THE CORPORATION OF THE CITY OF WINDSOR
OFFICE OF THE CITY SOLICITOR

ALEX VUCINIC
Manager of Purchasing & Risk Management

Dawn Lamontagne
Supervisor of Purchasing

(519) 255-6272
TELEPHONE NUMBER

ADDENDUM NO. 2
TENDER NO. 64-24
HOWARD AVENUE & SOUTH CAMERON BOULEVARD INTERSECTION IMPROVEMENTS

June 21, 2024

This addendum amends and forms part of the Tender Documents. The bidder shall insert the addendum behind the cover page of the Tender Documents.

QUESTIONS/ANSWERS:

Bidders shall note the following responses to questions received:

1. Q: Drawings indicate frost straps are required for all manholes as per OPDS 701.100. Please specify the depth of the frost strap required.

   A: The depth of frost strapping is a minimum 2.0m below finished grade.

2. Q: How will median island removal / replacement be paid as required for traffic cross overs? Are quantities for median removal/replacement for traffic control already included under Part A Item 4 and Part B Item 11a, respectfully?

   A: Median/curb removal/replacement along with temporary asphalt/granular required for traffic crossovers to accommodate traffic staging during stage 2 of the project will be paid under the respective items in the Unit Pricing Schedule.

3. Q: Can the cost of permits required for CN and Enbridge be included with the allowance for the flagging for CN?

   A: We feel there is sufficient Information within the CN and Enbridge appendices related to submissions/fees required as part of the CN Work permit and Enbridge approval for the Contractor to price the works. No change to the units/measurement is proposed. Additional information related to Geotechnical Monitoring and the CN Work Permit Application have been added to Appendix D as outlined below.

4. Q: When are sewer and CN approvals expected?

   A: CN approval (CN Work Permit) submission is the responsibility of the Contractor. The timeline for approval by CN has been noted as 6 to 8 weeks. The CN Utility Crossing Agreement (watermain crossing) is expected to be complete by the end of July 2024.

   The City of Windsor Consolidated Linear Infrastructure (CLI) is expected to be received by the end of July 2024.

5. Q: Can a predetermined allowance be included for the OLS work required to establish CN property limits adjacent to the pond?

   A: Costs for establishing the CN property boundary (OLS) are to be included within Part G Item 5a.

6. Q: The tender has items for sod and hydraulic seed and mulch but no item for standard seed mix to be used in boulevard areas? There is only a maintenance item for the standard seed mix and nothing for sod or hydraulic seed and mulch. How will maintenance of sod and hydraulic seed and mulch be paid or can items be added?

   A: Maintenance of sod/hydraulic seed and mulch is to be included in item unit price per City of Windsor Standards S-14, S-15, and SSMPP-17. See revisions to Unit Price Schedule and Special Provisions below.

7. Q: Please clarify what is allowed to be closed for Stage 1 and for how long.

   A: Howard Avenue between Kenilworth Drive (south) and South Cameron Boulevard may remain closed for the duration of Stage 1, however access to properties must be maintained.

   The existing CN Rail crossing and South Cameron Boulevard (between Kenilworth Drive (north) and Howard Avenue) may be closed to accommodate the installation of downstream storm and sanitary sewers, however the duration of this closure is to be minimized and limited to the duration required to complete the downstream sewer works and temporary pavement, which shall be prioritized before proceeding with upstream works south of the Howard Avenue and South Cameron Boulevard intersection. The intention is that the existing CN Rail crossing shall be maintained until Stage 2A as described in Special Information to Bidders Item 14 Construction Staging.

8. What are existing sanitary flows to maintain during construction?

   A: Peak sanitary flows up to 175L/s can be expected.

REVISIONS TO UNIT PRICING SCHEDULE:

Bidders shall note the following changes/modifications to the Unit Pricing Schedule:

a. Bidders shall replace “Part “B”: Roads” in Unit Pricing Schedule with the attached revision.

   The revisions to “Part “B”: Roads” are denoted in ***bold and italics*** in the attached revision and are as follows:

   - Item B3b quantity has been revised.
   - Item B7c quantity has been revised.

a. Bidders shall replace “Part “H”: Miscellaneous” in Unit Pricing Schedule with the attached revision.

   The revisions to “Part “H”: Miscellaneous” are denoted in ***bold and italics*** in the attached revision and are as follows:

- Item H2 has been revised to “Grass Restoration incl. Maintenance”
- Item H3 has been removed. Please note that the item numbering of all following items has been revised to reflect the removal.

REVISIONS TO SPECIAL PROVISIONS:

Bidders shall note the following changes/modifications to the Special Provisions:

a. Bidders shall amend Special Provision **49.0 – GRASS RESTORATION** as follows:

Replace the Measurement section with the following:
Measurement for sod and hydraulic seed and mulch shall be made in square meters. The Contractor will be paid 50% of the seeded area upon placement, and the remaining 25% after first 30 days of maintenance and 25% upon acceptance of grass by the City.

Unit pricing for grass restoration is to include costs for maintenance (watering, cutting, etc.) per City of Windsor Standards.

REVISIONS TO APPENDIX A:

Bidders shall replace Appendix A – Geotechnical Report with the attached. A summary of the revisions are as follows:

- Surface elevations have been added to borehole logs
- Discussion on soil behaviour related to the Jack and Bore operation has been added to section 5.13.
- Settlement monitoring alert levels (5.14.3) have been revised to align with CN Rail requirements.

REVISIONS TO APPENDIX C:

Bidders shall replace Appendix C – Soil Characterization Report with the attached. A summary of the revisions are as follows:

- Discussion added to section 2.2 around the reuse of sanitary trench material.
- Section 4.5 - Removed the text noting that soils exceeding Table 3.1 RPI could be managed as waste. It is the intent that these materials be reused on-site or at suitable reuse site.
- Section 4.8 - “Procedures for Unknown Contamination” revised to Excavation Contingency Plan to be consistent with other City projects.
- Section 5 – Added reference to soil “zones” to bullet two for reference.
- Section 5 – Split bullet four into two separate bullets for clarity.
- Various grammatical revisions which do not impact the results/findings.

REVISIONS TO APPENDIX D:

Bidders shall add the attached CN Rail “Settlement Monitoring Requirements” and “Application Checklist – Utilities 10” or Greater” to Appendix D.

REVISIONS TO CONTRACT DRAWINGS:

Bidders shall replace Contract Drawing sheets U-09 and T-07 with the attached.

ATTACHED:
Unit Pricing Schedule (13 pages)
Contract Drawing Sheets U-09 and T-07 (2 pages)
Revised Geotechnical Report (57 pages)
Revised Soil Characterization Report (188 pages)
CN Rail Settlement Monitoring Requirements and Application Checklist (7 pages)

Except for the contents of this addendum, all other terms and conditions of this tender remain the same.

END OF ADDENDUM NO. 2

Yours truly,

THE CORPORATION OF THE CITY OF WINDSOR

Alex Vucinic .

Alex Vucinic
Manager of Purchasing &Risk Management

AV/jm

ADDENDUM NO. 2
TENDER NO. 64-24
HOWARD AVENUE & SOUTH CAMERON BOULEVARD INTERSECTION IMPROVEMENTS

June 21, 2024

I hereby acknowledge receipt of Addendum No. 2 to the Tender No. 64-24 (272 pages).

The information contained therein is hereby noted and account of same will be taken in our tender cost.

This information was received on the _____day of _____, 20_____.

_____
Signature

_____
Name (Printed)

_____
Company Name

***NOTE: You are required to acknowledge this addendum with your TENDER submission.**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
UNIT PRICING SCHEDULE

PART "A": REMOVALS AND ADJUSTMENTS

ITEM NO.	SPEC PROV	SUB	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
1	SP1.0		Clearing, Grubbing and Stripping of Topsoil	Lump Sum	100%	$	$ 0.00
2	SP2.0		Tree Removal				
		a.	150 mm to 300 mm dia.	Each	23	$	$ 0.00
		b.	Larger than 300 mm to 600 mm dia.	Each	16	$	$ 0.00
		c.	Larger than 600 mm dia.	Each	2	$	$ 0.00
3	SP3.0		Pavement Removal (All Types)	m^2	19,200	$	$ 0.00
4	SP4.0		Sidewalk/Median Removal	m^2	1,200	$	$ 0.00
5	SP5.0		Driveway Removal:				
		a.	Asphalt	m^2	780	$	$ 0.00
		b.	Concrete	m^2	130	$	$ 0.00
		c.	Granular including Shoulders	m^2	4,000	$	$ 0.00
		d.	Brick	m^2	95	$	$ 0.00
6	SP6.0		Sawcutting Existing Pavement	m	480	$	$ 0.00
7	SP7.0		Curb and Gutter Removal	m	1,600	$	$ 0.00
8	SP8.0		Remove Existing Catchbasins and Leads	Each	26	$	$ 0.00
9	SP9.0		Adjust Existing Catchbasins, Manholes, and Clean Outs				
		a.	Adjust Existing Manholes	Each	4	$	$ 0.00
		b.	Adjust Existing Catchbasins	Each	2	$	$ 0.00
*		c.	Adjust Existing Cleanouts (**Provisional**)	Each	16	$	$ 0.00
10	SP10.0		Removal of Existing Sewers and Headwalls (All Material Types):				
*		a.	Storm Sewers Up to 450 mm dia. **(100m Provisional)**	m	150	$	$ 0.00
		b.	Storm Sewers Larger than 450 mm dia.	m	900	$	$ 0.00
		c.	Removal of Existing Headwalls	Each	7	$	$ 0.00
		d.	Sanitary Sewers Larger than 450mm dia.	m	400	$	$ 0.00
11	SP11.0		Removal of Existing Manholes				
		a.	Storm Manholes	Each	7	$	$ 0.00
		b.	Sanitary Manholes	Each	4	$	$ 0.00
***12**	SP12.0		Adjust Gas Valves (**Provisional**)	Each	5	$	$ 0.00
13	SP13.0		Miscellaneous Item Relocations (regulatory signs, landscaping, etc.)	Lump Sum	100%	$	$ 0.00
***14**	SP14.0		Removal of Existing Wooden Fencing (**Provisional**)	m	380	$	$ 0.00
15	SP60.0		**CONTINGENCY ALLOWANCE**	Lump Sum	100%	$	$ **100,000.00**
			TOTAL - PART "A" (including Contingency, excluding HST)				**$ 100,000.00**

*** PROVISIONAL ITEM**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
UNIT PRICING SCHEDULE

PART "B": ROADS

ITEM NO.	SPEC PROV	SUB	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
1	SP15.0		Earth Excavation and Grading (approx. 19,800 m³) incl. Erosion and Sediment Control	Lump Sum	100%	$	$ 0.00
*** 2**	SP15.0		Subexcavation **(Provisional)**	m^3	1,800	$	$ 0.00
3	SP16.0		Supply, Place and Compact Granular Material:				
		a.	Granular 'A' Road Base and Shouldering	Tonnes	30,000	$	$ 0.00
*		b.	Granular B Type II For Temporary Road Base and Subexcavated Areas (Incl 4,400 Tonnes **Provisional)**	Tonnes	***4,800***	$	$ 0.00
4	SP17.0		Supply, Place and Compact Asphalt Treated Open Graded Drainage Layer	m^2	1,700	$	$ 0.00
5	SP18.0		Dust Control				$
		a.	Water	m^3	700	$	$ 0.00
*		b.	Calcium Chloride Solution (brine) **(Provisional)**	Litres	20,000	$	$ 0.00
6	SP19.0		Mill Pavement				
*		a.	50 mm Depth (including 500m^2 **Provisional)**	m^2	4,000	$	$ 0.00
7	SP20.0		Asphalt Pavement:				
		a.	50 mm SP 12.5 FC2 Surface	Tonnes	3,700	$	$ 0.00
		b.	150mm (2 Lifts of 75mm) SP 19 Binder	Tonnes	9,100	$	$ 0.00
		c.	Temporary Asphalt Pavement, 90mm HL-4 (2 Lifts of 45mm)	Tonnes	***250***	$	$ 0.00
8	SP21.0		Tack Coat	m^2	24,200	$	$ 0.00
9	SP22.0		Subdrains **(500m Provisional)**	m	3,300	$	$ 0.00
10	SP23.0		Concrete Curb and Gutter:				
		a.	AS-208A	m	3,300	$	$ 0.00
*		b.	OPSD 600.110 (Incl. 50m **Provisional**)	m	110	$	$ 0.00
*		b.	Winter Protection **(Provisional)**	Lump Sum	100%	$	$ 0.00
*		c.	Additional Cost for High Early Admixture **(Provisional)**	m	2,000	$	$ 0.00
10	SP24.0		Concrete Pavement				
		a.	250 mm Thick	m^2	1,500	$	$ 0.00
*		b.	Winter Protection **(Provisional)**	Lump Sum	100%	$	$ 0.00
*		c.	Additional Cost for High Early Admixture **(Provisional)**	m^2	1,500	$	$ 0.00
11	SP25.0		Concrete Sidewalk and Medians including Granular Base Coloured and Stamped (Median Islands and Maintenance Strip) -				
		a.	150mm Thick	m^2	2,300	$	$ 0.00
		b.	Standard Concrete Sidewalk - 150mm Thick	m^2	830	$	$ 0.00
		c.	Wheelchair Ramps and Commercial - 150mm Thick	m^2	670	$	$ 0.00
*		d.	Additional Cost for High Early Admixture **(Provisional)**	m^2	1,000	$	$ 0.00
		e.	Tactile Warning Surfaces Indicators (610mm x 610mm)	Each	97	$	$ 0.00
13	SP26.0		Asphalt Pathway (incl. excavation and granular base)	m^2	2,800	$	$ 0.00
14	SP27.0		Driveway Restoration:				
		a.	Commercial Concrete (incl. granular base)	m^2	520	$	$ 0.00
		b.	Commercial Asphalt (incl. granular base)	m^2	180	$	$ 0.00
		c.	Residential Concrete (incl. granular base)	m^2	270	$	$ 0.00
		d.	Residential Asphalt (inc. granular base)	m^2	175	$	$ 0.00
*		d.	Additional Cost for High Early Admixture (**Provisional**)	m^2	870	$	$ 0.00
15	SP60.0		**CONTINGENCY ALLOWANCE**	Lump Sum	100%	$	$ **550,000.00**
TOTAL - PART "B" (including Contingency, excluding HST)							**$ 550,000.00**

*** PROVISIONAL ITEM**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
UNIT PRICING SCHEDULE

PART "C": DRAINAGE

ITEM NO.	SPEC PROV	SUB	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
1	SP28.0		Supply and Install Storm Sewers (Incl. connections to proposed manholes):				
		a.	450 mm dia. A257.2 65-D Concrete	m	40	$	$ 0.00
		b.	525 mm dia. A257.2 65-D Concrete incl. Grate	m	85	$	$ 0.00
		c.	600 mm dia. A257.2 65-D Concrete incl. Grate	m	45	$	$ 0.00
		d.	675 mm dia. A257.2 65-D Concrete incl. Grate	m	190	$	$ 0.00
		e.	750 mm dia. A257.2 65-D Concrete	m	495	$	$ 0.00
		f.	1095 x 1730 mm HE II A257.2 Concrete	m	330	$	$ 0.00
		g.	1095 x 1730 mm HE II A257.2 Concrete 27.6 degree Bend	Each	1	$	$ 0.00
		h.	1095 x 1730 mm HE II A257.2 Concrete 33.8 degree Bend	Each	1	$	$ 0.00
		i.	600 x 450mm Tee and Grate (Culvert Light Tunnel)	Each	4	$	$ 0.00
2	SP28.0		Supply and Install 1095 x 1730mm 3 pc. Precast Concrete Headwall (OPSD 804.040)	Each	1	$	$ 0.00
3	SP28.0		Connect Storm Sewer to Existing Manhole				
		a.	525 mm dia (to Ex. MH8R5376)	Each	1	$	$ 0.00
4	SP28.0		Connect Existing Storm Sewer to New Manhole				
		a.	750 mm dia. (to STMH 7R8418)	Each	1	$	$ 0.00
		b.	1050 mm dia. (to STMH7R8425)	Each	1	$	$ 0.00
5	SP29.0		Supply and Install Precast Concrete Manholes and Tees incl. frame and cover:				
		a.	1,500 mm dia.	Each	1	$	$ 0.00
		b.	1,800 mm dia.	Each	5	$	$ 0.00
		c.	2,400 mm dia.	Each	2	$	$ 0.00
		d.	3,000 mm dia.	Each	1	$	$ 0.00
		e.	1095 x 1730 Maintenance Tee (incl. riser and steps)	Each	4	$	$ 0.00
6	SP30.0		Supply and Install Catchbasins:				
*		a.	Standard Catchbasin (incl. 4 **Provisional**)	Each	8	$	$ 0.00
		b.	Twin Curb Inlet Catchbasin	Each	41	$	$ 0.00
		b.	Curb Inlet Catchbasin	Each	5	$	$ 0.00
7	SP31.0		Supply and Install Catchbasin Leads:				
*		a.	200 mm dia. PVC (30m **Provisional**)	m	100	$	$ 0.00
		b.	250 mm dia. PVC	m	325	$	$ 0.00
		c.	300 mm dia. PVC	m	125	$	$ 0.00
***8**	SP28.0		Non-Shrink Fill (incl. 75m^3 **Provisional**)	m^3	150	$	$ 0.00
9	SP32.0		Rip Rap with Filter Cloth - R10, 300 mm Thick	m^2	300	$	$ 0.00
10	SP33.0		Flush and Video Sewers				
		a.	Start of Maintenance	Lump Sum	100%	$	$ 0.00
		b.	End of Maintenance	Lump Sum	100%	$	$ 0.00
*		c.	On-site Camera Inspection (**Provisional**)	Hour	50	$	$ 0.00
11	SP34.0		Supply and Install CONFLOW Vortex Flow Regulator	Each	1	$	$ 0.00
12	SP35.0		Excavate and Grade Stormwater Facility (approx 2200m^3) incl. Sediment and Erosion Control	Lump Sum	100%	$	$ 0.00
13	SP28.0		Maintenance of Flows	Lump Sum	100%	$	$ 0.00
14	SP60.0		**CONTINGENCY ALLOWANCE**	Lump Sum	100%	$	$ **350,000.00**
TOTAL - PART "C" (including Contingency, excluding HST)							**$ 350,000.00**

*** PROVISIONAL ITEM**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
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PART "D": SANITARY

ITEM NO.	SPEC PROV	SUB	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
1	SP36.0		Supply and Install Sanitary Sewers (Including connections to proposed manholes) :				
		a.	675 mm dia. A257.2 100-D Concrete	m	395	$	$ 0.00
2	SP37.0		Supply and Install Sanitary Manholes (Incl. Benching, Buoyancy Slab, and Safety Platform)				
		a.	1500 mm dia.	Each	4	$	$ 0.00
3	SP36.0		Connect Existing Sanitary Sewer to New Manhole				
		a.	525 mm dia. (to 8S3499)	Each	1	$	$ 0.00
		b.	525 mm dia. (to 8S3496)	Each	1	$	$ 0.00
4	SP36.0		Connect Existing PDC to New Sewer (incl. fittings, pipe, bends, etc.)	Each	16	$	$ 0.00
***5**	SP38.0		Sanitary Private Drain Connections and Clean-outs (**Provisional**):				
		a.	150 mm dia. Incl. all fittings, bends, etc.	m	300	$	$ 0.00
		b.	150mm dia. Clean-Outs	Each	16	$	$ 0.00
		c.	150 mm dia. Metal Clean-Out Caps	Each	8	$	$ 0.00
6	SP33.0		Flush and Video Sewers				
		a.	Start of Maintenance	Lump Sum	100%	$	$ 0.00
		b.	End of Maintenance	Lump Sum	100%	$	$ 0.00
*		c.	On-site Camera Inspection (**Provisional**)	Hour	50	$	$ 0.00
7	SP28.0		Maintenance of Flows	Lump Sum	100%	$	$ 0.00
8	SP60.0		**CONTINGENCY ALLOWANCE**	Lump Sum	100%	$	$ **150,000.00**
TOTAL - PART "D" (including Contingency, excluding HST)							**$ 150,000.00**

*** PROVISIONAL ITEM**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
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UNIT PRICING SCHEDULE

