP) - 104 mm, Brown, damp, compact, diameter < 20mm, frozen.	230.7			
				CLAY (CH) - Dark grey, moist, stiff, high plasticity, frozen.				S2
								S3
230	1			- brown, grading to low plasticity, and silt, trace sand below 0.9 m. - LL=28, PL=17, PI=11 at 0.9 m. - PSA: 0% gravel, 2% sand, 76% silt, 22% clay at 0.9 m.	229.9			S4
				SILT (ML) - Light brown, moist, soft, low plasticity, trace clay, frozen.				S5
		5		- not frozen below 1.4 m.	229.5			
229	2							
228	3	10						
	4							

Notes:
1. End of test hole at 1.5 m.
2. Test hole remained open to 1.5 m upon completion of drilling.
3. Test hole backfilled with auger cuttings.
4. Test hole sealed at the surface with 100mm of asphalt cold patch.

PL MC LL
Cu TORVANE (kPa) ◆
qu POCKET PEN (kPa) ★
SPT (N) BLOWS/0.30 m ▲
20 40 60 80

WATER LEVELS	▽ **During Drilling/Digging**	on 2-25-2022 None Encountered
	▼ **Upon Completion**	on 2-25-2022 Dry

CONTRACTOR **Maple Leaf Drilling Ltd.**
INSPECTOR **K. GAUTHIER**
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KGS GROUP

TEST HOLE LOG

HOLE NO.
TH22-04

CLIENT	**KGS GROUP**	**PROJECT NO.**	22-0535-006
PROJECT	**2022 Redwood Reconstruction Project - Geotech**	**SURFACE ELEV.**	231.14 m
LOCATION	Winnipeg, Manitoba	**DATE DRILLED**	2-25-2022
DESCRIPTION	Redwood Ave - 2m from EB curb, 15m E of Charles St.	**UTM (m)**	N 5,531,157
DRILL RIG / HAMMER	Mobile B40 Truck Mounted Drill Rig		E 634,067 Zone 14
METHOD(S)	0.0 m to 0.3 m: Roadway coring 0.3 m to 3.0 m: 125 mm ø SSA		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	WATER LEVEL	SAMPLE TYPE	NUMBER / RUN
				ASPHALT - 114 mm, Black, sub-angular granular (diameter < 25mm).	231.0			
231				**CONCRETE** - 152 mm, Grey, rounded granular (diameter < 40mm).	230.9			S1
				POORLY GRADED GRAVEL AND SAND (GP) - 38 mm, Brown, damp, compact, frozen.	230.8			
				CLAY (CH) - Dark grey, moist, stiff, high plasticity, frozen.				S2
								S3
	1							S4
230				- brown, soft, with silt, not frozen below 1.4 m.				S5
		5						S6
				- firm, trace silt below 1.8 m.				S7
	2							S8
229				- stiff below 2.4 m.				S9
								S10
	3	10			228.1			
228				Notes: 1. End of test hole at 3.0 m. 2. Test hole remained open to 3.0 m upon completion of drilling. 3. Test hole backfilled with auger cuttings. 4. Test hole sealed at the surface with 100mm of asphalt cold patch.				
	4							

PL MC LL
Cu TORVANE (kPa) ◆
qu POCKET PEN (kPa) ★
SPT (N) BLOWS/0.30 m ▲
20 40 60 80

WATER LEVELS
During Drilling/Digging on 2-25-2022 None Encountered
Upon Completion on 2-25-2022 Dry

CONTRACTOR **Maple Leaf Drilling Ltd.**
INSPECTOR **K. GAUTHIER**
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TEST HOLE LOG

HOLE NO.
TH22-05

CLIENT	**KGS GROUP**	**PROJECT NO.**	22-0535-006
PROJECT	**2022 Redwood Reconstruction Project - Geotech**	**SURFACE ELEV.**	231.06 m
LOCATION	Winnipeg, Manitoba	**DATE DRILLED**	2-25-2022
DESCRIPTION	Redwood Ave - 2m from EB curb, 25m W of Main St.	**UTM (m)**	N 5,531,133
DRILL RIG / HAMMER	Mobile B40 Truck Mounted Drill Rig		E 634,122 Zone 14
METHOD(S)	0.0 m to 0.3 m: Roadway coring 0.3 m to 3.0 m: 125 mm ø SSA		

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEV (m)	WATER LEVEL	SAMPLE TYPE	NUMBER / RUN
231				**ASPHALT** - 76 mm, Black, sub-angular granular (diameter < 20mm).	231.0			S1
				CONCRETE - 229 mm, Grey, rounded granular (diameter < 40mm).	230.8			
				CLAY (CH) - Grey, moist, stiff, high plasticity, and silt, trace sand, frozen. - LL=87, PL=22, PI=65 at 0.3 m. - PSA: 0% gravel, 2% sand, 36% silt, 62% clay at 0.3 m.	230.5			S2
				CLAY (CL) - Light brown, moist, soft, low plasticity, trace sand, frozen. - LL=29, PL=16, PI=13 at 0.6 m. - PSA: 0% gravel, 1% sand, 79% silt, 20% clay at 0.6 m.				S3
230	1							S4
								S5
		5		- not frozen below 1.5 m.				S6
					229.2			
229	2			**CLAY (CH)** - Mottled grey/brown, moist, very stiff, high plasticity.				S7
								S8
								S9
								S10
228	3	10			228.0			
	4			Notes: 1. End of test hole at 3.0 m. 2. Test hole remained open to 3.0 m upon completion of drilling. 3. Test hole backfilled with auger cuttings. 4. Test hole sealed at the surface with 100mm of asphalt cold patch.				

PL MC LL
Cu TORVANE (kPa) ◆
qu POCKET PEN (kPa) ★
SPT (N) BLOWS/0.30 m ▲
20 40 60 80

WATER LEVELS
During Drilling/Digging on 2-25-2022 None Encountered
Upon Completion on 2-25-2022 Dry

CONTRACTOR **Maple Leaf Drilling Ltd.**
INSPECTOR **K. GAUTHIER**
APPROVED
DRAFT
DATE

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KEY TO SYMBOLS

LITHOLOGIC SYMBOLS


Asphalt


Clay (CH, high plasticity)


Clay (CL, low plasticity)


Concrete


Poorly Graded Gravel (GP)


Silt (ML)

SAMPLER SYMBOLS


Auger Grab


Core Barrel

WELL CONSTRUCTION SYMBOLS

ABBREVIATIONS

LL - Liquid Limit
PL - Plastic Limit
PI - Plastic Index
MC - Moisture Content
DD - Dry Density
NP - Non-Plastic
-200 - Percent Passing No. 200 Sieve
TV - Torvane (kPa)
PP - Pocket Penetrometer (kPa)
PSA - Particle Size Analysis
TOC - Top Of Casing

PN - Pneumatic Piezometer
VW - Vibrating Wire Piezometer
PID - Photoionization Detector
ppm - Parts Per Million


Water Level During Drilling


Water Level Upon Completion of Drilling


Water Level Remeasured/Static

CLIENT	**KGS GROUP**	**PROJECT NO.**	22-0535-006
PROJECT NAME	2022 Redwood Reconstruction Project - Geotech	**LOCATION**	Winnipeg, Manitoba