PART "E": LOCAL WATERMAIN

ITEM NO.	SPEC PROV	WUC PROV	SUB	DESCRIPTION	ESTIMATED QUANTITY	UNITS	UNIT PRICE	AMOUNT
1	SP39.0	30.08 30.13 30.14 30.18 .09		Supply and install new PVC watermain in the locations as shown on the drawings.				
			A)	Full granular backfill				
			i)	150mm diameter pipe	L.M.	36	$	$ 0.00
			ii)	200mm diameter pipe	L.M.	205	$	$ 0.00
			iii)	300mm diameter pipe	L.M.	740	$	$ 0.00
			B)	In Steel Casing (using fusible pipe, spacers, end caps, etc.)				
			i)		L.M.	24	$	$ 0.00
2	SP39.0	30.08 .08		Supply and install new PVC watermain & perform Direction Boring in the locations as shown on the drawings and where ordered by the engineer.				
			a)	200mm diameter pipe	L.M.	24	$	$ 0.00
			b)	300mm diameter pipe (Provisional)	L.M.	6	$	$ 0.00
3	SP39.0			Supply, Bore and Jack 300mm diameter x 9.53mm Wall Thickness Steel Casing under railway tracks complete with all excavation, granular backfilling, bore pits, concrete thrust blocking, shoring, dewatering and as detailed on the drawings and specifications at CN Rail Track Crossing. (Pipe Cost included in Item 1B)	L.M.	24	$	$ 0.00
4	SP39.0	30.18 .01		Supply and install valves.				
			A)	Gate Valves				
			i)	150mm diameter	Each	5	$	$ 0.00
			ii)	200mm diameter	Each	7	$	$ 0.00
			iii)	300mm diameter	Each	12	$	$ 0.00
			B)	Tapping Valves				
			i)	200mm diameter	Each	1	$	$ 0.00
			ii)	300mm diameter	Each	1	$	$ 0.00
*			C)	Install valve box extensions and extension stems. (**Provisional**)				
			i)	Valve box extension or Valve box threaded riser	Each	1	$	$ 0.00
			ii)	Valve extension stem	L.M.	1	$	$ 0.00
5	SP39.0	30.18 .04		required bolts nuts gaskets etc in the location shown on the drawings.				
		30.19.01	a)	200x200mm Tapping Sleeves	Each	1	$	$ 0.00
			b)	300x300mm Tapping Sleeves	Each	1	$	$ 0.00
			c)	200mm 11 1/4º PVC Elbows	Each	2	$	$ 0.00
*			d)	300mm 11 1/4º MJCL Elbows (**Provisional**)	Each	1	$	$ 0.00
			e)	150mm 45º PVC Elbows	Each	2	$	$ 0.00
			f)	200mm 45º PVC Elbows	Each	8	$	$ 0.00
			g)	300mm 45º MJCL Elbows	Each	4	$	$ 0.00
*			h)	150mm 90º PVC Elbows (**Provisional**)	Each	1	$	$ 0.00
			i)	200mm 90º PVC Elbows	Each	1	$	$ 0.00
			j)	300mm 90º MJCL Elbows	Each	3	$	$ 0.00
			k)	200x150mm PVC Tees	Each	1	$	$ 0.00
			l)	300x150mm MJCL Tees	Each	4	$	$ 0.00
			m)	300x200mm MJCL Tees	Each	4	$	$ 0.00
			n)	300x300mm MJCL Tees	Each	5	$	$ 0.00
			o)	200x150mm PVC Reducers	Each	2	$	$ 0.00
*			p)	300x150mm MJCL Reducers (**Provisional**)	Each	1	$	$ 0.00
			q)	150mm MJ Caps	Each	7	$	$ 0.00
			r)	200mm MJ Caps	Each	1	$	$ 0.00
			s)	300mm MJ Caps	Each	6	$	$ 0.00

*** PROVISIONAL ITEM**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
UNIT PRICING SCHEDULE

PART "E": LOCAL WATERMAIN

ITEM NO.	SPEC PROV	WUC PROV	SUB	DESCRIPTION	ESTIMATED QUANTITY	UNITS	UNIT PRICE	AMOUNT
			t)	200mm MJ Caps with 50mm galvanized blowoff pipe and cap	Each	3	$	$ 0.00
			u)	300mm MJ Caps with 50mm galvanized blowoff pipe and cap	Each	4	$	$ 0.00
			v)	300mm MJ Caps with 50mm Valve, Valve Box, 50mm galvanized blowoff pipe and cap	Each	2	$	$ 0.00
			w)	150mm Couplings	Each	3	$	$ 0.00
			x)	200mm Couplings	Each	2	$	$ 0.00
			y)	300mm Couplings	Each	6	$	$ 0.00
6	SP39.0	30.18 .03	A)	Supply and install fire hydrants (plugged) (Hydrant appurtenances included in items above).				
			i)	Hydrant for 1.68m (5'6") Bury	Each	2	$	$ 0.00
			ii)	Hydrant for 1.83m (6') Bury	Each	2	$	$ 0.00
*			B)	Install hydrant extensions as directed by the engineer. (**Provisional**)				
			i)	150mm Extension	Each	1	$	$ 0.00
			ii)	300mm Extension	Each	1	$	$ 0.00
7	SP39.0	30.32 .01 50.06 .02		Supply all material, excavation, shoring, dewatering, backfilling, etc., and connect to existing watermain at the following locations as shown in drawings: (pipe and fittings included in items above.) (All costs associated with supply, installation & testing of backflow devices to be included in appropriate items)				
			a)	Connect to the existing watermain using a tapping sleeve in front of 650 Division Rd. (Five Guys) See U-05, STN 0+710	Unit	1	$	$ 0.00
			b)	After testing is complete remove backflow preventer and connect new watermain.	Unit	1	$	$ 0.00
			c)	Tie in to the existing water service using a tapping sleeve in front of 3205 Howard Ave. (Roundhouse Centre) See U-02, STN 0+150	Unit	1	$	$ 0.00
			d)	Tie in and abandonment of the existing water service to 500 Division Rd. (Dan Kane) See U-04, STN 0+580	Unit	1	$	$ 0.00
			e)	Tie in and abandonment of the existing water service to 490 Division Rd. (The Keg) See U-04, STN 0+480	Unit	1	$	$ 0.00
			f)	Tie in and abandonment of the existing water service to 3060 Howard Ave. (Chick Fil A) See U-03, STN 0+255	Unit	1	$	$ 0.00
			g)	Tie in and abandonment of the existing water service to 3060 Howard Ave. (Devonshire Mall) See U-02, STN 0+210	Unit	1	$	$ 0.00
			h)	Tie in and abandonment of the existing water service to 3060 Howard Ave. (Devonshire Mall) (Provisional) (Confirm if Active) Se U-02, STN 0+160	Unit	1	$	$ 0.00
			i)	Tie in and abandonment of the existing watermain in front of 3205 Howard Ave. (Roundhouse Centre) See U-01, STN 0+070	Unit	1	$	$ 0.00
			j)	Tie in and abandonment of the existing watermain in front of 3060 Howard Ave. (Devonshire Mall) See U-01, STN 0+040	Unit	1	$	$ 0.00
			k)	Tie in and abandonment of the existing watermain on the Southeast corner of Howard Ave & Sydney Ave. See U-07, STN 0+450	Unit	1	$	$ 0.00

*** PROVISIONAL ITEM**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
UNIT PRICING SCHEDULE

PART "E": LOCAL WATERMAIN

ITEM NO.	SPEC PROV	WUC PROV	SUB	DESCRIPTION	ESTIMATED QUANTITY	UNITS	UNIT PRICE	AMOUNT
			l)	Cut and cap for abandonment of the existing watermain in front of 650 Division Rd. (Five Guys) See U-05, STN 0+710	Unit	1	$	$ 0.00
			m)	Cut and cap for abandonment of the existing watermain running underneath RR tracks. See U-03, U-06	Unit	2	$	$ 0.00
8	SP39.0	30.19 .01		Supply and install 24lb zinc anodes on existing metallic watermains and metallic fittings as directed by the engineer	Each	28	$	$ 0.00
9	SP39.0	30.18.05		Supply and install foam swabs.				
			a)	100mm to 200mm diameter pipe sizes	Each	3	$	$ 0.00
			b)	250mm to 300mm diameter pipe sizes	Each	5	$	$ 0.00
10	SP39.0	30.18.08		Install chlorine/air relief risers.				
			a)	off 100mm to 200mm diameter pipe sizes	Each	1	$	$ 0.00
			b)	off 250mm to 300mm diameter pipe sizes	Each	1	$	$ 0.00
11	SP39.0	30.18.06		Install all temporary blowoff assemblies and proper hoses in the locations shown on the drawings for testing and remove same after testing is completed; and assist WUC forces during swabbing, flushing, chlorination, and testing of all new watermains.	Unit	1	$	$ 0.00
12	SP39.0			Replace private drain connections or mainline sewer including required couplings. (**Provisional**)				
			a)	100mm diameter	L.M.	10	$	$ 0.00
			b)	150mm diameter	L.M.	25	$	$ 0.00
			c)	200mm diameter	L.M.	10	$	$ 0.00
			d)	250mm diameter	L.M.	5	$	$ 0.00
			e)	300mm diameter	L.M.	5	$	$ 0.00
13	SP39.0	30.03.06		Excavate and remove abandoned hydrants, close old valves and remove old valve boxes, and manholes.				
			a)	Hydrant removals	Each	4	$	$ 0.00
			b)	Valve box removals	Each	15	$	$ 0.00
*			c)	Manhole removals (**Provisional**)	Each	1	$	$ 0.00
***14**	SP39.0	30.20 30.21 30.22 30.23		new water services as per WUC Specifications and WUC Standards Drawing in locations as directed by the engineer. Contractor shall note that all commercial water service connections shall be excavated using Vacuum Truck paid under this item. Please price accordingly.				
			A)	Install new C904 PEX (REHAU MUNICIPEX, IPEX BLUE904, OR APPROVED EQUIVELENT) water service at locations as directed by the engineer.				
			i)	25mm diameter (1") Short Side (**Provisional**)	Each	2	$	$ 0.00
*			ii)	25mm diameter (1") Long Side (**Provisional**)	Each	1	$	$ 0.00
*			iii)	38mm diameter (1 1/2") Short Side (**Provisional**)	Each	1	$	$ 0.00
*			iv)	38mm diameter (1 1/2") Long Side (**Provisional**)	Each	1	$	$ 0.00
*			B)	Transfer existing copper services to new watermain at locations directed by the engineer. (**Provisional**)				
			a)	25mm	Each	1	$	$ 0.00
***15**	SP39.0	30.25		Supply and install new meter pits. (**Provisional**)	Each	1	$	$ 0.00
***16**	SP39.0	30.25		Install new water meter or relocated existing meter in new meter pit complete with copper risers and fittings. (**Provisional**)	Each	1	$	$ 0.00
***17**	SP39.0	30.18.03		Supply, place and compact sand backfill for additional watermain work. (**Provisional**)	Tonne	75	$	$ 0.00

*** PROVISIONAL ITEM**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
UNIT PRICING SCHEDULE

PART "E": LOCAL WATERMAIN

ITEM NO.	SPEC PROV	WUC PROV	SUB	DESCRIPTION	ESTIMATED QUANTITY	UNITS	UNIT PRICE	AMOUNT
***18**	SP39.0	30.48.04		Supply and place OPSS clear stone to backfill for additional watermain work. (**Provisional**)	Tonne	50	$	$ 0.00
***19**	SP39.0	30.48.02		Supply, place and compact 0 - 7/8" OPSS granular 'A', to backfill for additional watermain work. (**Provisional**)	Tonne	100	$	$ 0.00
***20**	SP39.0	30.53 30.26		Supply and place temporary hotmix maintenance asphalt (handwork) in watermain trenches. (**Provisional**)				
			a)	Total depths 25mm - 150mm	Tonne	50	$	$ 0.00
***21**	SP39.0	30.46 30.26		Supply and place temporary cold mix asphalt in watermain trenches. (**Provisional**)				
			a)	Total depths 25mm - 150mm	Tonne	50	$	$ 0.00
***22**	SP39.0			Supply and install 25MPA mass concrete thrust blocking as directed by the engineer complete with bond breaker. (**Provisional**)	C.M.	5	$	$ 0.00
23	SP39.0			Supply and install 30MPA flowable grout (sand water cement only) and provide adequate number of risers to complete grouting of old feedermains and ensure pipe is filled as directed by the engineer.	C.M.	60.0	$	$ 0.00
***24**	SP39.0			Supply and install N.S.F. 'U-fill' to City Spec S-24 for backfill. (**Provisional**)	C.M.	5	$	$ 0.00
***25**	SP39.0			Supply and install 50mm rigid foam insulation and insulate new watermain or water services in locations shown on the drawings or as directed by the engineer.	S.M.	10	$	$ 0.00
26	SP39.0		**a)**	shoring, dewatering, backfilling, etc. to deflect the new PVC watermain below the existing underground utility obstructions (concrete duct banks, sewers, fibre optics, hydro, etc.) in the locations shown on the drawings or as otherwise directed by the engineer. Refer to typical watermain deflection detail. (pipe and fittings to be paid for in items 1 and 4) Deflections up to 1 meter	Unit	2	$	$ 0.00
			b)	Deflections up to 1.5 meters	Unit	1	$	$ 0.00
***27**	SP39.0			Provide a vacuum excavation truck with two operators to perform additional daylighting for any utilities not shown on the drawings and as directed by the engineer.	Hours	80	$	$ 0.00
28	SP60.0			**CONTINGENCY ALLOWANCE**	Lump Sum	100%	$	$ **50,000.00**
TOTAL - PART "E" (including Contingency, excluding HST)								**$ 50,000.00**

*** PROVISIONAL ITEM**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
UNIT PRICING SCHEDULE

PART "F": TRAFFIC SIGNAL AND LIGHTING

NO.	SPEC	SUB	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	AMOUNT
1	SP40.0	a.	600mm Square Traffic Manhole	Each	23	$	$ 0.00
2	SP40.0		Electrical Handholes				
	SP41.0	a.	Synertech 11x18x12 (Streetlighting)		30	$	$ 0.00
		b.	Synertech 11x18x12 (Interconnect)	Each	9	$	$ 0.00
3	SP40.0		Rigid Ducts, Direct Buried:				
	SP41.0	a.	1 - 50mm	m	1,655	$	$ 0.00
		b.	2 - 75mm & 2 - 50mm	m	600	$	$ 0.00
		c.	2 - 50mm & 1 - 75mm	m	150	$	$ 0.00
		d.	3 - 100mm & 1 -75mm & 1 - 50mm	m	25	$	$ 0.00
		e.	2 - 50mm & 3 - 75mm & 1 - 75mm	m	50	$	$ 0.00
		f.	1 - 50mm & 2 - 75mm	m	480	$	$ 0.00
		g.	1 - 50mm & 1 - 75mm	m	140	$	$ 0.00
		h.	Interconnect Duct 1-75mm	m	660	$	$ 0.00
		i.	Interconnect Duct CN Rail 1-50mm	m	130	$	$ 0.00
4	SP41.0		Rigid Ducts, Concrete Encased:				
		a.	2 - 50mm	m	80	$	$ 0.00
5	SP41.0		Low Voltage Cables, in Ducts:				
		a.	1 - 1/C #6 AWG	m	4,200	$	$ 0.00
6	SP41.0		Low Voltage Cables, Aerial on Steel Messenger				
		a.	1 - Duplex #4 AWG	m	6	$	$ 0.00
9	SP40.0		Grounding				
	SP41.0	a.	Ground Rods	Each	27	$	$ 0.00
	SP43.0	b.	Ground Plates	Each	4	$	$ 0.00
	SP44.0	c.	Ground Rods, Temporary	Each	16	$	$ 0.00
10	SP40.0		Ground Wires:				
	SP41.0	a.	#6 AWG, Insulated Ground Wires	m	1,500	$	$ 0.00
	SP43.0	b.	#6 AWG, Bare Ground Wires	m	40	$	$ 0.00
	SP44.0	c.	#2 AWG, Bare Ground Wires	m	40	$	$ 0.00
	SP40.0						
	SP41.0						
11	SP42.0		Removals of Electrical Equipment	Lump Sum	100%	$	$ 0.00
12	SP41.0		Concrete Footing in Earth:				
		a.	Relocate Existing Luminaire and Pole to New Footing	Each	3	$	$ 0.00
		b.	600mm Diameter Pole Base	Each	27	$	$ 0.00
13	SP40.0		Concrete Traffic Controller Pad	Each	3	$	$ 0.00
14	SP40.0		Supply Control Cabinet Assemblies:				
	SP41.0	a.	Enwin Hydro Pole Mounted Supply	Each	4	$	$ 0.00
15	SP41.0		Concrete Poles, Direct Buried in Earth				
		a.	9.1m (30')	Each	22	$	$ 0.00
17	SP41.0		LED Roadway Lighting Luminaires and Bracket Assemblies:				
		a.	Driver Change (NXT-24S-700mA-2ES-4000K)	Each	1	$	$ 0.00
		b.	NXT-36S-600mA-2ES-4000K	Each	48	$	$ 0.00
		c.	Driver Change (NXT-36S-600mA-2ES-4000K)	Each	10	$	$ 0.00
		d.	NXT-36S-700mA-2ES-4000K	Each	2	$	$ 0.00
		e.	NXT-48M-600mA-2ES-4000K	Each	11	$	$ 0.00
		f.	NXT-48M-700mA-2ES-4000K	Each	3	$	$ 0.00
		g.	2.4 m Al. Tapered Elliptical Bracket	Each	43	$	$ 0.00
18	SP41.0		LED Roadway Lighting Luminaires and Bracket				
	SP44.0		Assemblies (Temporary):				
		a.	NXT-60M-5-7-2ES-7-GY-3-UL-X-2H-0423	Each	9	$	$ 0.00
		c.	2.4m Al. Tapered Elliptical Bracket - Aluminous ALP-RE8M	Each	9	$	$ 0.00
		d.	Temporary Lighting	Lump Sum	100%	$	$ 0.00
19	SP40.0						
	SP41.0		Coordination with Enwin	Lump Sum	100%	$	$ 0.00
20	SP43.0		Temporary Traffic Signals:				
	SP44.0	a.	Initial Installation	Lump Sum	100%	$	$ 0.00
		b.	Modifications Per Staging Requirements	Lump Sum	100%	$	$ 0.00
21	SP59.0		**CONTINGENCY ALLOWANCE**	Lump Sum	100%	$	$ **100,000.00**
TOTAL - PART "F" (including Contingency, excluding HST)							**$ 100,000.00**

*** PROVISIONAL ITEM**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
UNIT PRICING SCHEDULE

PART "G": UTILITY WORKS

ITEM NO.	SPEC PROV	SUB	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
*** 1**	SP45.0		Utility Exploratory Digs **(Provisional)**	Hours	150	$	$ 0.00
*** 2**	SP46.0		Temporary Support of Hydro Utility Poles **(Provisional)**	Each	3	$	$ 0.00
3	SP47.0		Utility Coordination	Lump Sum	100%	$	$ 0.00
4	SP47.0		Enbridge				
		a.	Enbridge Permit/Approval for Pipeline Crossing	Lump Sum	100%	$	$ 0.00
*****		b.	Temporary Support of Enbridge High Pressure Gas Main (**Provisional**)	Lump Sum	100%	$	$ 0.00
5	SP47.0		CN Rail				
		a.	Work Permit Applicaton	Lump Sum	100%	$	$ 0.00
		b.	Flag Persons	Allow.	100%	$	$ **75,000.00**
		c.	Geotechnical Monitoring	Lump Sum	100%	$	$ 0.00
6	SP60.0		**CONTINGENCY ALLOWANCE**	Lump Sum	100%	$	$ **25,000.00**
TOTAL - PART "G" (including Contingency, excluding HST)							**$ 100,000.00**

*** PROVISIONAL ITEM**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
UNIT PRICING SCHEDULE

PART "H": MISCELLANEOUS

ITEM NO.	SPEC PROV	SUB	DESCRIPTION	UNITS	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
1	SP48.0		Imported Topsoil - 100 mm Thick incl. Fine Grading	m^2	15,000	$	$ 0.00
2	SP49.0		Grass Restoration ***incl. Maintenance***				
		a.	Sod	m^2	12,000	$	$ 0.00
		b.	Hydraulic Seed and Mulch	m^2	5,000	$	$ 0.00
***3**	SP50.0		Wildlife Fencing (ERTEC E-Fence 1.22m w/ Climber Bracket) (**Provisional**)	m	270	$	$ 0.00
4	SP51.0		Traffic Control				
		a.	Stage 1 of Construction (2024)	Lump Sum	100%	$	$ 0.00
		b.	Stage 2-3 of Construction (2025/2026)	Lump Sum	100%	$	$ 0.00
5	SP51.0		Variable Message Boards (4 Signs)	Sign Week	32	$	$ 0.00
***6**	SP51.0		Business Access Signs **(Provisional)**	Each	15	$	$ 0.00
***7**	SP52.0		Project Signs (**Provisional**)	Each	2	$	$ 0.00
***8**	SP53.0		Protection of Trees **(Provisional)**	m	40	$	$ 0.00
9	SP54.0		Engineer's Site Office	Lump Sum	100%	$	$ 0.00
10	SP55.0		Pedestrian Maze (incl. concrete, railing, granular)	Each	4	$	$ 0.00
11	SP56.0		Provisions for Signage Including Installation of Stanchions (Supplied by City of Windsor)				
		a.	Within Hard Surface including PVC Sleeves	Each	35	$	$ 0.00
		b.	Within Grassed Boulevard	Each	30	$	$ 0.00
12	SP57.0		Excess Soil Management				
		a.	Disposal of Soils to Landfill	Tonne	4,500	$	$ 0.00
*		b.	Test Pit Investigation (**Provisional**)	Each	6	$	$ 0.00
*		c.	Coordination with City of Windsor Qualified Professional (**Provisional**)	Lump Sum	100%	$	$ 0.00
***13**	SP58.0		Labour Rates for Additional Work **(Provisional)**:				
		a.	Superintendent	Hour	50	$	$ 0.00
		b.	Foreman	Hour	100	$	$ 0.00
		c.	Operator	Hour	200	$	$ 0.00
		d.	Labourer	Hour	400	$	$ 0.00
		e.	Flagger	Hour	100	$	$ 0.00
***14**	SP59.0		Wooden Privacy Fence (**Provisional**)	Allow.	100%	$	$ **45,000.00**
15	SP60.0		**CONTINGENCY ALLOWANCE**	Lump Sum	100%	$	$ **150,000.00**
TOTAL - PART "H" (including Contingency, excluding HST)							**$ 195,000.00**

*** PROVISIONAL ITEM**

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
UNIT PRICING SCHEDULE

TENDER SUMMARY

PART "A": REMOVALS AND ADJUSTMENTS	**$**	100,000.00
PART "B": ROADS	**$**	550,000.00
PART "C": DRAINAGE	**$**	350,000.00
PART "D": SANITARY	**$**	150,000.00
PART "E": WATERMAIN	**$**	50,000.00
PART "F": TRAFFIC SIGNALS & LIGHTING	**$**	100,000.00
PART "G": UTILITY WORKS	**$**	100,000.00
PART "H": MISCELLANEOUS	**$**	195,000.00
TOTAL TENDER PRICE	**$**	**1,595,000.00**

PARTS: "A", "B" "C", "D", "E", "F", "G" AND "H" (INCL. CONTINGENCY & EXCLUDING H.S.T.)