APPENDIX C

Laboratory Testing Results

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SUMMARY OF INDEX TESTS

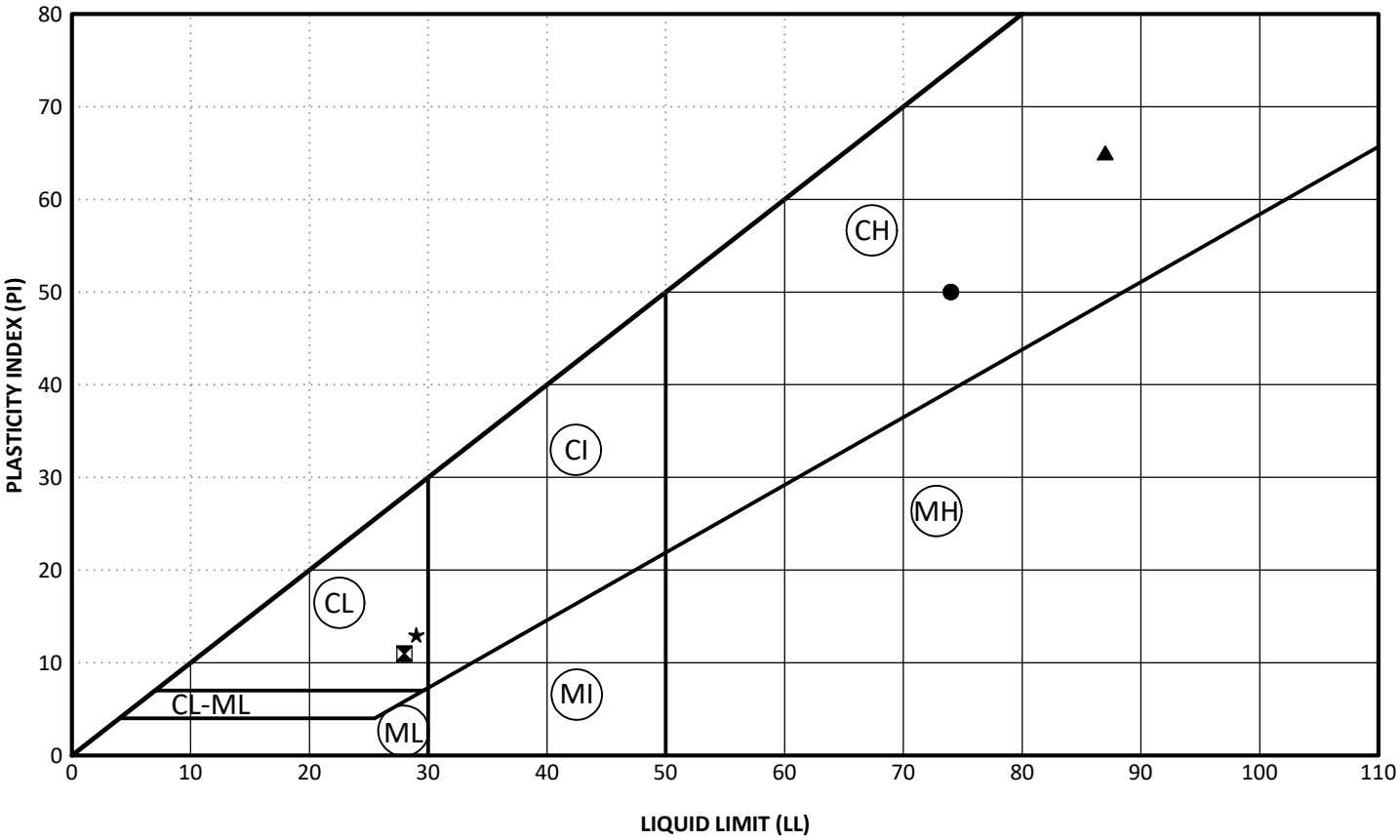
Test Hole ID	Depth (m)	Class-ification	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<75 µm Sieve	Water Content (%)	Dry Density (kN/m3)	Specific Gravity	Satur-ation (%)	Void Ratio
TH22-01	0.3	CH	74	24	50	1.18	98.1	35				
TH22-01	0.6	CH						29				
TH22-01	0.9	ML						27				
TH22-01	1.2	ML						48				
TH22-02	0.3	CH						27				
TH22-02	0.6	CH						26				
TH22-02	0.9	CH						26				
TH22-02	1.2	CH						29				
TH22-03	0.3	CH						44				
TH22-03	0.6	CH						37				
TH22-03	0.9	ML	28	17	11	4.75	98.1	28				
TH22-03	1.2	ML						23				
TH22-04	0.3	CH						51				
TH22-04	0.6	CH						44				
TH22-04	0.9	CH						34				
TH22-04	1.2	CH						32				
TH22-04	1.5	CH						28				
TH22-04	1.8	CH						35				
TH22-04	2.1	CH						34				
TH22-04	2.4	CH						40				
TH22-04	2.7	CH						49				
TH22-05	0.3	CH	87	22	65	2	97.9	37				
TH22-05	0.6	CL	29	16	13	4.75	98.5	28				
TH22-05	0.9	CL						22				
TH22-05	1.2	CL						24				
TH22-05	1.5	CL						23				
TH22-05	1.8	CH						36				
TH22-05	2.1	CH						49				
TH22-05	2.4	CH						50				
TH22-05	2.7	CH						49				