THE CITY OF WINDSOR
PUBLIC WORKS - ENGINEERING DEPARTMENT
RFT 64-24, HOWARD AVE. & SOUTH CAMERON BLVD. INTERSECTION IMPROVEMENTS
UNIT PRICING SCHEDULE

BREAKDOWN

NOTE:

The Total Tender Price is submitted in compliance with the provisions of the Harmonized Sales Tax (HST). The Breakdown is as follows:

Labour	**$** _____
Materials	**$** _____
Equipment	**$** _____
TOTAL TENDER PRICE PART "A", PART "B", PART "C", PART "D", PART "E", PART "F", PART "G" and PART "H" (Including Contingency, Excluding HST)	**$** _____
HST	**$** _____


MATCHLINE - SEE SHEET U-07
MATCHLINE - SEE SHEET U-03
MATCHLINE - STA: 0+200 SEE SHEET U-10
HOWARD AVE.
DIVISION RD.
C.N. RAIL
SYDNEY AVENUE
EXIST. R.O.W.
EXISTING VITAL 500mm GAS MAIN. PERMIT/APPROVAL REQUIRED FROM ENBRIDGE FOR ANY WORKS WITHIN THE VICINITY.
MIN. 300mm THICK RIPRAP ON GEOTEXTILE
OUTLET 600mm INV 186.750
30.6 CN RAIL ROW
NOTE: RAILWAY MARKERS TO BE INSTALLED BY CN FLAGMEN
75m–675mmø ST @ 0.22%
INSTALL 200x150mm PVC TEE, 150mm GATE VALVE & FIRE HYDRANT
INSTALL FOAM SWAB
INSTALL 300x200mm MJ TEE
AFTER TESTING IS COMPLETE, CUT & CAP EXISTING WATER SERVICE TO BE ABANDONED, REMOVE TEMPORARY BLOWOFF PIPING AND CONNECT THE NEW 200mm PVC WATER SERVICE TO THE EXISTING 150mm WATER SERVICE USING: 2 – 200mm 45° PVC ELBOWS 1 – 200x150mm PVC REDUCER 1 – 150mm COUPLING
KEY PLAN (N.T.S.)
44m–600mmDIA RCP CSA–A257.2 65D STORM @ 0.20%
CULVERT LIGHT TUNNEL SEE DETAIL ON SHEET R-17
CONSTRUCTION BASELINE
300mm PVC LEAD
INSTALL 200mm GATE VALVE WITH TEMPORARY FULL SIZE & 50mm BLOWOFFS
1200mmø WATERMAIN BY OTHERS
SEE WSP GEOTECHNICAL REPORT FOR BOREHOLE INFORMATION
CN RAILWAY: CASO SUBDIVISION MILE 221.84
PROP. WATERMAIN (TYP.)
200 PVC WM
PROP. BORE RECEIVING PIT 4.0x2.0m
PROP. BORE ENTRY PIT 10.0x2.0m
INSTALL 300mm MJ GATE VALVE
DEFLECT WATERMAIN UNDER NEW 750mm STORM
INSTALL 200mm GATE VALVE
INSTALL 200mm 11.25° PVC ELBOW
INSTALL 200mm 45° PVC ELBOW
INSTALL 200mm GATE VALVE
PROP. WATERMAIN CROSSING EXIST. RAIL TRACKS TO BE LINED IN STEEL AND CONSTRUCTED/MAINTAINED PER TRANSPORT CANADA STANDARDS RESPECTING PIPELINE CROSSINGS UNDER RAILWAYS (TC–E–10)
ALL WORKS WITHIN THE CN RAIL RIGHT OF WAY TO BE COORDINATED WITH CN RAIL. FLAG PERSONS REQUIRED.
INLET 600mm INV 186.840m
UTILITY OWNER: ENWIN UTILITIES LTD. 4545 RHODES DRIVE WINDSOR ON, N8W 5T1 CONTACT: SPENCER JOHNSTON PHONE: 519–251–7300 EXT 609
WINDSOR UTILITIES COMMISSION
WATER ENGINEERING
APPROVED FOR CONSTRUCTION:
PVI STA: 0+069.85 PVI ELEV: 187.61 LVC: 21.60m K: 15.4 LP STA: 0+059.05 LP ELEV: 187.49
PVI STA: 0+116.52 PVI ELEV: 188.79 LVC: 32.34m K: 5.3 HP STA: 0+113.78 HP ELEV: 188.55
PROP. BORE RECEIVING PIT
PROP. BORE ENTRY PIT
PROP. ℄ ROAD
EXIST. GRADE
ZONE OF INFLUENCE
PROP. 45° VERT. BEND
NEW 200mm FUSIBLE PVC WATERMAIN COMPLETE WITH SPACERS & RUBBER END SEALS
23.5m – ASTM 252 STEEL CASING PIPE 300mmøx9.53mm WALL THICKNESS MINIMUM YIELD STRENGTH 250MPa BY JACK & BORE. AUGER HEAD MUST BE MAINTAINED A MINIMUM ONCE CASING DIAMETER BEHIND THE LEAD OR 0.5m, WHICHEVER IS GREATER.
NOTE: DIRECTIONAL DRILLING WILL NOT BE PERMITTED.
1095X1730mm HE II STORM SEWER
750mmø CONC WATERMAIN
ABANDONED 50mmø GAS MAIN
150mmø PVC WATERMAIN
1050mmø CONC STM.
500mmø CONC GAS MAIN
900mmø CSP STM.
250mmø GAS MAIN
300mmø DI WM
1200mmø WATERMAIN BY OTHERS
0+025
0+050
0+075
0+100
0+125
0+150
0+175

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

LICENSED PROFESSIONAL ENGINEER
D. C. J. RICE
100218817
JUNE 19, 2024
PROVINCE OF ONTARIO

APPROVED AS TO FORM, IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF DILLON CONSULTING LIMITED AS TO DESIGN AND SPECIFICATION.

MARK WINTERTON P.ENG., CITY ENGINEER
THE CORPORATION OF THE CITY OF WINDSOR

THE CITY OF WINDSOR

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
Δ	ADDENDUM #2	06/19/24	DCR
5	TENDER	05/31/24	DCR
4	ISSUED FOR TENDER REVIEW	05/03/24	DCR
3	ISSUED FOR 90% REVIEW	08/11/23	DCR
2	ISSUED FOR 60% REVIEW	04/09/22	MP
1	ISSUED FOR 30% REVIEW	12/17/21	M.P.

DESIGN	REVIEWED BY
DCR	VJH
DRAWN: MMM	CHECKED BY: RBH
DATE: MAY 2024	
SCALE: 1:250 1:50	

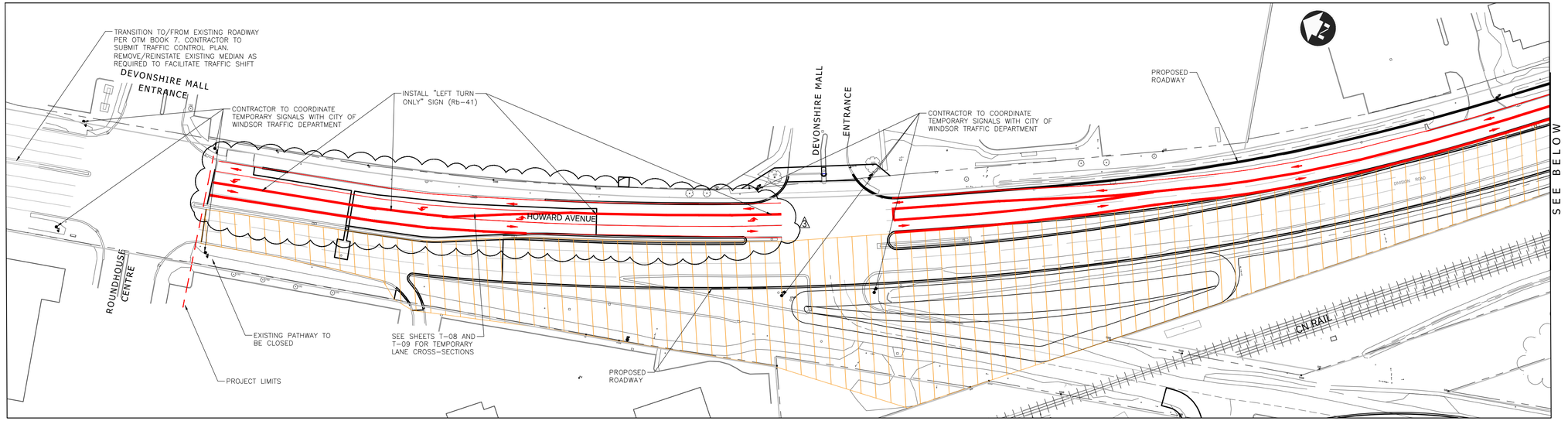
Howard Avenue & South Cameron Boulevard Intersection Improvements
City of Windsor

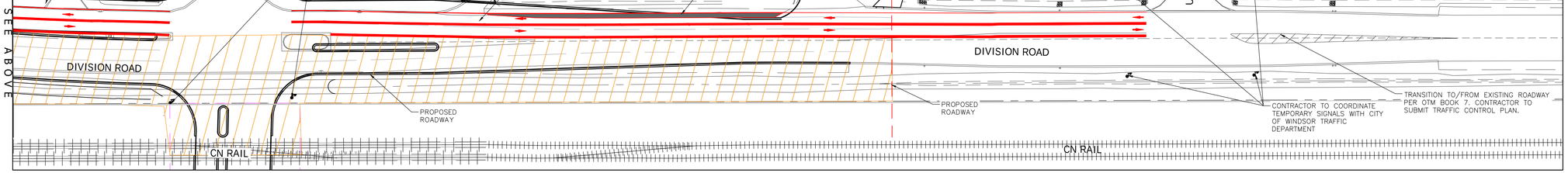
PLAN & PROFILE - UTILITIES
SYDNEY AVENUE
STA. 0+000 TO STA. 0+200

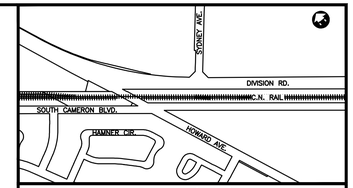
PROJECT NO. 20-3864

SHEET NO. U-09

DILLON CONSULTING LIMITED 3200 DEZIEL DRIVE, SUITE 608, WINDSOR, ONTARIO, N8W 5K8, PHONE (519) 948-5000, FAX (519) 948-5054







KEY PLAN (N.T.S.)

LEGEND

WORK ZONE #2A

TEMPORARY ASPHALT

CONSTRUCTION STAGING:

THE CONTRACTOR SHALL NOTE THE FOLLOWING CONSTRUCTION STAGING AS IT RELATES TO STAGING OF TRAFFIC AND TIME AND SPACE REQUIREMENTS FOR ADJACENT UTILITY AND RAIL WORKS. COORDINATION WITH UTILITY COMPANIES AND CN RAIL WILL BE REQUIRED PRIOR TO AND DURING CONSTRUCTION TO ALLOW FOR CONCURRENT CONSTRUCTION.

STAGE 1 – 2024

1. CONSTRUCTION OF THE NEW STORM AND SANITARY SEWER ON HOWARD AVENUE FROM SOUTH OF KENILWORTH DR. TO SOUTH CAMERON BLVD, SOUTH OF THE C.N. RAIL TRACKS. THE CONTRACTOR IS TO COODINATE WITH ENWIN FOLLOWING STORM SEWER INSTALLATION AND PROVIDE TIME AND SPACE FOR ENWIN'S CONTRACTOR TO INSTALL THE NEW HYDRO ROAD CROSSING.
2. IT IS INTENDED THAT THE EXISTING HOWARD RAIL CROSSING AND SOUTH CAMERON INTERSECTION ARE TO REMAIN OPEN FOLLOWING THE INSTALLATION OF UNDERGROUND WORKS. CLOSURE OF THESE AREAS IS TO BE LIMITED TO ONLY WHEN NECESSARY TO FACILITATE CONSTRUCTION.
3. FULL RECONSTRUCTION OF HOWARD AVE INCLUDING GRADING AND CURB RETURNS FOR THE NEW SYDNEY AVENUE EXTENSION, SIDEWALKS, PATHWAY STREET LIGHTING, TRAFFIC INFRASTRUCTURE AND RESTORATION.
4. IT IS EXPECTED THAT ROAD WORKS ALONG HOWARD & SOUTH CAMERON WILL NEED TO BE TERMINATED SOUTH OF THE EXISTING SOUTH CAMERON INTERSECTION TO ALLOW THE RAIL CROSSING AND INTERSECTION TO REMAIN OPEN UNTIL STAGE 2 OF THE WORKS COMMENCE. TEMPORARY PAVEMENT AND DRAINAGE WILL BE REQUIRED TO ACCOMMODATE THE CONNECTION BETWEEN EXISTING AND NEW ROAD WORKS.
5. THE CONTRACTOR TO COORDINATE AND PROVIDE TIME AND SPACE FOR CN RAIL TO COMPLETE UNDERGROUND WORKS AND REMOVE EXISTING WEST TRACK WITHIN THE CN ROW AT THE NEW CROSSING LOCATION.
6. GRADING, DRAINAGE, WATERMAIN, CURBING, AND BASE ASPHALT INSTALLATION BETWEEN CN RAIL TRACKS AND HOWARD AVENUE (WEST). CURBING AND BASE ASPHALT REQUIRED PRIOR TO CN SIGNAL INSTALLATION (EXPECTED 2025). CN RAIL PERMIT AND FLAG PERSONS REQUIRED.
7. INSTALLATION OF WATERMAIN UNDER RAIL CROSSING TO CN ROW LIMITS (EAST). CN PERMIT AND FLAG PERSONS REQUIRED.
8. MAINTAIN ACCESS TO HOMES AND BUSINESSES DURING CONSTRUCTION. THE CONTRACTOR TO COORDINATE WITH AFFECTED BUSINESS/HOME OWNERS WHEN ACCESSES MAY BE IMPACTED.
9. IT IS EXPECTED THAT HOWARD AVENUE BE OPEN TO REGULAR TRAFFIC BEFORE THE END OF 2024. CONTRACTOR TO PROVIDE AND MAINTAIN ALL NECESSARY TRAFFIC CONTROLS (BARRICADES, ETC.) UNTIL THE NEW RAIL CROSSING IS COMMISSIONED (2025).

STAGE 2A

1. CONSTRUCTION OF STORM SEWERS AND SWM FACILITY AND FULL RECONSTRUCTION OF THE SOUTH/WEST SIDE OF HOWARD/DIVISION ROAD FROM THE ROUNDHOUSE CENTER TO SOUTH OF SYDNEY AVE (WORK ZONE 2) INCLUDING WATERMAIN, THE WEST LEG OF THE PROPOSED SYDNEY EXTENSION, AND STORM SEWER LEADS WHICH ARE TO BE EXTENDED IN PHASE 2B.
2. INSTALL TEMPORARY TRAFFIC POLES AND PAVE TEMPORARY ASPHALT FOR WORK ZONE 2 TRAFFIC CONTROL. MAINTAIN TWO-WAY TRAFFIC AT ALL TIMES.
3. MAINTAIN ACCESS TO BUSINESSES DURING CONSTRUCTION. THE CONTRACTOR TO COORDINATE WITH AFFECTED BUSINESS OWNERS WHEN ACCESSES MAY BE IMPACTED.
4. COMPLETE REMAINING ROAD RECONSTRUCTION ALONG HOWARD AVE AND SOUTH CAMERON BOULEVARD.
5. EXISTING RAIL CROSSING TO BE CLOSED TO ACCOMMODATE WORKS.

STAGE 2B

1. CONSTRUCTION OF WATERMAIN, STORM DRAINAGE, AND FULL RECONSTRUCTION OF THE NORTH/EAST HALF OF HOWARD/DIVISION ROAD BETWEEN THE ROUNDHOUSE CENTER AND SOUTH OF SYDNEY AVE. (WORK ZONE 3) INCLUDING SIDEWALKS/PATHWAYS, STREET LIGHTING, TRAFFIC INFRASTRUCTURE AND RESTORATION.
2. REMOVAL OF TEMPORARY TRAFFIC POLES, SPANS WIRES AND GUYS
3. MAINTAIN ACCESS TO BUSINESSES DURING CONSTRUCTION. THE CONTRACTOR TO COORDINATE WITH AFFECTED BUSINESS OWNERS WHEN ACCESSES MAY BE IMPACTED

STAGE 3

1. FULL RECONSTRUCTION OF SYDNEY AVE. INCLUDING SIDEWALKS, STREET LIGHTING, TRAFFIC INFRASTRUCTURE AND RESTORATION.
2. FINAL CONSTRUCTION OF NEW SYDNEY AVE. EXTENSION (RAIL CROSSING) FOLLOWING THE INSTALLATION OF CN RAIL SIGNALS.

CONTRACTOR TO PROVIDE SIGNAGE AS REQUIRED TO DIRECT PEDESTRIANS TO SAFE CROSSINGS AND FACILITIES

TRAFFIC CONTROL GENERAL NOTES:

1. TRAFFIC CONTROL DRAWINGS PROVIDED HEREIN ARE INTENDED TO SERVE AS A GUIDE TO THE CONTRACTOR AND IN NO WAY RELIEVES THE CONTRACTOR OF THEIR OBLIGATIONS SO SPECIFIED IN THE CONTRACT DOCUMENTS.
2. ALL SIGNS SHALL CONFORM TO THE MOST RECENT EDITION OF THE ONTARIO TRAFFIC MANUAL– BOOK 7.
3. ALL SIGNS, BARRICADES, AND TEMPORARY SIGNALS SHALL BE INSPECTED REGULARLY AND MAINTAINED BY THE CONTRACTOR.
4. CONTRACTOR SHALL PREPARE AND SUBMIT TRAFFIC CONTROL PLANS INCLUDING ROAD CLOSURES AND DETOUR ROUTES AS MAY BE REQUIRED FOR EACH STAGE OF CONSTRUCTION TO THE CITY OF WINDSOR AND ENGINEER TWO WEEKS IN ADVANCE TRAFFIC CONTROL INSTALLATION.
5. TEMPORARY TRAFFIC SIGNALS AND MODIFICATION TO EXISTING TRAFFIC SIGNALS TO BE COORDINATED WITH THE CITY OF WINDSOR TRAFFIC ENGINEERING DEPARTMENT.
6. CONTRACTOR SHALL COVER CONFLICTING SIGNAGE AS NEEDED IN COORDINATION WITH THE CITY OF WINDSOR.
7. ACCESS TO BUSINESSES SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION. NO DRIVEWAY ACCESS TO BE OBSTRUCTED OVERNIGHT. THE CONTRACTOR IS TO SUPPLY, INSTALL, AND MAINTAIN BUSINESS SIGNAGE AS DIRECTED BY THE ENGINEER AND THE CITY FOR THE DURATION OF CONSTRUCTION.
8. CONTRACTOR TO NOTIFY AND UPDATE EMERGENCY SERVICES AND SCHOOL BUSES PRIOR TO THE START OF EACH STAGE OF CONSTRUCTION. CITY OF WINDSOR TO NOTIFY MEDIA COMMUNICATIONS.
9. ALL TRAFFIC SIGNAL INFRASTRUCTURE (TEMPORARY AND PERMANENT) TO BE LOCATED IN THE FIELD BY CITY OF WINDSOR TRAFFIC DEPARTMENT.
10. CITY OF WINDSOR TRAFFIC DEPARTMENT TO PERFORM ALL ABOVE GROUND WORKS, CABLING, ETC. FOR TRAFFIC INFRASTRUCTURE.
11. ADVANCED NOTICE (PVMS OR TC-67) 1 WEEK IN ADVANCE OF START OF PROJECT.

THIS TRAFFIC DETOUR PLAN MEETS THE MOST RECENT REQUIREMENTS OF THE ONTARIO TRAFFIC MANUAL - BOOK 7	APPROVED AS TO FORM, IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF DILLON CONSULTING LIMITED AS TO DESIGN AND SPECIFICATION.
EXECUTIVE DIRECTOR OF OPERATIONS THE CORPORATION OF THE CITY OF WINDSOR	CHIEF OF POLICE WINDSOR POLICE SERVICES

LICENSED PROFESSIONAL ENGINEER — D. C. J. RICE — 100218817 — June 19, 2024 — PROVINCE OF ONTARIO

APPROVED AS TO FORM, IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF DILLON CONSULTING LIMITED AS TO DESIGN AND SPECIFICATION.

MARK WINTERTON P.ENG., CITY ENGINEER
THE CORPORATION OF THE CITY OF WINDSOR

THE CITY OF WINDSOR

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
3	ADDENDUM #2	06/19/24	DCR
2	TENDER	05/31/24	DCR
1	ISSUED FOR TENDER REVIEW	05/03/24	DCR

DESIGN: DCR | REVIEWED BY: TMH
DRAWN: DCR | CHECKED BY: RBH
DATE: MAY 2024
SCALE: 1:750

Howard Avenue & South Cameron Boulevard Intersection Improvements
City of Windsor

TRAFFIC CONTROL, PAVEMENT MARKINGS & SIGNAGE
SUGGESTED CONSTRUCTION STAGING PLAN
WORK ZONE #2A

PROJECT NO. 20-3864

SHEET NO. T-07

FILENAME: C:\PW WORKING DIRECTORY\PROJECTS 2020\123MA\DMS7242\20-3864-02-TCP.DWG PLOTTED BY: MUELHAUPT, MANFRED
PLOT DATE: 2024-06-19 @ 5:34:05 PM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB
DILLON CONSULTING LIMITED 3200 DEZIEL DRIVE, SUITE 608, WINDSOR ONTARIO, N8E 5K8, PHONE (519) 948-5000, (519) 948-5054

THE CORPORATION OF THE CITY OF WINDSOR

GEOTECHNICAL INVESTIGATION REPORT (REV. 1)

HOWARD AVENUE AND SOUTH CAMERON INTERSECTION RECONSTRUCTION WINDSOR, ONTARIO

JUNE 14, 2024

GEOTECHNICAL INVESTIGATION REPORT (REV. 1)

HOWARD AVENUE AND SOUTH CAMERON INTERSECTION RECONSTRUCTION WINDSOR, ONTARIO

THE CORPORATION OF THE CITY OF WINDSOR

PROJECT NO.: OGTW2171
DATE: JUNE 14, 2024

WSP CANADA INC.
11865 COUNTY ROAD 42
TECUMSEH, ONTARIO, N8N 0H1

T: +1 519-735-2499
F: +1 519-735-9669
WSP.COM

June 14, 2024

The Corporation of the City of Windsor
350 City Hall Square, Suite 210
Windsor, Ontario
N9A 6S1

Attention: Mr. Patrick Winters, P.Eng.

Dear Mr. Winters:

Subject: Geotechnical Investigation Report (Rev. 1)

WSP Canada Inc. (formerly Wood Environment & Infrastructure Solutions Canada Ltd) was retained by The Corporation of the City of Windsor. (the "Client") to conduct a geotechnical investigation for the proposed reconstruction of the Howard Avenue and South Cameron intersection in Windsor, Ontario. The scope of the fieldwork for this geotechnical investigation was based on proposal number POGTW21538.

This report has been revised to address review comments from the Canadian National Railway dated June 3, 2024.

Yours sincerely,

Steve Suurnakki, CET
Senior Geotechnical Technologist

SS/DUP/ss
cc: Dirka U. Prout, Shane MacLeod
WSP ref.: OGTW2171

SIGNATURES

PREPARED BY

Steve Suurnakki, CET
Senior Geotechnical Technologist

APPROVED BY

Dirka U. Prout, P..Eng.
Lead Geotechnical Engineer

WSP Canada Inc. prepared this report solely for the use of the intended recipient, The Corporation of the City of Windsor., in accordance with the professional services agreement. The intended recipient is solely responsible for the disclosure of any information contained in this report. The content and opinions contained in the present report are based on the observations and/or information available to WSP Canada Inc. at the time of preparation. If a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP Canada Inc. does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report. This limitations statement is considered an integral part of this report.

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PRODUCTION TEAM

CLIENT

Engineering – Design & Development	Patrick Winters, P.Eng.

WSP

Senior Geotechnical Technologist	Steve Suurnakki, CET
Lead Geotechnical Engineer	Dirka U. Prout, P.Eng.

TABLE OF CONTENTS

TABLES

APPENDICES

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by The Corporation of the City of Windsor (the "Client") to conduct a geotechnical investigation for the proposed reconstruction of the Howard Avenue and South Cameron Boulevard intersection in Windsor, Ontario. On the south side of the rail tracks Howard Avenue connects to South Cameron Boulevard with a three way stop sign at the intersection. On the north side of the tracks, Howard Avenue connects to Division Road at a four-way intersection guided by traffic lights.

The project area is shown on the Key Plan, Figure 1.

The purpose of this investigation was to assess the existing soil conditions along Howard Avenue, South Cameron Boulevard and Division Road, and to provide geotechnical recommendations for the design of new pavement structure for the new intersections.

The scope of the fieldwork for this geotechnical investigation included sixteen (16) boreholes spaced randomly throughout the site with boring depths ranging from 2.0 m to 6.6 m below existing grade.

This report contains the findings of WSP's geotechnical investigation, together with recommendations and comments. The recommendations and comments are based on factual information at the test location and intended primarily for use by design engineers. The number of boreholes may not be sufficient to determine all of the factors that may affect construction methods and costs. Subsurface and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction that could not be detected or anticipated at the time of the site investigation.

The anticipated construction conditions are also discussed, but only to the extent that they may influence the design decisions. The feasible construction methods, however, express our opinion and are not intended to direct contractors on how they carry out construction. Contractors should also be aware that the data and their interpretation presented in this report may not be sufficient to assess all factors that may have effect upon construction.

This report has been prepared with the assumption that the design will be in accordance with good engineering practices, applicable regulations of jurisdictional authorities, and applicable standards and regulations. Further, the recommendations and opinions in this report are applicable only to the proposed project. Hydrogeological considerations were not included in this scope of work. Environmental considerations are included under a separate cover. The limitations of this report, as discussed in detail in Appendix A, constitute an integral part of this report.

There should be an ongoing liaison with WSP during both the design and construction phases of this project to ensure that the recommendations in this report have been adequately interpreted and implemented. Also, any further clarification and/or elaboration are needed concerning the geotechnical aspects of this project, WSP should be contacted immediately.

2 SITE DESCRIPTION & GEOLOGICAL BACKGROUND

2.1 SITE DESCIPTION

The site was located at the intersection of Howard Avenue and South Cameron Boulevard and along Division Road between Sydney Avenue and Howard Avenue in the city of Windsor, Ontario. Howard Avenue and South Cameron Boulevard are both undivided two-lane roads and meet at a three way stop just south of the rail tracks. This intersection is to be redesigned so that Howard Avenue will no longer cross over the tracks negating the current stop signs at the intersection. Traffic heading south along Howard Avenue will now have to turn right at the proposed new intersection at Division Road and Sydney Avenue. The proposed intersection at Sydney Avenue will allow traffic to re-connect with Howard Avenue.

2.2 GEOLOGICAL BACKGROUND

The site is located within a geological formation known as Essex Clay Plain, which is an extensive clay plain with little relief and poor natural drainage. The plain is underlain by a relatively thick deposit of glaciolacustrine silty clay to silty clay till. Occasional embedded pockets and lenses of sand and silt are present within the overburden clay. The clay deposit is underlain by limestone bedrock at a depth of 35 m to 45 m, based on available drift thickness mapping (Ontario Geological Survey, Preliminary Map P.3255, 1994).

3 INVESTIGATION PROGRAM

3.1 FIELD WORK

The scope of the geotechnical fieldwork included eight (8) sampled boreholes to a depth of 6.6 m and eight (8) sampled boreholes 2.0 m for a total of sixteen (16) sampled boreholes designated as BH01 to BH16, inclusive.

The locations of the boreholes from this geotechnical investigation are shown on Figure 2. The coordinates of the boreholes are shown on the Record of Borehole sheets attached in Appendix B. The coordinates at the borehole locations were recorded in the field using a hand-held GPS device with a horizontal accuracy of 3 m.

The borehole drilling program for this investigation was carried out on October 27th and 28th, 2021 and April 26th and May 9th, 2022. The boreholes were advanced using a self-propelled drilling machine equipped with hollow stem augers and conventional soil sampling tools. Soil samples were taken at frequent intervals of depth following the Standard Penetration Test (ASTM D1586) procedure.

The drilling was conducted under the full-time supervision of WSP's engineering staff who directed the drilling and sampling operation and logged the boreholes.

After completion of the boreholes, the augers were extracted, the boreholes were inspected for groundwater and caving, then backfilled using bentonite pellets in accordance with O. Reg. 903. The surface of the pavement at the borehole locations was repaired using "cold-patch" asphalt.

All samples were field logged, placed in airtight containers, and transported to WSP's Windsor laboratory for further examination and testing.

Natural moisture content tests were carried out in accordance with ASTM D2216 on all the recovered soil samples. One selected native soil sample was tested for the grain size distribution and Atterberg limits in accordance with ASTM D6913 and ASTM D4318.

4 SUBSURFACE CONDITONS

4.1 SUBSURFACE SOIL CONDITIONS

The following is a summary of the subsurface soil conditions encountered in the boreholes advanced at the site. The results of geotechnical laboratory testing carried out on select samples are also shown on the Record of Borehole sheets in Appendix B.

Topsoil

Boreholes BH03, BH04 and BH16 were advanced in the vacant lot where Sydney Avenue will connect to Howard Avenue and encountered topsoil at the ground surface. The topsoil thickness ranged from 175 millimetres (mm) to 330 mm.

Materials designated as topsoil in this report were classified solely based on visual and textural evidence. Testing of organic content or for other nutrients was not carried out. Therefore, the use of materials classified as topsoil cannot be relied upon for support and growth of landscaping vegetation.

Asphalt Concrete and Granular Fill

Asphalt and a granular base were encountered in ten of the boreholes. The asphalt encountered ranged in thickness between 150 mm to 280 mm. The granular fill in these boreholes ranged from 150 mm to 735 mm. Concrete was encountered below the asphalt in three boreholes BH02, BH05 and BH07, and ranged in thickness between 175 mm and 255 mm. Silty clay fills and sandy fills were encountered in eight boreholes below the pavement structure and ranged in thickness between 150 mm to 1645 mm. Table 4.1 below indicates the thicknesses of the asphalt and various fill materials in each borehole. Borehole BH10 was terminated within the sandy fills (2.0 metres (m) below ground surface) and may have been within an existing sewer trench.

Table 4.1 Asphalt Concrete & Fill Thickness

Borehole ID	Topsoil Thickness (mm)	Asphalt Thickness (mm)	Granular Fill Thickness (mm)	Concrete Thickness (mm)	Sand to Sand & Gravel Fill Thickness (mm)
BH01	-	205	150	-	860
BH02	-	240	-	255	-
BH03	330	-	-	-	-
BH04	305	-	-	-	-
BH05	-	205	-	205	-
BH06	-	205	610	-	150
BH07	-	175	560	175	-
BH08	-	255	710	-	-

Borehole ID	Topsoil Thickness (mm)	Asphalt Thickness (mm)	Granular Fill Thickness (mm)	Concrete Thickness (mm)	Sand to Sand & Gravel Fill Thickness (mm)
BH09	-	280	-	-	940
BH10	-	205	150	-	1625
BH11	-	280	480	-	1065
BH12	-	205	735	-	735
BH13	-	150	533	-	700
BH14	-	230	685	-	460
BH15	-	230	480	-	-
BH16	175	-	-	-	-

Silty Clay

Underlying the fill, the boreholes penetrated an extensive stratum of silty clay. This stratum generally divides into three general zones, the 'weathered' zone, the 'crust' and the grey zone.

The upper zone was generally weathered and extended to a depth of 1.5 to 2.2 m below grade. Soils in the weathered zone are subjected to freeze-thaw cycles, and changes in moisture content caused by seasonal weather variations. This zone is characterized by fissures, with a mottled brown and grey appearance. The measured "N" values from Standard Penetration Test ranged from 3 blows to 14 blows per 0.3 m penetration, indicating a soft to stiff consistency. The moisture contents of the mottled silty clay ranged from 13% to 29%.

Below the weathered zone was the crust. The crust was characterized by a brown colour, and a minor amount of oxidation. The crust extended to a depth of approximately 2.0 m to 4.2 m below grade. The measured "N" values from Standard Penetration Test ranged from 9 blows to 27 blows per 0.3 m penetration, indicating a stiff to very stiff consistency. The moisture content of the brown silty clay ranged from 13% to 16%.

Underlying the crust was the grey zone. This zone of the silty clay stratum was generally characterized by increased natural moisture contents, and virtually no fissures. The measured "N" values from Standard Penetration Test ranged from 6 blows to 16 blows per 0.3 m penetration, indicating a firm to very stiff consistency. The moisture contents of the grey silty clay ranged from 9% to 16%.

Grain size distribution analysis and an Atterberg limits test will be carried out on one sample of the brown silty clay, and the results of these tests are included on the borehole log sheet and attached in Appendix C.

Table 4.2 Results of Grain Size and Atterberg Limits Tests

Borehole No./		Grain Size Distribution	Atterberg Limits	USCS

Sample No.	Sample Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (W_L)	Plastic Limit (W_P)	Plasticity Index (I_P)	Modified Group Symbol
BH-3/SA6	4.6 to 5.0	2.1	30.1	41.4	26.4	25.4	14.4	11.1	CL

4.2 GROUNDWATER

The remaining boreholes were left open upon completion of drilling. With the exception of borehole BH-16, where groundwater was encountered at a depth of 1.1 m or Elevation 186.2 m, the boreholes remained dry for the relatively brief period between withdrawal of the augers and backfilling of the boreholes. Due to the low permeability of the clayey soil at the site, insufficient time had passed to allow stabilization of groundwater levels in the open boreholes.

Typically, the grey colour of the soils noted at a depth of about 3.6 m to 4.2 m (Elevation 182.5 m to 183.5 m) below grade is indicative of a permanent saturated condition, and therefore, fluctuation of the long-term groundwater should be anticipated near this depth level. However, during and after local precipitation events, groundwater that is 'perched' above the long-term level may accumulate in the fills, weathered and fissured clay near the ground surface above the relatively more impervious grey silty clay. This condition is likely the case at BH-16. In addition, significant amounts of groundwater may be present in any fill materials around existing utilities that may be present.

Perched groundwater may rise to the ground surface following precipitation and snowmelt. In the absence of an active, engineered drainage system, the design should assume possible temporary groundwater levels rising to the ground surface.

5 DISCUSSION & RECOMMENDATIONS

5.1 GENERAL

It is understood that The Corporation of the City of Windsor is planning to reconstruct intersections at the Howard Avenue and South Cameron Boulevard intersection and at the Division Road and Sydney Avenue intersection. The project will consist of an improved intersection at Sydney Avenue and Division Road that will see Sydney Avenue connect with Howard Avenue. The intersection at Howard Avenue and South Cameron Boulevard will be removed. New utilities will be installed along Howard Avenue with the maximum depth of utilities being estimated at 4.5 m below ground surface.

The subsurface conditions in the work area generally consist of a composite asphalt and concrete pavement structure, underlain by sand and gravel fill over firm to stiff silty clay.

5.2 INTERPRETED SOIL DESIGN PARAMATERS

Based on the subsurface conditions encountered in the boreholes and the results of the laboratory testing, the following table summarizes the recommended soil parameters for design. The recommended unfactored properties were derived based on limited testing and semi-empirical correlations.

Table 5.1 Interpreted Native Soil Parameter Design Values

Soil	Bulk Unit Weight (kN/m^3)	Buoyant Unit Weight (kN/m^3)	Effective Angle of Internal Friction, Phi' (degrees)	Undrained Cohesion, C' (kPa)
Undisturbed Firm Silty Clay	19.5 to 20.5	9.7 to 10.7	28	25 to 50
Undisturbed Stiff to Very Stiff Silty Clay	20.5 to 21.0	10.7 to 11.2	30	50 to 100

5.3 GENERAL RECOMMENDATIONS FOR EXCAVATIONS

Excavations can be made with conventional equipment and open cut methods where space requirements permit. If seepage from perched groundwater and runoff flow are prevented, groundwater seepage from native cohesive deposits is expected to be nominal and manageable by conventional dewatering from filtered sumps.

Excavations must be carried out in accordance with Ontario Regulation 213/91 of the Occupational Health and Safety Act (OHSA) as amended. These regulations designate four broad classifications of soils to stipulate appropriate measures for excavation safety. The existing dewatered fills and the native silty clay materials which will be generally encountered within the trenching excavations are classified as Type 3. Saturated granular fills are

considered to be Type 4 soils. Excavations may be carried out with unsupported side-slopes no steeper than 1V:1H in Type 3 soils and 1V:3H in Type 4 soils.

Alternatively, a trench liner box could be used for temporary support of vertical excavations providing the natural deposits are properly dewatered where required. It should be noted that additional measures may be necessary to protect the health and safety of the workers even if work is carried out using a trench liner box.

It is understood that an open cut option is desired for the installation of the watermain. If other installation methods such as trenchless are to be considered WSP should be notified, and further recommendations can be provided.

5.4 EARTH PRESSURES

A distinction should be made between short-term earth pressures on temporary excavation support structures, and long-term retaining structures against compacted backfill.

As a preliminary guideline, the temporary shoring structures should be verified for conventional uniform earth pressures of at least 0.35 Pz, (Pz, in kPa, is the overburden pressure corresponding to the depth 'z' of excavation below the ground surface). For the in-situ soils a conservative unit weight of 22 kN/m^3 should be used. Surcharges at the ground surface should be added in accordance with applicable soil mechanics methods such as described in the Canadian Foundation Engineering Manual (CFEM).

For permanent structures, unfactored earth pressure coefficients and associated unit weights are presented in Table 5.2.

Table 5.2 Soil Parameters for Earth Pressure Calculations

Backfill Type	Coefficient of Earth Pressure at Active Case	Coefficient of Earth Pressure at Passive Case	Coefficient of Earth Pressure at Rest Case	Design Bulk Unit Weight (kN/m^3)	Friction Angle (degrees)
Select Crushed Limestone (Granular 'A') (*)	0.27 to 0.30	3.4 to 3.7	0.43 to 0.46	22	33 to 35
Well Graded Sand (Granular 'B', Type I) (*)	0.31 to 0.35	2.9 to 3.2	0.47 to 0.52	21.0 to 21.5	29 to 32
Site Generated Silty Clay (**)	0.33 to 0.36	2.8 to 3.0	0.50 to 0.53	19.5 to 21.0	28 to 30

(*) All granular compacted to at least 98% Standard Proctor Maximum Dry Density (SPMDD).
(**) Compacted to at least 95% SPMDD.

The design earth pressures in compacted backfill should be augmented with the additional pressures induced by compaction efforts, which typically are taken as a uniform 12 kPa pressure over the entire depth below grade where the calculated earth pressure based on the above earth pressure factors is less than 12 kPa.

Surcharges at the ground surface should be considered in all cases.

Consideration should be given to using the submerged weight plus the hydrostatic pressures where the soil is below the groundwater table unless a permanent dewatering system is installed.

The above coefficients apply to simple cases of retaining structures (wall not higher than typically 4.5 m, horizontal ground surface of the backfill, non-frost susceptible backfill etc.). In case of more complex conditions, appropriate methods should be used as indicated in the Canadian Foundation Engineering Manual (CFEM).

5.5 GROUNDWATER CONTROL DURING CONSTRUCTION

Groundwater inflow into excavations in the clayey soils is expected to be low. 'Perched' groundwater may be present within the granular fill, intersected utility trenches and weathered materials particularly during and after local precipitation events. In this case, the inflow into excavations may become substantial.

The soils identified are sensitive to disturbance by water. Groundwater and surface water run-off should be removed from excavations by means of pumping from strategically placed open sumps located within the excavation bottom but outside the zone of influence of any foundations.

In order to limit the effects of the ground seepage through the fill and surface water run off which may cause sloughing, the trenches should be excavated in short sections (2 to 4 pipe sections in length) and backfilled the same day. The trench length could be adjusted during construction based on soil and groundwater conditions, however, a maximum length of trench of 15 m to be open in advance is recommended in OPSS 401.07.09. The work area should be graded to direct surface water flows away from the excavations.

If the trench base intersects saturated layers of fine sand and silt, basal instability by piping (boiling) can occur. Where encountered, the condition and extent of the wet layers of sand/silt should be assessed by boreholes and/or test pits before the excavation continues to the design trench base elevation.

5.6 PROTECTION OF EXISTING SERVICES

It is recommended that the alignment and depths of existing utilities be checked relative to the proposed watermain trenches. In general, if movement of existing utilities and other settlement sensitive elements is to be minimized, it will be necessary to carry out watermain construction in properly sheeted and braced excavations. If, however, some movement of the adjacent utilities can be tolerated, watermain installation within a prefabricated support system (trench liner box) is probably acceptable.

Longitudinal open sections of the trenches should be kept to a minimum and backfilling of the trenches should be carried out immediately behind the support system. Any utilities along the proposed route of the trenches should be continuously monitored during construction so that corrective action can be taken if significant ground movement is observed.

A number of existing utility lines will likely cross the proposed alignments. Where existing services are exposed during the excavation, suitable temporary or permanent support of these services should be provided consistent with the requirements of the respective utility company.

5.7 PIPE BEDDING, COVER & BACKFILL

5.7.1 PIPE BEDDING & COVER

The depth of the pipe bedding should be a minimum of 150 mm; the pipe cover should be completed to at least 300 mm above the pipe crown. Compaction shall be 100% of the pipe cover and 98% for the pipe bedding as per City of Windsor Standards (refer to AS-310B). All bedding, clearance and cover materials should consist of Granular 'A' or approved Granular B Type I, or unshrinkable fill, in accordance with the City of Windsor requirements.

In the unlikely case of poor subgrade conditions, a granular clear stone bedding meeting the gradation specifications for sewer stone (equivalent to HL4 coarse aggregate per OPSS 1150) may also be used as bedding and cover material, however a non-woven geotextile should be used as a separation fabric between this material and the native soils. It is further recommended that, where used, the geotextile have a minimum overlap of 300 mm and the seams should be stitched to prevent separation of the geotextile at the seams.

Care should be exercised to avoid compaction methods that may damage the pipe. The placement and thickness of the granular bedding should also meet the pipe manufacturer's specifications.

5.7.2 BURIED STRUCTURE BEDDING & BACKFILL

Bedding and backfill materials shall be placed in accordance with City of Windsor Specifications on approved subgrade at the bottom of the excavation and around manholes and catch basins, and compacted to 95% SPMDD and in lifts not exceeding 300 mm. Within the thickness of the pavement structures and a distance of 1.0 m from the structure, the backfill should be compacted to 100% SPMDD using hand operated small compactors.

Backfill within the depth of frost penetration should match the adjacent roadway granular materials and should be maintained and drained at all times to prevent accumulation of perched groundwater causing frost heave of the pavement abutting the manholes. Filtered stub drains discharging into the manhole should be considered.

5.7.3 TRENCH BACKFILLING

The project area is located within a deposit of silty clay. WSP recommends the backfill material from 300 mm above the top of pipe to the pavement subgrade level should match, if possible, with the existing soils encountered in the trench walls, especially within the depth of frost penetration (about 1.0 m below finished grades). Alternatively, in conjunction with a well graded subgrade and use of sub drain along the curb line, imported Granular 'A' or 'B' Type I, or approved reclaimed well-graded 0-75 mm granular or approved well-graded recycled

aggregate placed in lifts not exceeding 200 mm and compacted to 98% of SPMDD may be used in accordance with the City of Windsor standard trench backfill details (AS-536).