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

KGS GROUP

CLIENT KGS GROUP
PROJECT NAME 2022 Redwood Reconstruction Project - Geotech
TESTED BY Stantec
PROJECT NO. 22-0535-006
LOCATION Winnipeg, Manitoba
DATE TESTED March 2022

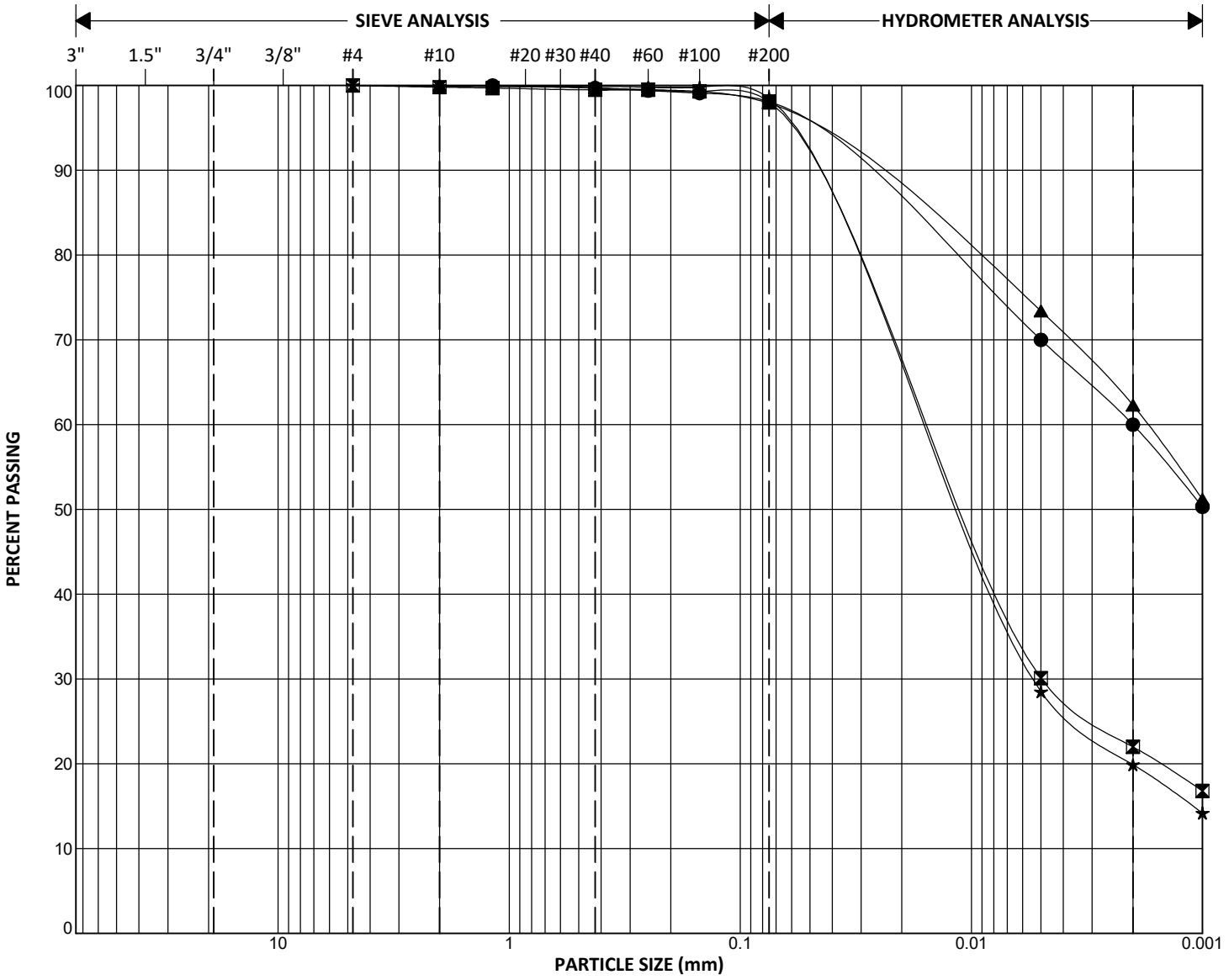
ATTERBERG LIMITS



	HOLE	DEPTH (m)	SAMPLE #	LL	PL	PI	SAND (%)	SILT (%)	CLAY (%)	SILT & CLAY (%)	MC (%)	CLASSIFICATION
●	TH22-01	0.3	S3	74	24	50	2	38	60	98	35	CH
⊠	TH22-03	0.9	S4	28	17	11	2	76	22	98	28	CL
▲	TH22-05	0.3	S2	87	22	65	2	36	62	98	37	CH
★	TH22-05	0.6	S3	29	16	13	1	79	20	99	28	CL

CLIENT	**KGS GROUP**	**PROJECT NO.**	22-0535-006
PROJECT NAME	2022 Redwood Reconstruction Project - Geotech	**LOCATION**	Winnipeg, Manitoba
TESTED BY	Stantec	**DATE TESTED**	March 2022