Consideration could be given to the reuse of the site generated soils from the existing pavement structure as general trench backfill. However, the excavated materials should be carefully sorted and stockpiled by type and any overly wet or deleterious materials should be removed and disposed. Excavated granular material should meet the requirements of City of Windsor Specifications. Prior to use of these materials, the geotechnical consultant should inspect the stockpiled soil and take samples for testing. Depending upon the test results, the soils may be suitable for use as backfill material.

Anti-seepage barriers (clay/bentonite plugs) should be considered at strategic locations along the utility trenches to control the random flow of the perched groundwater accumulated in the trenches.

As mentioned earlier, in the areas where the trench excavation underlies the roadway, it is good practice to backfill the trench below the road structure with excavated, compactable native inorganic material, at least within the upper frost zone (1.0 m below grade), to provide compatibility with similar native soils, and alleviate the concern of yearly differential frost heaving movements between the trench backfill and the adjacent native soils. However, the compactability of granular fill material within a small trench may be easier during construction as compared to silty clay fill material. If the silty clay fill is not compacted properly or, difficulty in compaction efforts is encountered, settlement of the trench alignment may occur over time

5.7.4 REACTION BLOCKS

Reaction blocks, if required, should be placed on competent subgrade, or engineered backfill placed on approved subgrade. The active earth pressures and passive resistances can be calculated using the earth pressure coefficients described in Table 4. A reduction factor of at least 2.0 should be applied to the passive resistance. An unfactored friction / adhesion coefficient of 0.4 may be used at the bottom of the reaction block. Buoyancy effects should be accounted for unless the trench backfill is fully drained at all times.

5.8 PAVEMENT DESIGN

It is understood that new pavement construction for the entire width and length of the roadway section will be completed. We understand that the roadways involved in this project fall under heavy traffic loads including bus routes. During our investigation, the traffic consisted of heavy local residential traffic and buses. Therefore, the following pavement section is recommended as a minimum for use at these sites.

Table 5.3 Flexible Pavement Design

Layer	Material	Thickness for Flexible Pavement (mm)
Asphaltic Concrete	OPSS 1150 HL3 Surface Asphalt[1]	50
	OPSS 1150 HL4 Base Asphalt[2]	150[3]
Granular Base	OPSS 1010 Granular 'A'	450

Notes:

1. For increased durability in pavement surface coarse, SP12.5 FC2 maybe considered at 1:1 ratio
2. For increased durability in pavement base coarse, SP19 maybe considered at 1:1 ratio
3. Minimum of two lifts of 75 mm each.

The subgrade material should be sloped to promote drainage and prevent the build-up and stagnation of pore water within the granular base. The Contractor should conduct non-vibratory proof-rolling of the subgrade soils, which should be inspected by a geotechnical consultant prior to the placement of the granular base. Any soft spots noted during the proof-roll should be sub- excavated and replaced with approved granular backfill such as Granular 'B' Type I or Type II (OPSS 1010).

All granular base and sub-base material must meet the corresponding OPSS 1010 requirements and be placed in 200 mm thick loose lifts and compacted to 100% of SPMDD.

The recommended pavement structure above, is based on the assumption the roadway will be used by passenger (car) vehicles and some heavy trucks.

The base layer should be hydraulically connected to filtered subdrains to prevent the buildup of standing water in the base layer and on the surface.

The pavement structure noted above is based on the assumption that construction will take place under dry weather and subgrade conditions. If the construction is not carried out during dry weather conditions, it may be necessary to increase the recommended thicknesses of the pavement structure and the geotechnical engineer should be allowed to re-evaluate the structure and construction requirements.

5.9 FROST DEPTH

WSP recommends a depth of 1.0 m for frost protection as per OPSD 3090.101, (November 2010).

5.10 DRAINAGE

To meet the design requirements for the pavement life, the pavement granular base should be well drained at all times. This can be accomplished by installing perforated subdrain pipes along both sides of the road, below the roadbed level, to ensure effective drainage in accordance with OPSD 216.021. The subdrain pipes should be surrounded by a minimum drainage zone of 20 mm size clear stone of minimum 150 mm thickness and wrapped in suitable non-woven geotextile to provide separation from the surrounding soil.

A minimum slope of 3% should be maintained for the subgrade, and a minimum slope of 2% should be maintained across the surface of the paved sections to ensure proper surface drainage.

5.11 TRANSITION TREATMENTS

At the limits of the project, a butt joint with the existing pavement is recommended. The butt joint between successive lifts of hot mix should be staggered a distance not less than 5 m in accordance with OPSS 313. No joint location should correspond with a joint location in any other layer, along the road.

5.12 PAVEMENT CONSTRUCTION CONSIDERATIONS

The pavement structure maybe placed on a stable subgrade as confirmed by proof-roll inspections by a heavy roller in the presence of the Geotechnical Consultant. As indicated, any soft or loose spots revealed by the proof-rolling should be sub-excavated and replaced with approved site generated granular or imported Granular 'B' Type I (OPSS 1010). The sub-grade material should be sloped to promote drainage and prevent the build-up and stagnation of pore water within the granular base.

Where new fill is needed to raise the grade, or replace disturbed portions of the subgrade, imported granular fill conforming to the gradation requirements of OPSS Granular 'B' Type I (OPSS 1010) should be placed in thin lifts (maximum 200 mm thick) and compacted to 98% of SPMDD. The long-term performance of the pavement structure is dependent upon the sub-grade support conditions. Stringent construction control procedures must be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as practically possible where fill is placed and that the subgrade is not disturbed or weakened after it is exposed.

Control of surface water is a significant factor in achieving good pavement life. Grading adjacent to pavement area must be designed so that water is not allowed to pond adjacent to the outside edges of the pavement or curb.

The subgrade soils identified in this report are sensitive to disturbance from excessive exposure to construction traffic (vehicular and pedestrian). Once the excavations have been completed to design elevations, the Geotechnical Consultant should immediately inspect the subgrade soils. Upon approval, the subgrade soil should be protected from further exposure. Disturbance by construction traffic may compromise the bearing resistances of the soils and necessitate further excavation.

If construction is to be completed during the winter months additional care should be given to protecting any subgrade from freezing. No backfill materials shall be placed on frozen subgrade and all backfill shall be free of frozen materials.

5.13 JACK AND BORE

Jack and bore installation of the watermain is the preferred method of installation. The watermain will be installed at a depth of approximately 2.8 m below grade and will be installed within a 300 mm steel casing with 9.53 mm wall thickness. The bore will be 23.5 m long with an invert elevation of 185.5 m. The depth of cover below both tracks is approximately 2.7 m.

The pipe jacking and boring or horizontal auger boring methods involve drilling a near horizontal borehole from a jacking (sending) pit with a rotating cutter head and jacking a liner/bore pipe to support the borehole walls. The bore pipe is pushed by a jacking system though a thrust block that uniformly distributes the thrust load on the bore pipe cross-section. The soil within the bore pipe is then excavated and spoil from the tunnel excavation is transported to the jacking pit along helical wound auger flights. After the bore pipe is fully installed, the new pipe is welded onto the bore pipe and pulled or pushed into place. In soft or unstable ground conditions, boring and jacking operations are performed simultaneously to minimize ground loss. Lubrication may be provided to reduce the friction between the bore pipe and the borehole walls. The characteristics and stickiness of the surrounding soil should be considered in selecting the appropriate lubricant.

During the jack and bore operations, the bore pipe should be advanced as far ahead of the augers as possible such that the auger is maintained behind the leading edge of the bore pipe creating a plug of soil material at the face. Therefore, it is recommended that auger head maintains at least the equivalent of two pipe diameters behind the leading edge of the bore pipe.

Based on the stratigraphy in boreholes BH15 and BH16, it appears that the tunnel window will be through firm to very stiff silty clay with silt seams and completed above the long-term groundwater level. The anticipated soil behaviour is firm with slow ravelling occurring where the silty clay is fissured or has silt seams.

The works will likely be carried out above the groundwater table; however, though not encountered within the boreholes, sand pockets are known to occur within the mottled brown and grey silty clay and may contribute to water seepage within the tunnel excavation, especially during and after precipitation events. The contractor should be prepared in the event significant amounts of water are present within the excavation.

The volume of mucked soil should be monitored to provide an indication of the ground loss. Should any sudden loss of ground occur, the contractor should be prepared to properly bulkhead the bore pipe immediately and carry out remedial work (such as grouting of the void between the pipe and soil) as soon as possible to minimize future settlements.

The jack and bore operations should be carried out in general accordance with Ontario Provincial Standard Specification OPSS 416. The accuracy (line and grade) of a jack and bore installation is highly dependent on the initial set up, hence the elevation and gradient of the steel liner should be controlled and maintained during the course of the jack and bore. Jacking forces should be continually monitored and the level and alignment of the lead end of the bore pipe checked routinely. It is recommended that on-site inspections be carried out by the

geotechnical consultant to monitor the progress of the work and document the soil conditions encountered during the bore.

Ground movements should be monitored during the steel pipe installation to confirm permissible ground surface movement (i.e., settlement/heave) tolerances are not exceeded (see Section 5.14.3).

5.14 SETTLEMENT MONITORING

The proposed watermain will be installed perpendicular to Division Road at Sydney Avenue and continue westerly under the railway tracks towards Howard Avenue. The railway tracks run parallel to Division Road on the west side of Division Road and will require monitoring during the jack and bore activities.

The subsurface conditions encountered in the boreholes advanced at the site generally consist of topsoil or asphalt, granular road base underlain by firm to stiff mottled brown and grey silty clay, very stiff brown silty clay and stiff to very stiff grey silty clay. As the installation will take place beneath Division Road and within the railway right of way, the proposed jack and bore profile will be predominately within the brown silty clay deposit.

5.14.1 METHODS OF INSTRUMENTATION INSTALLATION

Settlements associated with trenchless installation methods such as jack and bore installations are typically of two types:

— Large settlements: These settlements are the result of loss of ground due to over-excavation caused by the inability to control adverse ground conditions or due to the tunnelling operators' errors. Large settlements can lead to the creation of voids and/or sinkholes above the installed pipeline.

— Systematic settlements: These settlements are primarily caused by the collapse of the annular space between the pipe and the bore annulus or by deformation of the soils ahead of the advanced bore.

Transportation agencies typically accept an allowable settlement for railroads ranging from 6 mm to 12.5 mm and 25 mm for surface streets.[1] Considering the selection of the jack and bore installation method, the estimated ground surface settlement would be 7mm or less assuming the volume of the settlement trough is approximately 40% of the volume of the annulus. An overcut of 25 mm was assumed. The estimated width of the settlement trough is 3.8 m.

— Notwithstanding the above, an instrumentation and monitoring program will be implemented at the proposed crossing location in order to:

— Document the effects of tunnel installation on the overlying railway crossing;

[1] HDD Consortium 2008. Horizontal Directional Drilling Good Practices Guidelines, Third Edition.

— Obtain prior warning of ground movements that could occur due to the construction methods and equipment or unforeseen ground conditions;

— Verify the Contractor's compliance with the settlement limits imposed to satisfy CN Rail guidelines for rail encroachment; and,

— Allow adjustments to be made to the installation methods such that the settlement limits established are not exceeded.

The proposed monitoring locations are shown on Figure 3 and the details regarding the installations are provided below. An array of five monitoring points will be installed at a 2 m spacing above and centered on the casing alignment, on either side of the two active rail lines, including between them.

The remaining survey monitoring points will consist of hammer (or augured if hammering is not possible) driven 10 mm diameter steel rods a minimum 900 mm in length. The details of the installation method can be found on Figure 3, attached. These points will be replaced by in- ground monitoring points if driving them as deep as 900 mm becomes impractical.

A minimum of two in-ground settlement monitoring points will be installed directly over the centerline of the proposed watermain on the north and south sides of the railway corridor about 1.2 m below ground surface. The in-ground settlement monitoring points will be installed in pre- augured holes and consist of continuous steel rods cement grouted for a minimum of 200 mm length at the tip of the installation, as shown on Figure 3, attached.

A specialist surveying firm will be retained to confirm the set up and to carry out the settlement monitoring during construction; their equipment and procedures must be capable of surveying the settlement point elevations to within 2 mm of the actual elevations.

Measurements of the monitoring points will be reported promptly to the Client for review. A procedure is required to be established in consultation with the Client so that the monitoring data and the interpreted data will reach all parties as soon as necessary.

5.14.2 FREQUENCY OF MONITORING

The installations and the subsequent survey monitoring would be done by a licensed surveying consultant responsible for implementing the program with the results being promptly reviewed by WSP on an ongoing basis. A condition survey to document the existing rail condition should also be carried out prior to the start of construction. The condition survey should include descriptions and locations of visible distress such as distortions, deviations, heaves and depressions. A baseline survey will be carried out at least twice prior to construction with the points referenced to two independent benchmarks. Anomalous readings will be rechecked and re-baselined, if necessary. As a minimum, the consultant responsible for survey monitoring will:

— Assign each monitoring point a unique identifier and note the location;

— Note the date and elevation of baseline readings and all subsequent readings; and

— Note differences in elevation.

Monitoring will be carried out at the following frequencies:

— All monitoring points should be read at least twice (on separate days) before the start of tunnelling to establish a preconstruction baseline;

— All points will be read three (3) times per day including shut-down periods and weekends over the duration of the tunnel drive within the rail corridor. The effectiveness of this monitoring method could be impacted by weather conditions if the work is undertaken during wintertime, and;

— The monitoring points will be read and recorded three time per day during the time the tunnel is bored and the watermain is pulled in, within the rail corridor. After installation daily measurements will be obtained for a period of at least two (2) weeks, provided that any further settlement has ceased.

5.14.3 ACTION ITEMS

The following review and alert levels with the associated actions items are proposed for the proposed trenchless crossing:

— Below Review Level - Proceed: The detected cumulative settlements (movements) of less than 10 mm are considered acceptable and do not require any actions to be taken.

— Review Level - Proceed with Caution: If cumulative settlement of 10 mm to 14 mm is reached (Review Level) at the location of any of the monitoring points, the contractor should be required to provide a formal plan that states what is going to be done to ensure that the Alert Level is not reached. Monitoring will continue with an increased reading frequency; however, undercrossing excavation will not continue until movement has stabilized/stopped. If greater than 10 mm and less than 20 mm of vertical movement is recorded at a deep in-ground settlement point, but the survey of the surface points confirms that movements are below the review level of 10 mm, the work will be authorized to continue.

— Alert Level - Cease Operations: If cumulative settlement of 15 mm and above is reached, for a surface settlement point, or over 20 mm is reached for a deep in-ground settlement point the trenchless installation will be ceased immediately. The Client, as well as CN Rail, would have the authority to order that the Contractor alter the tunneling methods prior to continuing with the installation or recommend remedial actions as necessary. Monitoring frequency will be increased as required to determine if additional settlements are occurring, until such time that WSP and the Client can confirm that the settlements have stabilized/stopped.

6 CLOSURE

The limitations of this report, as discussed in detail in Appendix A, constitute an integral part of this report. We recommend the Geotechnical Consultant be retained to review drawings and the intended methods of construction prior to implementation in order to assure conformance with the geotechnical restrictions and assumptions.

We trust this report is complete within the terms of our reference. However, should questions arise concerning this report, do not hesitate to contact us.

Sincerely,

WSP Canada Inc.

Prepared By:

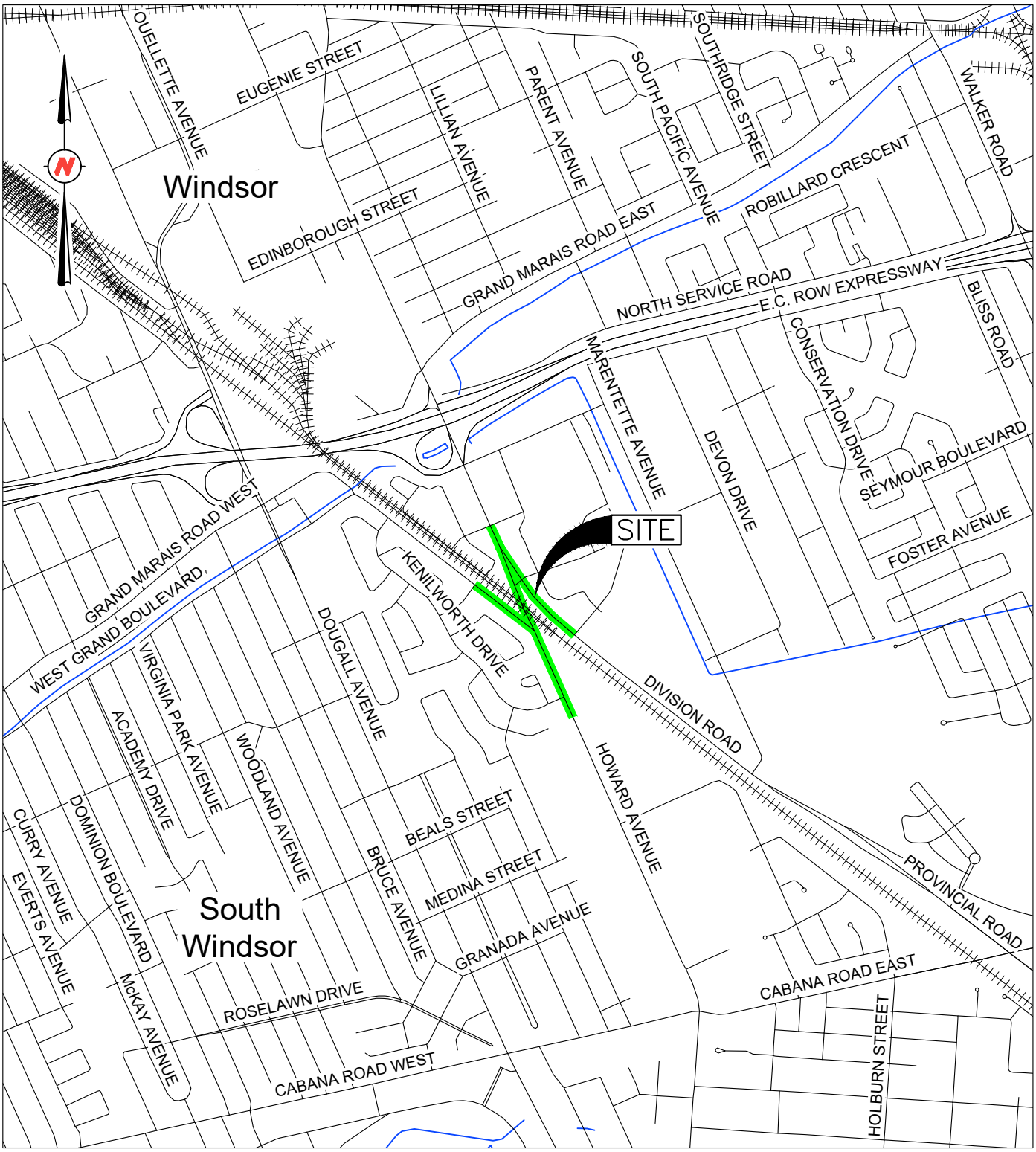
Steve Suurnakki, C.E.T.
Senior Geotechnical Technologist

Reviewed By:

Dirka U. Prout, P.Eng.
Lead Geotechnical Engineer

SS/TMA/DUP/ss

FIGURES



NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WSP E&I CANADA LIMITED REPORT No. OGTW2171.

ALL LOCATIONS ARE APPROXIMATE. **ORIGINAL PAPER SIZE: 8½ x 11.**

REFERENCES:
CANMAP STREETFILES V2008.4.

The Corporation of the City of Windsor
Engineering - Design & Development
350 CITY HALL SQUARE, SUITE 210
WINDSOR, ONTARIO, N9A 6S1

WSP
E&I Canada Limited
11865 COUNTY ROAD 42
TECUMSEH, ONTARIO, N8N 0H1
519-735-2499

DWN BY:	SJL
CHK'D BY:	SS
DATUM:	NAD83
PROJECTION:	UTM Zone 17
SCALE:	1:20000
PROJECT:	GEOTECHNICAL INVESTIGATION INTERSECTION RECONSTRUCTION HOWARD AVENUE AND SOUTH CAMERON BOULEVARD WINDSOR, ONTARIO
TITLE:	KEY PLAN
DATE:	NOV. 11, 2021
PROJECT No:	OGTW2171
REV No:	0
FIGURE No:	1

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LEGEND: BOREHOLE LOCATION

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SCALE 1:1500

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WSP E&I CANADA LIMITED REPORT No. OGTW2171.

ALL LOCATIONS ARE APPROXIMATE. **ORIGINAL PAPER SIZE: 11 x 17.**

REFERENCES:
2021 AERIAL PHOTOGRAPHS BY THE COUNTY OF ESSEX; CANMAP STREETFILES V2008.4.