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
●	TH22-01	0.3	S3	0	2	38	60	98			CH
⊠	TH22-03	0.9	S4	0	2	76	22	98			CL
▲	TH22-05	0.3	S2	0	2	36	62	98			CH
★	TH22-05	0.6	S3	0	1	79	20	99			CL

KGS GROUP

CLIENT	**KGS GROUP**	**PROJECT NO.**	22-0535-006
PROJECT NAME	2022 Redwood Reconstruction Project - Geotech	**LOCATION**	Winnipeg, Manitoba
TESTED BY	Stantec	**DATE TESTED**	March 2022

Stantec
199 Henlow Bay
Winnipeg, Manitoba
R3Y 1G4
Tel: (204) 488-6999

CERTIFIED BY CCIL Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

PROCTOR TEST REPORT

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

ATTN: Kayden Gauthier

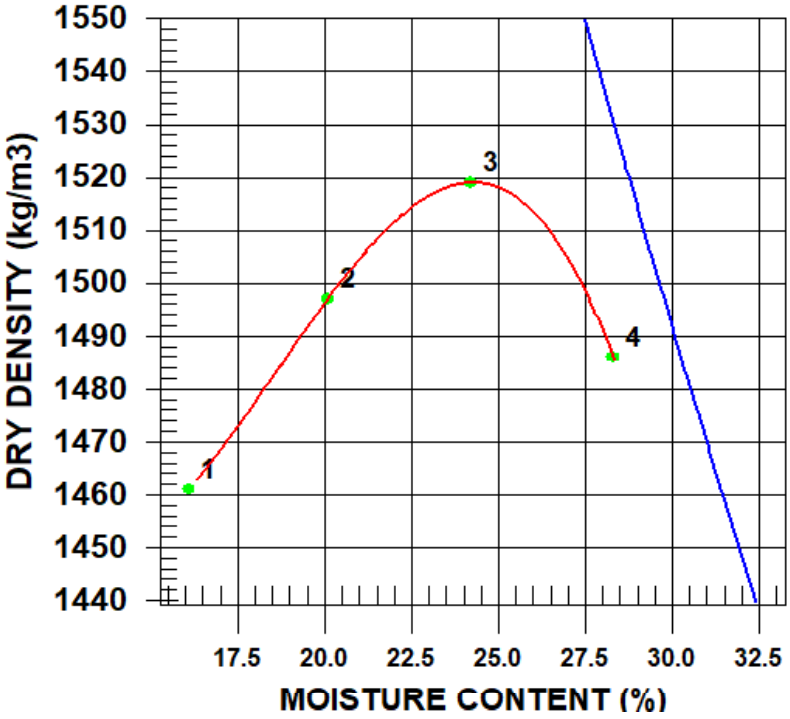
CLIENT KGS Group Inc.
C.C. KGS Group Inc.

PROJECT Redwood Avenue

PROJECT NO. 123315924
PROCTOR NO. 1 DATE SAMPLED 2022.Mar.04 DATE RECEIVED 2022.Mar.08 DATE TESTED 2022.Mar.11

INSITU MOISTURE 3.7 %
TESTED BY Donald Eliazar
MATERIAL IDENTIFICATION
MATERIAL USE Subgrade
MAX. NOMINAL SIZE
MATERIAL TYPE Clay
SUPPLIER Existing material
SOURCE Composite

COMPACTION STANDARD Standard Proctor, ASTM D698
COMPACTION PROCEDURE A: 101.6mm Mold, Passing 4.75mm
RAMMER TYPE Manual
PREPARATION Dry
OVERSIZE CORRECTION METHOD None
RETAINED 4.75mm SCREEN



TRIAL NUMBER	WET DENSITY (kg/m3)	DRY DENSITY (kg/m3)	MOISTURE CONTENT (%)
1	1696	1461	16.1
2	1798	1497	20.1
3	1887	1519	24.2
4	1906	1486	28.3

	MAXIMUM DRY DENSITY (kg/m3)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1520	24.5
OVERSIZE CORRECTED		

COMMENTS

Material tested is a composite sample obtained from TH22-03, S06, TH22-04, S11 & TH22-05, S02.

REVIEWED BY Jason Thompson, C.E.T.

Stantec Consulting Ltd.
199 Henlow Bay, Winnipeg, MB R3Y 1G4
Tel: (204) 488-6999

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

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

ATTN: Taunya Ernst

PROJECT Redwood Avenue

PROJECT NO. 123315924

REPORT NO. 1 (Data page - see Page 2 for Chart)

DATE SAMPLED: 2022.Mar.04 DATE RECEIVED: 2022.Mar.08 DATE TESTED: 2022.Mar.14
SAMPLED BY: KGS Group Inc. SUBMITTED BY: KGS Group Inc. TESTED BY: Donald Eliazar

MATERIAL IDENTIFICATION

MATERIAL USE	Subgrade	SUPPLIER	Existing Material
MAX. NOMINAL SIZE	< 4.75 mm	SOURCE	Redwood Avenue
MATERIAL TYPE	Clay	SAMPLE LOCATION	Testholes
SPECIFICATION	Not Applicable	STANTEC SAMPLE NO.	4105

IMMERSION PERIOD	96 ± 2 hr	TARGET MAX. DRY DENSITY	1520 kg/m^3
		TARGET OPTIMUM MOISTURE	24.5 %
CONDITION OF SAMPLE	Soaked		
		AS-COMPACTED MAX. DRY DENSITY	1444 kg/m^3
SURCHARGE MASS	4.54 kg	AS-COMPACTED MOISTURE CONTENT	24.6 %
SWELL OF SAMPLE	4.2%	POST-TEST MOISTURE CONTENT (TOP 25 mm)	37.4 %

CBR VALUE AT **2.54 mm** PENETRATION	**2.0**
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.
Material tested is a composite sample obtained fron TH22-03 S06, TH22-04 S11 & TH22-05 S02.
We appreciate the opportunity to assist you on this project. Please contact the undersigned if you have any questions regarding this report.