The Corporation of the City of Windsor
Engineering - Design & Development
350 CITY HALL SQUARE, SUITE 210
WINDSOR, ONTARIO, N9A 6S1

WSP
E&I Canada Limited
11865 COUNTY ROAD 42
TECUMSEH, ONTARIO, N8N 0H1
519-735-2499

DWN BY:	SJL
CHK'D BY:	SS
DATUM:	NAD83
PROJECTION:	UTM Zone 17
SCALE:	1:1500

PROJECT:
GEOTECHNICAL INVESTIGATION
INTERSECTION RECONSTRUCTION
HOWARD AVENUE AND SOUTH CAMERON BOULEVARD
WINDSOR, ONTARIO

TITLE:
BOREHOLE LOCATION PLAN

DATE:	MAY 18, 2022
PROJECT No:	OGTW2171
REV No:	1
FIGURE No:	2

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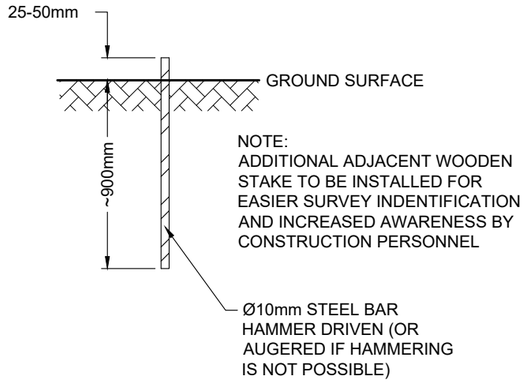
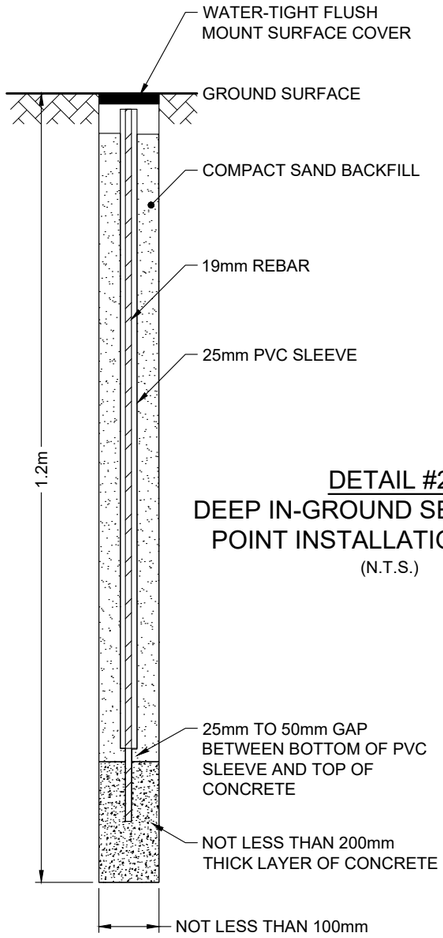


DETAIL #1
SURVEY PIN MONITORING POINT INSTALLATION DETAIL
(N.T.S.)



DETAIL #2
DEEP IN-GROUND SETTLEMENT POINT INSTALLATION DETAIL
(N.T.S.)

NOTES:
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GEOTECHNICAL INVESTIGATION REPORT.
2. ALL MONITORING LOCATIONS SHOULD BE CONSIDERED APPROXIMATE AND MUST BE CONFIRMED PRIOR TO INSTALLATION AND MAY HAVE TO BE ADJUSTED IN THE FIELD TO SUIT LOCATION CONDITIONS AND/OR RESTRAINTS.
3. A SURVEYOR REGISTERED IN ONTARIO FOR ESTABLISHING AND SURVEYING OF THE MONITORING POINTS WILL BE RETAINED.
4. THREE (3) TEMPORARY BENCHMARKS WILL BE ESTABLISHED OUTSIDE THE AREA OF CONSTRUCTION. PRIOR TO CONSTRUCTION ALL MONITORING POINTS WILL BE COORDINATED TO A TOLERANCE OF 10mm AND THE ELEVATIONS WILL BE DETERMINED TO A TOLERANCE OF NOT MORE THAN 2mm. AN ELEVATED PLATFORM MAY BE UTILIZED AT THE ENTRY SITE TO READ ALL MONITORING POINTS.
5. ALL NECESSARY ARRANGEMENTS WILL BE MADE FOR TRAFFIC SAFETY PRECAUTIONS.

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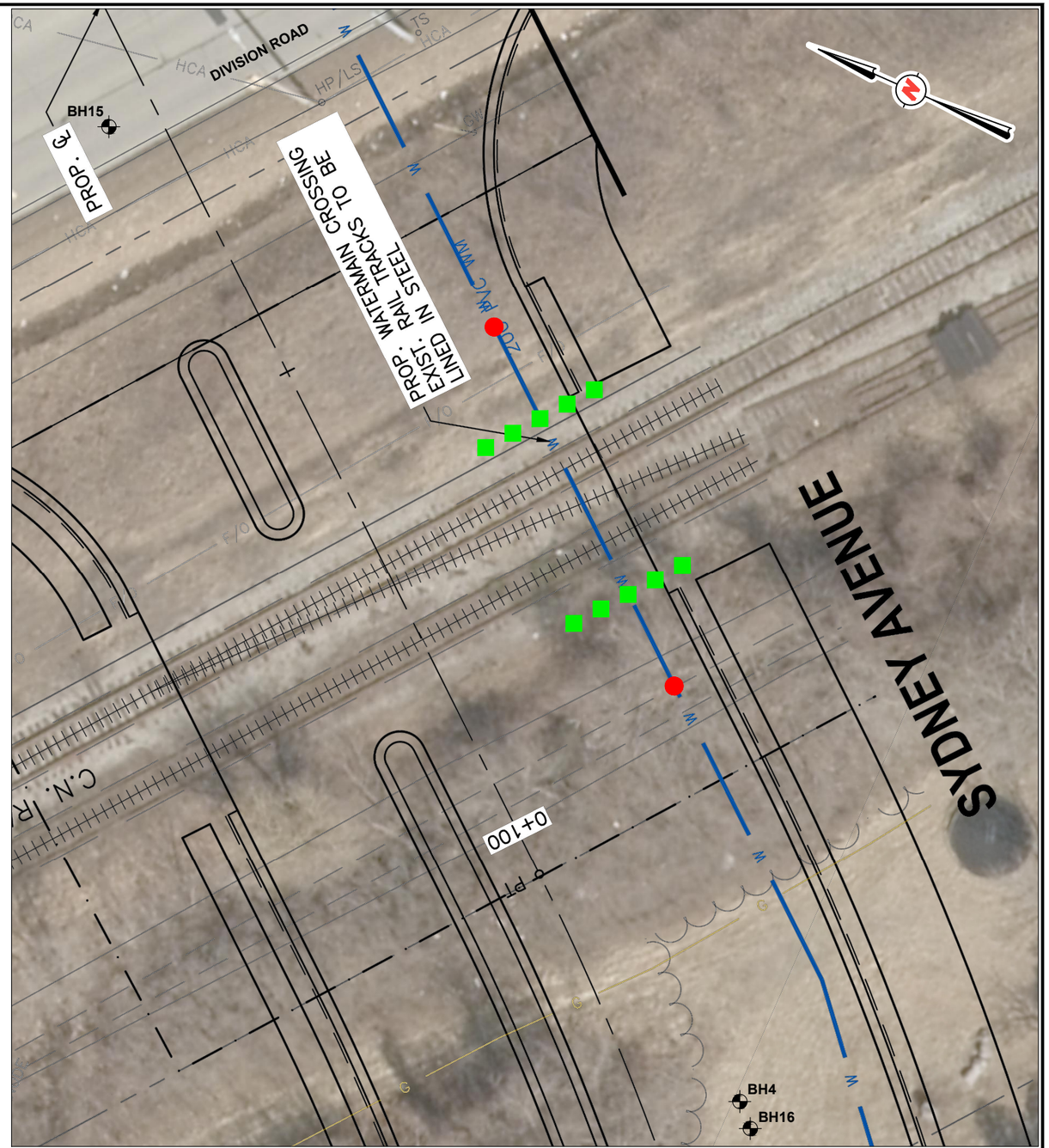
SCALE 1:250



LEGEND:
- SURVEY PIN MONITORING POINT (DETAIL #1)
- DEEP IN-GROUND SETTLEMENT MONITORING POINT (DETAIL #2)
- BOREHOLE LOCATION

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WSP E&I CANADA LIMITED REPORT No. OGTW2171.

ALL LOCATIONS ARE APPROXIMATE. **ORIGINAL PAPER SIZE: 11 x 17.**

REFERENCES:
DILLON CONSULTING, "PLAN & PROFILE - UTILITIES, SYDNEY AVENUE, STA. 0+000 TO 0+200", PROJECT No. 20-3864, SHEET No. U-08, REV. 1, DEC. 2021; 2021 AERIAL PHOTOGRAPHS BY THE COUNTY OF ESSEX; CANMAP STREETFILES V2008.4.

The Corporation of the City of Windsor
Engineering - Design & Development
350 CITY HALL SQUARE, SUITE 210
WINDSOR, ONTARIO, N9A 6S1

WSP
E&I Canada Limited
11865 COUNTY ROAD 42
TECUMSEH, ONTARIO, N8N 0H1
519-735-2499

DWN BY:	SJL
CHK'D BY:	SM
DATUM:	NAD83
PROJECTION:	UTM Zone 17
SCALE:	1:250

PROJECT: GEOTECHNICAL INVESTIGATION
INTERSECTION RECONSTRUCTION
HOWARD AVENUE AND SOUTH CAMERON BOULEVARD
WINDSOR, ONTARIO

TITLE: SETTLEMENT MONITORING PLAN

DATE:	MAY 18, 2022
PROJECT No:	OGTW2171
REV No:	1
FIGURE No:	3

DATE PLOTTED: 10/11/2022 10:21:00 AM
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APPENDIX

A

LIMITATIONS TO GEOTECHNICAL REPORTS

APPENDIX

The work performed in the preparation of this report and the conclusions presented herein are subject to the following:

a) The contract between WSP and the Client, including any subsequent written amendment or Change Order dully signed by the parties (hereinafter together referred as the "Contract");

b) Any and all time, budgetary, access and/or site disturbance, risk management preferences, constraints or restrictions as described in the contract, in this report, or in any subsequent communication sent by WSP to the Client in connection to the Contract; and

c) The limitations stated herein.

2. **Standard of car**e: WSP has prepared this report in a manner consistent with the level of skill and are ordinarily exercised by reputable members of WSP's profession, practicing in the same or similar locality at the time of performance, and subject to the time limits and physical constraints applicable to the scope of work, and terms and conditions for this assignment. No other warranty, guaranty, or representation, expressed or implied, is made or intended in this report, or in any other communication (oral or written) related to this project. The same are specifically disclaimed, including the implied warranties of merchantability and fitness for a particular purpose.

3. **Limited locations:** The information contained in this report is restricted to the site and structures evaluated by WSP and to the topics specifically discussed in it, and is not applicable to any other aspects, areas or locations.

4. **Information utilized:** The information, conclusions and estimates contained in this report are based exclusively on: i) information available at the time of preparation, ii) the accuracy and completeness of data supplied by the Client or by third parties as instructed by the Client, and iii) the assumptions, conditions and qualifications/limitations set forth in this report.

5. **Accuracy of information:** No attempt has been made to verify the accuracy of any information provided by the Client or third parties, except as specifically stated in this report (hereinafter "Supplied Data"). WSP cannot be held responsible for any loss or damage, of either contractual or extra-contractual nature, resulting from conclusions that are based upon reliance on the Supplied Data.

6. **Report interpretation:** This report must be read and interpreted in its entirety, as some sections could be inaccurately interpreted when taken individually or out-of-context. The contents of this report are based upon the conditions known and information provided as of the date of preparation. The text of the final version of this report supersedes any other previous versions produced by WSP.

7. **No legal representations:** WSP makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes

are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

8. **Decrease in property value:** WSP shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.

9. **No third party reliance:** This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or Contract. Any use or reproduction which any third party makes of the report, in whole or in part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. WSP does not represent or warrant the accuracy, completeness, merchantability, fitness for purpose or usefulness of this document, or any information contained in this document, for use or consideration by any third party. WSP accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on this report or anything set out therein. including without limitation, any indirect, special, incidental, punitive or consequential loss, liability or damage of any kind.

10. **Assumptions:** Where design recommendations are given in this report, they apply only if the project contemplated by the Client is constructed substantially in accordance with the details stated in this report. It is the sole responsibility of the Client to provide to WSP changes made in the project, including but not limited to, details in the design, conditions, engineering or construction that could in any manner whatsoever impact the validity of the recommendations made in the report. WSP shall be entitled to additional compensation from Client to review and assess the effect of such changes to the project.

11. **Time dependence:** If the project contemplated by the Client is not undertaken within a period of 18 months following the submission of this report, or within the time frame understood by WSP to be contemplated by the Client at the commencement of WSP's assignment, and/or, if any changes are made, for example, to the elevation, design or nature of any development on the site, its size and configuration, the location of any development on the site and its orientation, the use of the site, performance criteria and the location of any physical infrastructure, the conclusions and recommendations presented herein should not be considered valid unless the impact of the said changes is evaluated by WSP, and the conclusions of the report are amended or are validated in writing accordingly.

    Advancements in the practice of geotechnical engineering, engineering geology and hydrogeology and changes in applicable regulations, standards, codes or criteria could impact the contents of the report, in which case, a supplementary report may be required. The requirements for such a review remain the sole responsibility of the Client or their agents.

    WSP will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

12. **Limitations of visual inspections:** Where conclusions and recommendations are given based on a visual inspection conducted by WSP, they relate only to the natural or man-

made structures, slopes, etc. inspected at the time the site visit was performed. These conclusions cannot and are not extended to include those portions of the site or structures, which were not reasonably available, in WSP's opinion, for direct observation.

13. **Limitations of site investigations:** Site exploration identifies specific subsurface conditions only at those points from which samples have been taken and only at the time of the site investigation. Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions.

    The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite this investigation, conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.

    Final sub-surface/bore/profile logs are developed by geotechnical engineers based upon their interpretation of field logs and laboratory evaluation of field samples. Customarily, only the final bore/profile logs are included in geotechnical engineering reports.

    Bedrock, soil properties and groundwater conditions can be significantly altered by environmental remediation and/or construction activities such as the use of heavy equipment or machinery, excavation, blasting, pile-driving or draining or other activities conducted either directly on site or on adjacent terrain. These properties can also be indirectly affected by exposure to unfavorable natural events or weather conditions, including freezing, drought, precipitation and snowmelt.

    During construction, excavation is frequently undertaken which exposes the actual subsurface and groundwater conditions between and beyond the test locations, which may differ from those encountered at the test locations. It is recommended practice that WSP be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered at the test locations, that construction work has no negative impact on the geotechnical aspects of the design, to adjust recommendations in accordance with conditions as additional site information is gained and to deal quickly with geotechnical considerations if they arise.

    Interpretations and recommendations presented herein may not be valid if an adequate level of review or inspection by WSP is not provided during construction.

14. **Factors that may affect construction methods, costs and scheduling:** The performance of rock and soil materials during construction is greatly influenced by the means and methods of construction. Where comments are made relating to possible methods of construction, construction costs, construction techniques, sequencing, equipment or scheduling, they are intended only for the guidance of the project design professionals, and those responsible for construction monitoring. The number of test holes may not be sufficient to determine the local underground conditions between test locations

that may affect construction costs, construction techniques, sequencing, equipment, scheduling, operational planning, etc.

Any contractors bidding on or undertaking the works should draw their own conclusions as to how the subsurface and groundwater conditions may affect their work, based on their own investigations and interpretations of the factual soil data, groundwater observations, and other factual information.

15. **Groundwater and Dewatering:** WSP will accept no responsibility for the effects of drainage and/or dewatering measures if WSP has not been specifically consulted and involved in the design and monitoring of the drainage and/or dewatering system.

16. **Environmental and Hazardous Materials Aspects:** Unless otherwise stated, the information contained in this report in no way reflects on the environmental aspects of this project, since this aspect is beyond the Scope of Work and the Contract. Unless expressly included in the Scope of Work, this report specifically excludes the identification or interpretation of environmental conditions such as contamination, hazardous materials, wild life conditions, rare plants or archeology conditions that may affect use or design at the site. This report specifically excludes the investigation, detection, prevention or assessment of conditions that can contribute to moisture, mould or other microbial contaminant growth and/or other moisture related deterioration, such as corrosion, decay, rot in buildings or their surroundings. Any statements in this report or on the boring logs regarding odours, colours, and unusual or suspicious items or conditions are strictly for informational purposes

17. **Sample Disposal:** WSP will dispose of all uncontaminated soil and rock samples after 30 days following the release of the final geotechnical report. Should the Client request that the samples be retained for a longer time, the Client will be billed for such storage at an agreed upon rate. Contaminated samples of soil, rock or groundwater are the property of the Client, and the Client will be responsible for the proper disposal of these samples, unless previously arranged for with WSP or a third party.

WSP Canada Inc.

APPENDIX

B

EXPLANATION OF RECORD OF BOREHOLE SHEETS &
RECORD OF BOREHOLE SHEETS BH-01 TO BH-16

EXPLANATION OF BOREHOLE LOG

This form describes some of the information provided on the borehole logs, which is based primarily on examination of the recovered samples, and the results of the field and laboratory tests. Additional description of the soil/rock encountered is given in the accompanying geotechnical report.

GENERAL INFORMATION

Project details, borehole number, location coordinates and type of drilling equipment used are given at the top of the borehole log.

SOIL LITHOLOGY

Elevation and Depth

This column gives the elevation and depth of inferred geologic layers. The elevation is referred to the datum shown in the Description column.

Lithology Plot

This column presents a graphic depiction of the soil and rock stratigraphy encountered within the borehole.

Description

This column gives a description of the soil stratums, based on visual and tactile examination of the samples augmented with field and laboratory test results. Each stratum is described according to the *Modified Unified Soil Classification System* (modified slightly so that an inorganic clay of "medium plasticity" is recognized).

The compactness condition of cohesionless soils based on standard penetration testing (SPT) and the consistency of cohesive soils (undrained shear strength) are defined as follows *(Ref. Canadian Foundation Engineering Manual, 4th Edition, 2006)*:

Compactness of Cohesionless Soils	SPT N-Value
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

Consistency of Cohesive Soils	Undrained Shear Strength	
	kPa	psf
Very Soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1000
Stiff	50 to 100	1000 to 2000
Very Stiff	100 to 200	2000 to 4000

SOIL SAMPLING

Sample types are abbreviated as follows:

SS	Split Spoon	TW	Thin Walled Open (Pushed)	RC	Rock Core	GS	Grab Sample
AS	Auger Sample	TP	Thin Walled Piston (Pushed)	WS	Washed Sample	AR	Air Return Sample

Additional information provided in this section includes sample numbering, sample recovery (%) and numerical testing results (SPT).

FIELD AND LABORATORY SAMPLING

Results of field testing (e.g., SPT, pocket penetrometer, and vane testing) and laboratory testing (e.g., natural moisture content, and limits) executed on the recovered samples are plotted in this section.

Definitions of Penetration Resistance

Standard penetration resistance 'N' – The number of blows required to advance a standard split spoon sampler 30 cm into the subsoil, driven by means of a 63.5 kg hammer falling freely a distance of 76 cm. WOH = sampler advanced under "weight of hammer"

Dynamic penetration resistance – The number of blows required to advance a 50 mm, 60 degree cone, fitted to the end of drill rods, 30 cm into the subsoil, the driving energy being 474.5 Joules per blow.

INSTRUMENTATION INSTALLATION

Instrumentation installations (monitoring wells, piezometers, inclinometers, etc.) are plotted in this section.

WATER LEVEL

Water levels, if measured during fieldwork, are plotted in the depth/elevation column. These water levels may or may not be representative of the static groundwater level depending on the nature of soil stratum where the piezometer tips are located, the time elapsed from installation to reading and other applicable factors. Other information includes the depth of borehole cave-in, if any. This information is also included in the borehole log footer.

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Ontario Region

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Rev. date: 6-Oct-22

EXPLANATION OF BOREHOLE LOG

GENERAL REPORT NOTE

The soil conditions, profiles, comments, conclusions and recommendations found in this report are based upon the samples recovered during the fieldwork. Soils are heterogeneous materials and, consequently, variations (possibly extreme) may be encountered at site locations away from boreholes. During construction, competent, qualified inspection personnel should verify that no significant variations exist from the conditions described in this report.

MODIFIED* UNIFIED SOIL CLASSIFICATION SYSTEM

*The soil of each stratum is described using the Unified Soil Classification System (Technical Memorandum 36-357 prepared by Waterways Experiment Station, Vicksburg, Mississippi, Corps of Engineers, U.S Army. Vol. 1, March 1953) modified slightly so that an inorganic clay of "medium plasticity" is recognized.

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75mm	CLEAN GRAVELS (TRACE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY GRAVELS (WITH SOME OR MORE FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR I_P LESS THAN 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE OR I_P MORE THAN 7
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75mm	CLEAN SANDS (TRACE OR NO FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
			SP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY SANDS (WITH SOME OR MORE FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR I_P LESS THAN 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE OR I_P MORE THAN 7
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75µm)	SILTS BELOW "A" LINE NEGLIGIBLE ORGANIC CONTENT	$W_L < 50\%$	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)
		$W_L > 50\%$	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	
	CLAYS ABOVE "A" LINE NEGLIGIBLE ORGANIC CONTENT	$W_L < 30\%$	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS	
		$30\% < W_L < 50\%$	CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	
		$W_L > 50\%$	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
	ORGANIC SILTS & CLAYS BELOW "A" LINE	$W_L < 50\%$	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	WHENEVER THE NATURE OF THE FINES CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER "F", e.g. SF IS A MIXTURE OF SAND WITH SILT OR CLAY
		$W_L > 50\%$	OH	ORGANIC CLAYS OF HIGH PLASTICITY	
HIGH ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE

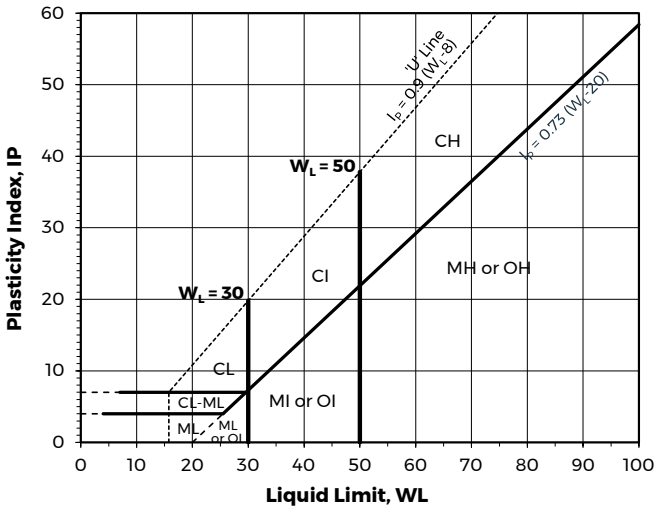
SOIL COMPONENTS

FRACTION	U.S STANDARD SIEVE SIZE			DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
		PASSING	RETAINED	PERCENT	DESCRIPTOR
GRAVEL	COARSE	75 mm	19 mm	35 - 50	AND
	FINE	19 mm	4.75 mm	20 - 35	Y/EY
SAND	COARSE	4.75 mm	2.00 mm	10 - 20	SOME
	MEDIUM	2.00 mm	425 µm	1 - 10	TRACE
	FINE	425 µm	75 µm		
FINES (SILT AND CLAY BASED ON PLASTICITY)		75 µm			

OVERSIZED MATERIAL

ROUNDED OR SUBROUNDED:	NOT ROUNDED:
COBBLES 75 mm to 300 mm	ROCK FRAGMENTS > 75 mm
BOULDERS > 300 mm	ROCKS > 0.76 CUBIC METRE IN VOLUME

PLASTICITY CHART FOR SOIL PASSING 425 µm SIEVE



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Rev. date: 6-Oct-22

MODIFIED USCS

Note 1: Soils are classified and described according to their engineering properties and behaviour.

Note 2: The modifying adjectives used to define the actual or estimated percentage range by weight of minor

RECORD OF BOREHOLE No. BH01

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681523, E334928**

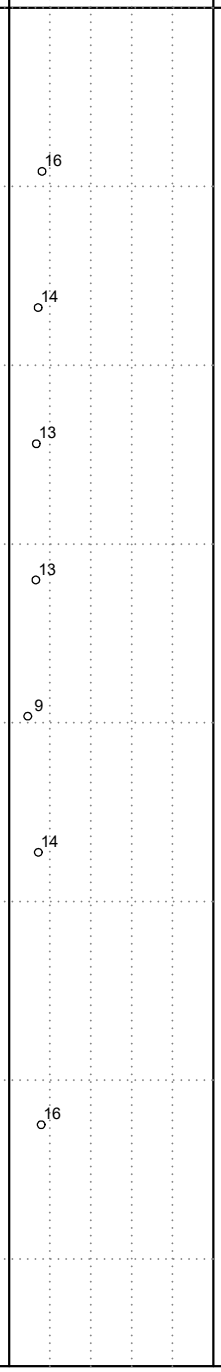
Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **27 Oct 2021** Date Completed: **27 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Geodetic Ground Surface Elevation: 187.2 m

Lithology Plot	DESCRIPTION	Elevation (m)	Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value
	ASPHALT (approx. 205 mm)	187.0					
	FILL (approx. 150 mm) Granular	186.9	0.2				
	FILL (approx. 860 mm) Silty clay, some sand and gravel, Brown, Firm	186.8	0.4	SS	1	43	5
	SILTY CLAY Some sand, trace gravel, Brown, Stiff	186.0	1.2	SS	2	100	9
	Very stiff			SS	3	103	17
	Oxidized			SS	4	100	21
	Grey, Stiff			SS	5	100	14
				SS	6	100	12
	Firm			SS	7	100	6
	END OF BOREHOLE (no refusal)	180.7	6.6				

FIELD TESTING: Penetration Testing — SPT, DCPT; MTO Vane* (Intact, Remould); Nilcon Vane* (Intact, Remould); Undrained Shear Strength (kPa) (from P. Penetrometer tests) 20 40 60 80

LAB TESTING: Atterberg Limits (W_P, W, W_L); Plastic — Liquid; Passing 75 um (%); Moisture Content (%); Unit Weight (KN/m3); 20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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Tel: 5197352499
Fax:
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▽ No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH02

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681605, E334889**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **27 Oct 2021** Date Completed: **27 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 187.2 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING PenetrationTesting: SPT ○ DCPT ● MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould ■ Undrained Shear Strength (kPa) (from P. Penetrometer tests) 20 40 60 80	LAB TESTING Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) ★ Unit Weight (KN/m3) 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	ASPHALT (approx. 240 mm)	186.9										
	CONCRETE (approx. 255 mm)	0.2 186.7										
	SILTY CLAY Some sand, trace gravel Mottled brown and grey Stiff	0.5	SS	1	54	8	1	186		15		
	Rootlets Weathered		SS	2	100	13	2	185		13		
	Brown Very stiff		SS	3	100	22	3	184		13		
	Oxidized		SS	4	100	25	4	183		13		
	Grey		SS	5	100	15	5	182		12		
	Stiff											
	Pink nodules		SS	6	100	12	6	181		14		
	Firm		SS	7	100	7	7	180		16		
	END OF BOREHOLE (no refusal)	180.6 6.6										

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Tecumseh, Ontario, N8N 2M1
Tel: 5197352499
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▽ No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH03

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681689, E334867**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **28 Oct 2021** Date Completed: **28 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Geodetic Ground Surface Elevation: 187.1 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	TOPSOIL (approx. 330 mm) 186.8					0	187				
	SILTY CLAY 0.3 Some sand, trace gravel Mottled brown and grey Firm										
		SS	1	100	7	1	186		19		
		SS	2	100	10				14		
	Brown Very stiff					2	185				
		SS	3	100	19				13		
						3	184				
	Oxidized	SS	4	100	25				13		
	Grey	SS	5	100	15	4	183		15		
	Stiff	SS	6	100	13				13		
						5	182				
		SS	7	100	8	6	181		15		
	180.6										
	END OF BOREHOLE 6.6 (no refusal)					7	180				

FIELD TESTING: Penetration Testing — SPT, DCPT; MTO Vane* Intact, Remould; Nilcon Vane* Intact, Remould; Undrained Shear Strength (kPa) (from P. Penetrometer tests) 20 40 60 80

LAB TESTING: Atterberg Limits W_P W W_L Plastic Liquid; Passing 75 um (%); Moisture Content (%); Unit Weight (KN/m3) 20 40 60 80

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11865 County Road 42
Tecumseh, Ontario, N8N 2M1
Tel: 5197352499
Fax:
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No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH04

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681706, E334913**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **28 Oct 2021** Date Completed: **28 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 187.3 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould ■ Undrained Shear Strength (kPa) (from P. Penetrometer tests) 20 40 60 80	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) ★ Unit Weight (KN/m3) 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	TOPSOIL (approx. 305 mm) 187.0		SS	1	0	2		187		37		
	SILTY CLAY 0.3 Some sand, trace gravel Weathered Mottled brown and grey Stiff						1	186		14		
			SS	2	100	11						
	Brown Very stiff									13		
	185.3		SS	3	100	18	2	185				
	END OF BOREHOLE 2.0 (no refusal)						3	184				
							4	183				
							5	182				
							6	181				

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Tecumseh, Ontario, N8N 2M1
Tel: 5197352499
Fax:
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▽ No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH05

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681715, E334842**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **27 Oct 2021** Date Completed: **27 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Geodetic Ground Surface Elevation: 187.1 m

Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	SPT 'N' Value
	ASPHALT (approx. 205 mm)	186.9					0	187	
	CONCRETE (approx. 205 mm)	0.2 / 186.7							
	SILTY CLAY	0.4							
	Some sand, trace gravel Mottled brown and grey Stiff		SS	1	78	13	1	186	13
	Brown Very stiff								
	Oxidized		SS	2	100	18	2	185	13
			SS	3	100	20			13
			SS	4	100	27	3	184	13
	Grey		SS	5	100	18	4	183	14
	Stiff		SS	6	89	10	5	182	14
	Firm		SS	7	100	7	6	181	16
		180.5							
	END OF BOREHOLE (no refusal)	6.6					7	180	

FIELD TESTING: Penetration Testing — SPT, DCPT; MTO Vane* — Intact, Remould; Nilcon Vane* — Intact, Remould; Undrained Shear Strength (kPa) (from P. Penetrometer tests) 20 40 60 80

LAB TESTING: Atterberg Limits — W_P, W, W_L; Plastic, Liquid; Passing 75 um (%); Moisture Content (%); Unit Weight (KN/m3); 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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Tel: 5197352499
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No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH06

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681843, E334737**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **27 Oct 2021** Date Completed: **27 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Geodetic Ground Surface Elevation: 186.7 m

Lithology Plot	DESCRIPTION	Elevation (m)	Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value
	ASPHALT (approx. 205 mm)	186.5					
	FILL (approx. 610 mm) Granular	0.2 185.9					
	FILL (approx. 150 mm) Clay, some sand Stained	0.8 185.7 1.0		SS	1	28	5
	SILTY CLAY Some sand, trace gravel Mottled brown and grey Firm		1				
				SS	2	100	7
	Brown Very stiff		2				
	Oxidized			SS	3	100	17
			3				
				SS	4	100	22
			4				
	Grey			SS	5	100	15
			5				
				SS	6	100	15
	Stiff		6				
				SS	7	100	12
		180.2	7				
	END OF BOREHOLE (no refusal)	6.6					

FIELD TESTING
Penetration Testing: SPT ○ DCPT ●
MTO Vane*: Intact △ Remould ▲
Nilcon Vane*: Intact ◇ Remould ◆
Undrained Shear Strength (kPa) (from P. Penetrometer tests)
20 40 60 80

LAB TESTING
Atterberg Limits: W_P W W_L (Plastic — Liquid)
✳ Passing 75 um (%)
○ Moisture Content (%)
★ Unit Weight (KN/m3)
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

WSP Canada Inc.
11865 County Road 42
Tecumseh, Ontario, N8N 2M1
Tel: 5197352499
Fax:
www.wsp.com

▽ No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH07

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681884, E334685**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **27 Oct 2021** Date Completed: **27 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 186.4 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	ASPHALT (approx. 175 mm)	186.3						
	CONCRETE (approx. 175 mm)	0.2 186.1						
	FILL (approx. 560 mm) Crushed granular	0.4						
		185.5	SS	1	54	5	1	186
	SILTY CLAY Some sand, trace gravel Mottled brown and grey Firm Stained between 0.91m and 0.97m	0.9	SS	2	100	6	2	185
	Brown Very stiff		SS	3	100	20	3	184
	Grey Stiff Oxidized		SS	4	100	25	4	183
			SS	5	100	13	5	182
			SS	6	100	11	6	181
		179.9	SS	7	100	8	7	180
	END OF BOREHOLE (no refusal)	6.6						179

FIELD TESTING

PenetrationTesting: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
■ Undrained Shear Strength (kPa) (from P. Penetrometer tests)
20 40 60 80

LAB TESTING

Atterberg Limits
W_P W W_L
Plastic Liquid
✳ Passing 75 um (%)
○ Moisture Content (%)
★ Unit Weight (KN/m3)
20 40 60 80

1	18
2	21
3	13
4	14
5	14
6	13
7	13

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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▽ No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH08

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681817, E334891**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **28 Oct 2021** Date Completed: **28 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Geodetic Ground Surface Elevation: 187.3 m

Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	ASPHALT (approx. 255 mm)	187.1						
	FILL (approx. 710 mm) Granular	0.3						
		186.4	SS	1	50	7	1	186
	SILTY CLAY Some sand, trace gravel Mottled brown and grey firm Stained between 0.97m and 1.07m Stiff	1.0	SS	2	78	8	2	185
		185.4					3	184
	END OF BOREHOLE (no refusal)	2.0					4	183
							5	182
							6	181

FIELD TESTING
PenetrationTesting: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
■ Undrained Shear Strength (kPa) (from P. Penetrometer tests)
20 40 60 80

LAB TESTING
Atterberg Limits: W_P W W_L — Plastic — Liquid
✳ Passing 75 um (%)
○ Moisture Content (%)
★ Unit Weight (KN/m3)
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

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Tecumseh, Ontario, N8N 2M1
Tel: 5197352499
Fax:
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▽ No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH09

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681885, E334826**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **28 Oct 2021** Date Completed: **28 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Geodetic Ground Surface Elevation: 187.1 m

Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	ASPHALT (approx. 280 mm)	186.8					0	187
	FILL (approx. 940 mm) Sand and gravel	0.3 185.9	SS	1	89	7	1	186
	SILTY CLAY Some sand, trace gravel Mottled brown and grey Firm	1.2 185.1	SS	2	72	4	2	185
	END OF BOREHOLE (no refusal)	2.0					3	184
							4	183
							5	182
							6	181

FIELD TESTING
PenetrationTesting: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
■ Undrained Shear Strength (kPa) (from P. Penetrometer tests)
20 40 60 80

LAB TESTING
Atterberg Limits: W_P W W_L
Plastic Liquid
✳ Passing 75 um (%)
○ Moisture Content (%)
★ Unit Weight (KN/m3)
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

WSP Canada Inc.
11865 County Road 42
Tecumseh, Ontario, N8N 2M1
Tel: 5197352499
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▽ No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH10

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4682057, E334681**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **28 Oct 2021** Date Completed: **28 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Geodetic Ground Surface Elevation: 187.0 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	ASPHALT (approx. 205 mm) 186.8						
	FILL (approx. 150 mm) Granular 186.7 / 0.2 / 0.4						
	FILL (approx. 1625 mm) Sand Wet						
		SS	1	71	13	1	186
		SS	2	67	8		
	185.1					2	185
	END OF BOREHOLE 2.0 (possible sewer trench backfill spoon hitting something hard at 1.98m)						
						3	184
						4	183
						5	182
						6	181

FIELD TESTING

PenetrationTesting: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
■ Undrained Shear Strength (kPa) (from P. Penetrometer tests)
20 40 60 80

LAB TESTING

Atterberg Limits: W_P W W_L
Plastic Liquid
✳ Passing 75 um (%)
○ Moisture Content (%)
★ Unit Weight (KN/m3)
20 40 60 80

7
15

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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Tel: 5197352499
Fax:
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▽ No freestanding groundwater observed in open borehole upon completion of drilling.

■ Cave in measured at a depth of 1.2 m upon completion of drilling.

RECORD OF BOREHOLE No. BH11

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4682004, E334709**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **28 Oct 2021** Date Completed: **28 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Geodetic Ground Surface Elevation: 187.0 m

Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	ASPHALT (approx. 280 mm)	186.8						
	FILL (approx. 480 mm) Granular	0.3 186.3						
	FILL (approx. 1065 mm) Sand	0.8	SS	1	71	10	1	186
		185.2	SS	2	84	8		
	SILTY CLAY Some sand, trace gravel Mottled brown and grey	1.8 185.1 2.0					2	185
	END OF BOREHOLE (no refusal)						3	184
							4	183
							5	182
							6	181

FIELD TESTING

PenetrationTesting: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
■ Undrained Shear Strength (kPa) (from P. Penetrometer tests)
20 40 60 80

LAB TESTING

Atterberg Limits: W_P W W_L — Plastic — Liquid
✳ Passing 75 um (%)
○ Moisture Content (%)
★ Unit Weight (KN/m3)
20 40 60 80

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21

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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Fax:
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▽ No freestanding groundwater observed in open borehole upon completion of drilling.

■ Cave in measured at a depth of 1.5 m upon completion of drilling.

RECORD OF BOREHOLE No. BH12

Project Number: OGTW2171
Project Client: The Corporation of the City of Windsor
Project Name: Howard Ave & South Cameron Intersection Reconstruction
Project Location: Windsor, Ontario
Drilling Location: N4681911, E334783

Drilling Method: 150 mm O.D. Hollow Stem Auger
Drilling Machine: B48 Mobile
Date Started: 28 Oct 2021 Date Completed: 28 Oct 2021
Logged by: SKS Compiled by: SLS
Reviewed by: SDM Revision No.: 0

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **INSTRUMENTATION INSTALLATION** | **COMMENTS & GRAIN SIZE DISTRIBUTION (%)** (GR SA SI CL)

Geodetic Ground Surface Elevation: 187.5 m

Field Testing legend: Penetration Testing: ○ SPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; ■ Undrained Shear Strength (kPa) (from P. Penetrometer tests); scale 20 40 60 80

Lab Testing legend: Atterberg Limits W_P W W_L (Plastic – Liquid); ✱ Passing 75 um (%); ○ Moisture Content (%); ★ Unit Weight (KN/m3); scale 20 40 60 80

Description	Elevation (m) / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	Moisture Content (%)
ASPHALT (approx. 205 mm)	187.3 / 0.2					
FILL (approx. 735 mm) Granular	186.6 / 0.9					
FILL (approx. 735 mm) Clay, some sand, some gravel Black	185.9 / 1.7	SS	1a b	61	14	14, 23
SILTY CLAY Some sand, trace gravel Mottled brown and grey Firm	185.6 / 2.0	SS	2	67	7	21
END OF BOREHOLE (no refusal)						

Depth scale (m): 1, 2, 3, 4, 5, 6; Elevation scale (m): 187, 186, 185, 184, 183, 182

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No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH13

Project Number:	OGTW2171	Drilling Method:	150 mm O.D. Hollow Stem Auger
Project Client:	The Corporation of the City of Windsor	Drilling Machine:	B48 Mobile
Project Name:	Howard Ave & South Cameron Intersection Reconstruction	Date Started:	28 Oct 2012
		Date Completed:	28 Oct 2021
Project Location:	Windsor, Ontario	Logged by:	SKS
		Compiled by:	SLS
Drilling Location:	N4681833, E334849	Reviewed by:	SDM
		Revision No.:	0

Geodetic Ground Surface Elevation: 188.0 m

DESCRIPTION	Elev. (m) / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	Moisture Content (%)
ASPHALT (approx. 150 mm)	187.8 / 0.2					
FILL (approx. 533 mm) Granular	187.4 / 0.5					
FILL (approx. 700 mm) Clay with sand and gravel Brown/black	186.6 / 1.4	SS	1	100	15	14
SILTY CLAY Some sand, trace gravel Mottled brown and grey Stiff	186.0 / 2.0	SS	2	100	12	14
END OF BOREHOLE (no refusal)						

Depth (m) / Elevation (m) scale: 1 / 187; 2 / 186; 3 / 185; 4 / 184; 5 / 183; 6 / 182

FIELD TESTING: Penetration Testing — O SPT, ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; ■ Undrained Shear Strength (kPa) (from P. Penetrometer tests) 20 40 60 80

LAB TESTING: Atterberg Limits W_P W W_L Plastic Liquid; ✱ Passing 75 um (%); O Moisture Content (%); ★ Unit Weight (KN/m3) 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

No freestanding groundwater observed in open borehole upon completion of drilling.

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Fax:
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Borehole details, as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretive assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF BOREHOLE No. BH14

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681775, E334914**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **B48 Mobile**
Date Started: **28 Oct 2021** Date Completed: **28 Oct 2021**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Geodetic Ground Surface Elevation: 188.0 m

Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	ASPHALT (approx. 230 mm)	187.7						
	FILL (approx. 685 mm) Granular	0.2 187.1						
	FILL (approx. 460 mm) Sand and gravel, some clay Black	0.9 186.6	SS	1	100	10	1	187
	SILTY CLAY Some sand, trace gravel Mottled brown and grey Stiff	1.4 186.0	SS	2	100	14	2	186
	END OF BOREHOLE (no refusal)	2.0					3	185
							4	184
							5	183
							6	182

FIELD TESTING

PenetrationTesting: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
■ Undrained Shear Strength (kPa) (from P. Penetrometer tests)
20 40 60 80

LAB TESTING

Atterberg Limits
W_P W W_L
Plastic Liquid
✳ Passing 75 um (%)
○ Moisture Content (%)
★ Unit Weight (KN/m3)
20 40 60 80

12
14

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

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▽ No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH15

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681753, E334944**

Drilling Method: **150 mm O.D. Hollow Stem Augers**
Drilling Machine: **B48 Mobile**
Date Started: **26 Apr 2022** Date Completed: **26 Apr 2022**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Geodetic Ground Surface Elevation: 187.7 m

Depth (m)	Elevation (m)	Description	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	Atterberg Limits
	187.5	**ASPHALT** (approx. 230 mm)					
	187.0	**FILL** (approx. 480 mm) 0.2 Crushed granular					
0	187	**SILTY CLAY** 0.7 Some sand, trace gravel Mottled brown and grey Stiff	SS	1	100	10	17
		Firm	SS	2	100	7	29
2	186	Brown Very stiff					
		Fissured	SS	3	100	24	13
3	185						
		Oxidized	SS	4	100	27	13
4	184						
		Grey	SS	5	100	21	13
5	183		SS	6	100	16	14
		Stiff					
6	182						
			SS	7	100	9	15
	181.2						
7	181	END OF BOREHOLE 6.6 (no refusal)					

Penetration Testing: SPT ○ DCPT ●
MTO Vane*: Intact △ Remould ▲
Nilcon Vane*: Intact ◇ Remould ◆
Undrained Shear Strength (kPa) (from P. Penetrometer tests) 20 40 60 80

Atterberg Limits: W_P W W_L; Plastic Liquid
✳ Passing 75 um (%)
○ Moisture Content (%)
★ Unit Weight (KN/m3)
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

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Tel: 5197352499
Fax:
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▽ No freestanding groundwater observed in open borehole upon completion of drilling.

RECORD OF BOREHOLE No. BH16

Project Number: **OGTW2171**
Project Client: **The Corporation of the City of Windsor**
Project Name: **Howard Ave & South Cameron Intersection Reconstruction**
Project Location: **Windsor, Ontario**
Drilling Location: **N4681705, E334912**

Drilling Method: **150 mm O.D. Hollow Stem Auger**
Drilling Machine: **Geoprobe**
Date Started: **09 May 2022** Date Completed: **09 May 2022**
Logged by: **SKS** Compiled by: **SLS**
Reviewed by: **SDM** Revision No.: **0**

Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 187.3 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	TOPSOIL (approx. 175 mm)	187.1						
	SILTY CLAY Trace sand, trace gravel, weathered Mottled brown and grey Soft	0.2	SS	1	80	3		187
	Brown Very stiff		SS	2	69	16	1 ▽ ■	186
	Fissured, oxidized		SS	3	100	23	2	
								185
			SS	4	100	24		
							3	
	Silt seams		SS	5	100	26		184
			SS	6	100	19	4	
	Grey							183
	Stiff							
			SS	7	100	11	5	
								182
							6	
			SS	8	100	9		181
		180.7						
	END OF BOREHOLE (no refusal)	6.6					7	180

FIELD TESTING

PenetrationTesting: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
■ Undrained Shear Strength (kPa) (from P. Penetrometer tests)
20 40 60 80

LAB TESTING

Atterberg Limits
W_P W W_L
Plastic Liquid
✳ Passing 75 um (%)
○ Moisture Content (%)
★ Unit Weight (KN/m3)
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

▽ Groundwater measured at a depth of 1.1 m upon completion of drilling.