REPORT DATE 2022.Mar.21

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

Stantec Consulting Ltd.
199 Henlow Bay, Winnipeg, MB R3Y 1G4
Tel: (204) 488-6999

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

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

ATTN: Taunya Ernst

PROJECT Redwood Avenue

PROJECT NO. 123315924

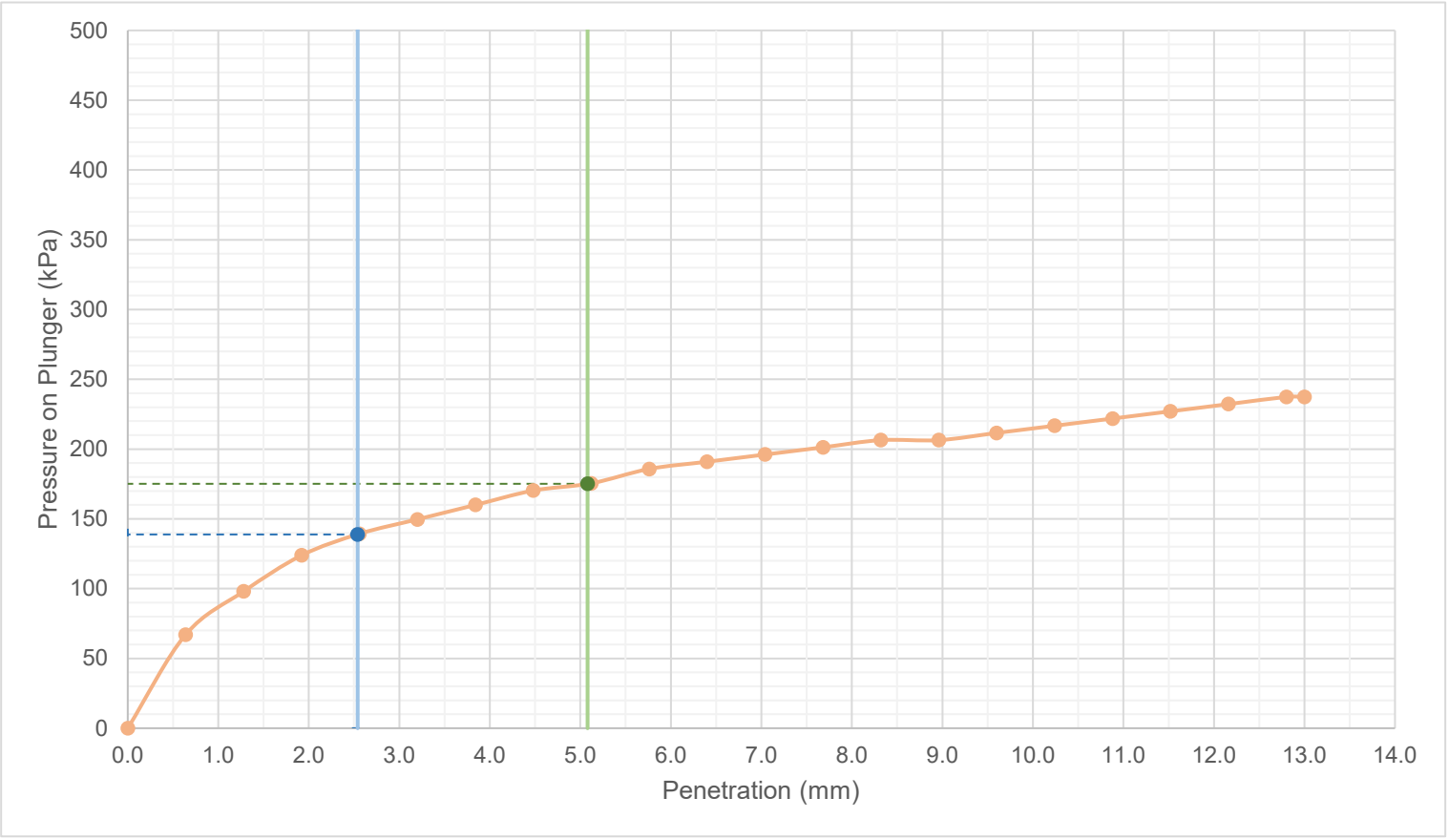
REPORT NO. 1 (Chart page - See Page 1 for Data)

DATE SAMPLED: 2022.Mar.04
SAMPLED BY: KGS Group Inc.

DATE RECEIVED: 2022.Mar.08
SUBMITTED BY: KGS Group Inc.

DATE TESTED: 2022.Mar.14
TESTED BY: Donald Eliazar

LOAD PENETRATION CURVE



REPORT DATE 2022.Mar.21