■ Cave in measured at a depth of 1.2 m upon completion of drilling.

WSP Canada Inc.
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Tel: 5197352499
Fax:
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APPENDIX

C

GEOTECHNICAL LABORATORY TEST RESULTS

WSP E&I Canada Limited.
11865 County Road 42
Tecumseh, Ontario N8N 0H1
Tel +1 (519) 735-2499
Fax +1 (519) 735-9669
www.wsp.com

ATTERBERG LIMITS
ASTM D-4318 or LS-703 / 704

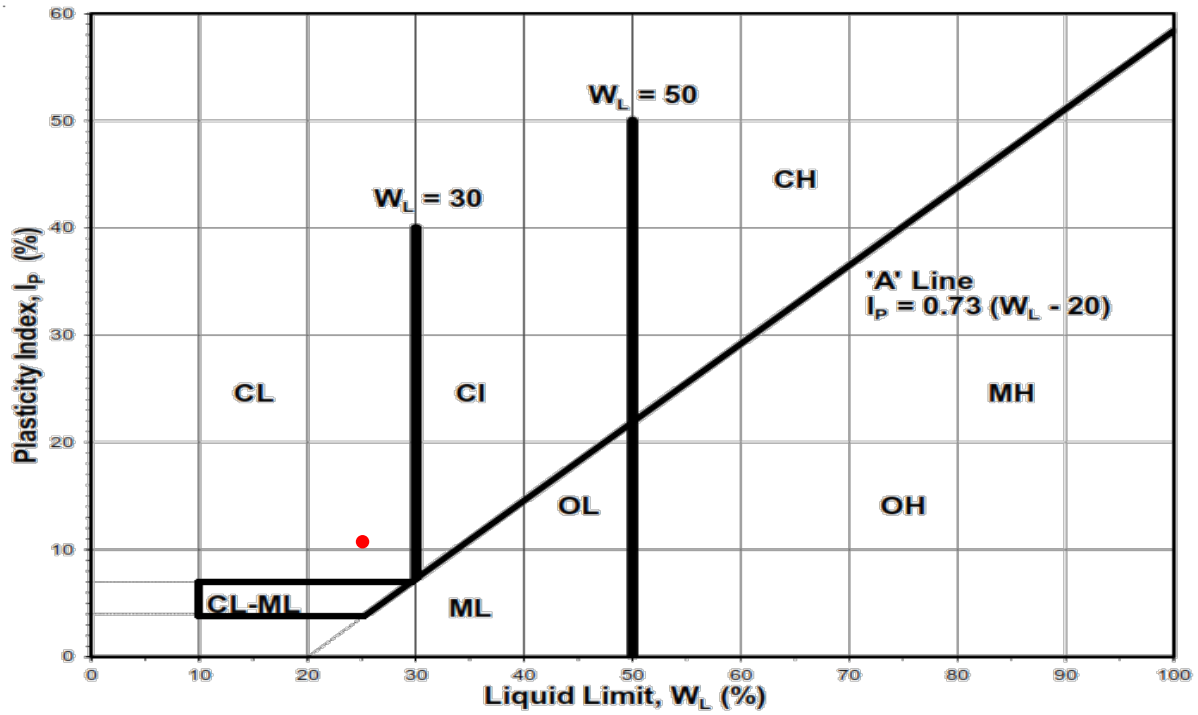
Project Number:	OGTW2171	**Sampled by:**	SS	**Sampled on:**	28-Oct-21
Project Client:	City of Windsor	**Tested by:**	SS	**Received on:**	28-Oct-21
Project Name:	South Cameron and Howard Avenue Intersection Improvements			**Tested on:**	5-Nov-21
Project Location:	South Cameron and Howard Avenue				

Test Results

LAB NUMBER	657
BOREHOLE	3
SAMPLE	6
DEPTH (m)	4.6-5

PLASTIC LIMIT	**14.4**
LIQUID LIMIT	**25.4**
PLASTICITY INDEX	**11.1**

Plasticity Chart for Soil Passing 425 Micron Sieve



Signed by: _____
Justin Palmer, C. Tech

WSP E&I Canada Limited.
11865 County Road 42
Tecumseh, Ontario N8N 0H1

Tel +1 (519) 735-2499
Fax +1 (519) 735-9669
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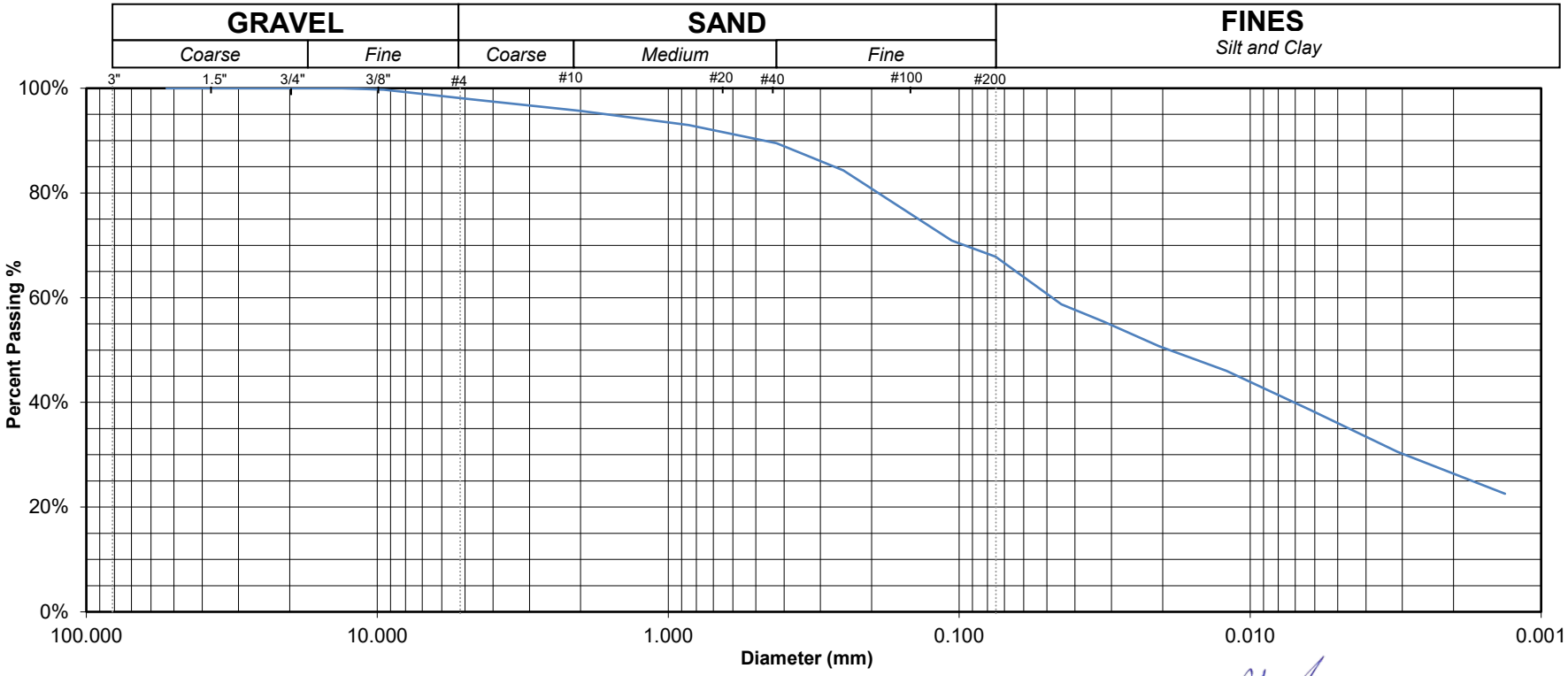
GRAIN SIZE DISTRIBUTION
MTO LS 702 / ASTM D7928 / ASTM D6913

Project Number:	OGTW2171	**Sampled by:**	SS	**Sampled on:**	28-Oct-2021
Project Client:	City of Windsor	**Tested by:**	SS	**Received on:**	29-Oct-2021
Project Name:	South Cameron and Howard Avenue Intersection Improvements			**Tested on:**	3-Nov-2021
Project Location:	South Camerone and Howard Ave				

Test Results

Sample Location:	Sample Identification:	Gravel	Sand	Silt	Clay	Moisture content (%)
BH3 SS6	**658**	2.1%	30.1%	41.4%	26.4%	13.7%



Signed by: _____
Justin Palmer, C. Tech

DILLON CONSULTING

THE CORPORATION OF THE CITY OF WINDSOR

Soil Characterization Report

Howard Avenue Corridor Improvements

December 2022 (Updated May 2024) – 20-3864

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Figures

Tables

Attached

Appendices

Executive Summary

Dillon Consulting Limited (Dillon) was retained by the Corporation of the City of Windsor (the "City") to provide reuse and disposal options for excess soils expected to be generated as part of the Howard Avenue Corridor Improvements Project, which is proposed to occur along stretches of Division Road, Sydney Avenue, South Cameron Boulevard, and Howard Avenue, in Windsor, Ontario (the "Project Area"). The location of the Project Area is shown on Figure 1.

A Due Diligence Environmental Review was completed for the Project Area by Dillon in June 2022. The purpose of the Environmental Review was to assess the Project Area for evidence of potential or actual environmental contamination as a result of current or past activities and to utilize this information for the preparation of a Sampling and Analysis Plan (SAP) to investigate the soil quality in the intended areas of excavation. Based on the findings of the Environmental Review, Dillon completed a SAP and conducted an initial drilling program that occurred on June 6 to 7, 2022. Upon receipt and review of the initial sampling program results, Dillon completed a delineation program on December 8 to 9, 2022.

Dillon notes that the date the last work was done on the records review, interviews and site reconnaissance from the Environmental Review must be no later than 18 months before the submission to the excess soil registry. If the 18 month period is exceeded prior to the filing of the excess soil registry, an update will be required to be completed to assess if there are any additional PCAs/APECs in the area. If the update concludes additional APECs, then the Soil Characterization Report may require revision.

Based on the results received, Dillon has evaluated the reuse and disposal options, based on the soil quality in comparison to the Excess Soil Quality Standards (ESQS) identified in Part II of the Ontario Ministry of the Environment's (MECP) document "Rules for Soil Management and Excess Soil Quality Standards" (ESQS, Soil Rules), a companion document to *Ontario Regulation (O.Reg.) 406/19 On-site and Excess Soil Management*. It is our understanding that excess soils generated within the Project Area will be handled during construction as follows, and as illustrated on the attached Site and Sample Location Plans (Figures 2A to 2D):

- Granular material present under the road surface noted throughout the Project Area is recommended to be transported to an aggregate recycling yard/facility to be reused as granular material for a specific engineering purpose and not for use as general fill. This material can also be used on-site as granular material under the roadway if it meets appropriate specifications. If not being reused for this purpose, this material can also be transported to an MECP approved waste receiving site following requirements of R.R.O. 347 (General – Waste Management), as it would not otherwise be considered suitable as a potential clean fill material for other purposes;
- Excess soils contain concentrations exceeding Table 3.1 Industrial/Commercial/Community (ICC) ESQS (i.e. Zones C, D and E1) must be transported to an MECP approved waste receiving site following requirements of R.R.O. 347;
- The Excess soils that exceed Table 3.1 Residential/ Parkland/ Institutional (RPI) ESQS but were below Table 3.1 ICC ESQS are suitable for beneficial reuse at a site that accepts Table 3.1 ICC ESQS, but are

required to be managed as salt impacted soil as outlined in Part I Section D Section 1 (3) of the Soil Rules;

- Excess soils within the Project Area are not suitable for reuse at Table 2.1 AgO ESQS site due to lead and arsenic exceedances across the Project Area; and
- Excess soil area that meets Table 1 RPI/ICC ESQS, however as is expected in the region, there is also naturally occurring molybdenum at concentrations exceeding Table 1 RPI/ICC ESQS. These soils are understood to be suitable for acceptance at a Table 1 RPI/ICC receiver that can accept molybdenum above Table 1 RPI/ICC ESQS (i.e. a local Table 1 receiver present in the region that is knowledgeable of molybdenum's elevated background concentrations). Otherwise, these materials are to be managed at a site that accepts soils meeting Table 3.1 RPI ESQS.

Additional soil quality standards have not been reviewed as a part of this Report for the purposes of supporting reuse of soils at sites with other acceptance criteria not referenced in this Report. Should the contractor identify receiving sites that do not meet the land use requirements for beneficial reuse, further comparison may be completed.

1.0 Introduction

Dillon Consulting Limited (Dillon) has been retained by the Corporation of the City of Windsor (the "City") to assist with the incorporation of regulatory requirements associated with *Ontario Regulation 406/19 – On-Site and Excess Soil Management (O.Reg. 406/19; the Regulation)* into the Howard Avenue Corridor Improvements project, which is proposed to occur along stretches of Division Road, Sydney Avenue, South Cameron Boulevard, and Howard Avenue, in Windsor, Ontario (the "Project Area"). The location of the Project Area is presented in Figure 1.

As of January 1, 2023, the Registry and reuse planning requirements of O.Reg. 406/19 are in effect. Based on the planned construction works during 2024, it is Dillon's understanding that the project will be required to file a notice on the Registry and will be required to complete the following:

- Due Diligence Environmental Review report;
- Due Diligence Soil Sampling and Analysis Plan (SAP);
- Due Diligence Soil Characterization Report (SCR); and
- Excess Soil Destination Assessment Report (ESDAR).

O.Reg. 406/19 permits the use of soil assessments (related to the Environmental Review, SAP and SCR) that did not meet all regulatory requirements but were completed before January 1, 2023 to support a project's Registry filing. As the date of reporting for excess soils was completed prior to January 1, 2023, the reports completed to support this project include the following:

- Due Diligence Environmental Review;
- Due Diligence SAP; and
- Due Diligence SCR.

The SCR has been completed to meet due diligence investigation and reporting requirements and is understood to meet the requirements of the Regulation to support the Registry filing.

1.1 Background

A Due Diligence Environmental Review was completed for the Project Area by Dillon in June 2022. The purpose of the Environmental Review was to assess for evidence of potential or actual environmental contamination, as a result of current or past activities, and to utilize this information for the preparation of a SAP and Soil Characterization Program.

Based on the findings of the Environmental Review, one Area of Potential Environmental Concern (APEC) was identified within the Project Area. A summary of recommended actions is provided below.

APEC #	Address/ Location	Risk Ranking	Associated PCA(s)	Recommended Assessment Method	Soil Sample Target Depth	Potential Contaminants of Concern
1	Division Road, Howard Avenue, South Cameron Boulevard, and Sydney Road	Moderate	• Potential import of fill materials associated with the construction of the roadway and right of way • Long-term salt application • Long-term use of a public roadway • Historical operation of a rail corridor and construction of the railway • Potential leaks and spills from properties with underground fuel storage • Potential impacts from reported spill from automobile accident	• Pre-construction soil characterization program • Locate boreholes for general coverage	• Surface soils • Subsurface soils (for sites with underground fuel storage)	• Metals • Inorganics • PHCs • BTEX

Notes:
(1) PHCs -petroleum hydrocarbons.
(2) BTEX - benzene, toluene, ethylbenzene, and xylenes.
(3) Inorganics includes sodium adsorption ratio (SAR), electrical conductivity (EC), cyanide and pH.

1.2 Objective and Scope of Work

The purpose of the soil characterization program was to evaluate the APEC identified in the Environmental Review and outline the excess soil reuse/disposal and management options to be considered in the tender and contract documents for the project. The scope of work for the soil characterization program is based on knowledge of the Project Area obtained from the Environmental Review (Dillon, June 2022) and includes:

- Preparation of a Health and Safety Plan;
- Coordination of public and private utility clearances;
- Coordination of traffic control and right of way permitting;
- Initial Soil investigation program and Delineation Soil program;
- Data evaluation; and
- Report preparation.

Dillon notes that the date the last work was done on the records review, interviews and site reconnaissance from the Environmental Review must be no later than 18 months before the submission to the excess soil registry. If the 18 month period is exceeded prior to the filing of the excess soil registry, an update will be required to be completed to assess if there are any additional PCAs/APECs in the area. If the update concludes additional APECs, then the Soil Characterization Report may require revision.

2.0 Project Area Description

2.1 General Location

The Project Area consists of approximately 1.5 kilometres (km) of roadway on South Cameron Boulevard, Howard Avenue, Division Road, and Sydney Avenue. The Project Area location is presented on Figure 1.

The Project Area consists of a four lane public roadway which runs northwest-southeast on Division Road, a two lane public roadway that runs north-south on Sydney Avenue, and a two lane public roadway that runs northwest-southeast on South Cameron Boulevard and Howard Avenue. Surrounding land uses are primarily single-family residential (south of Howard Avenue and South Cameron), and commercial retail plazas (north of Howard Avenue and South Cameron).

2.2 Description of Proposed Construction Works

Improvements proposed to be completed within the Project Area include the following:

- Road reconstruction – target depth of 0-1.0 meter below ground surface (m bgs);
- Construction of a new watermain – target depth of 0-2.5 m bgs; and
- Construction of a new storm sewer – target depth of 0-3.0 m bgs.

As per information provided by the project design team, it is assumed that up to 21,000 cubic meters (m^3) of excess soil will need to be removed from the Project Area, which consists of approximately 11,600 m^3 (or 55%) granular material from the road base and approximately 9,700 m^3 (or 45%) soil material from the utility trenches (~9,400 m^3).

Additionally, approximately 6,400 m^3 of soil will be generated from a proposed storm water pond and sanitary sewer along Howard Avenue (beyond the depth of soil characterization). However, the soil will be reused on-site, therefore is not considered excess soil, and will not require characterization.

2.3 Topographic, Geologic and Hydrogeological Setting

To describe the regional physiography and expected hydrogeological conditions beneath the Project Area, the following documents were reviewed:

- Ministry of the Environment, Conservation and Parks (MECP) Water Well Record Database;
- Essex Region/Chatham-Kent Regional Groundwater Study;
- Soil Map of Essex County, Soil Survey Report No. 11;
- Chapman and Putnam for The Physiography of Southern Ontario; and
- Google OGS Earth.

The Project Area lies within the physiographic region of Southern Ontario known as the St. Clair Clay Plains. The surficial geology of the area is interpreted to be predominately fine-textured glaciolacustrine deposits of silt and clay, minor sand and gravel (massive to well-laminated).

Surficial geology on the eastern extent of the Project Area is interpreted to be Clay to silt-textured till. Soils in the area of the Project Area consist of Brookston Clay. Brookston Clay Loam is characterized as a dark clay loam over mottled blue-grey gritty clay, with few stones.

The thickness of overburden in the vicinity of the Project Area is approximately 35 to 40 m thick. Bedrock geology mapping for the area indicates that the Site is underlain by Middle Devonian aged limestone, dolostone and shale of the Dundee formation.

Based on visual observations made during the site inspection, as well as a review of available topographic maps, the Project Area and surrounding area are generally flat. The Project Area is at a similar grade to the adjoining properties.

The topographic gradient of the land in proximity to the Project Area suggests that the regional groundwater flow direction is likely to the northwest, towards the Detroit River, located approximately 6 km north of the Project Area.

According to the MECP well database, there are several wells present around the surrounding properties. The ERIS report indicated that twenty-one monitoring wells were present for the surrounding properties, namely within all the commercial retail plazas along Division Road.

3.0 Methodology

3.1 Excess Soil Quality Standards

Soils within the Project Area have been evaluated for potential reuse, generally following the guidelines for sampling under O.Reg. 406/19 and the associated Soil Rules. The following ESQS were used to evaluate potential reuse and disposal options:

- ESQS Table 1: Full Depth Background Site Condition Standards for Residential/Parkland/Institutional (RPI)/ Industrial/Commercial/Community (ICC) Property Use;
- ESQS Table 2.1 AgO: Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition for Agricultural and Other (AgO) Property Use;
- ESQS Table 3.1 RPI: Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition for RPI Property Use; and
- ESQS Table 3.1 ICC: Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition for ICC Property Use.

The noted ESQS above do not encompass every reuse site. If a reuse site is identified that accepts soils meeting an alternate and/or site-specific ESQS additional evaluation of the soils documented herein may be required.

3.2 Utility Locates

Prior to the completion of the on-site drilling program, a public utility locate request was submitted by Dillon through Ontario One Call to arrange utility clearances for public sewer, water, telephone, natural gas, cable and electrical services. Buried utility services were either marked on-site (i.e., painted) or documented in maps provided by the locators.

The results of the public locates were also compared to Dillon's design team's utility alignment records which had been developed as part of the detailed design for Project Area.

A traffic management program was also prepared in advance of the on-site drilling activities by Landshark Group.

Municipal approvals, including a right-of-way permit and traffic management plan approval were obtained as part of the project.

3.3 Soil Sampling and Analysis Plan

Based on the history of the Project Area, its location in a commercial and residential area, and the APEC identified, an initial drilling program was completed on June 6 to 7, 2022. Landshark Group was retained by Dillon to complete the environmental drilling program in the roadways and public right-of-ways of Howard Avenue, Division Road, Sydney Avenue and South Cameron Boulevard using a 7822 DT Geoprobe drill rig. Fifteen boreholes were advanced to completed depths between of 3.04 to 3.49 mbgs.

Sample locations and sample frequency was completed to provide coverage for Project Area soils both laterally and vertically (based on the intended depth of proposed construction works). Soil samples were generally collected within soils below the road base and in deeper native soils to characterize soils at the estimated depth of proposed excavation. Where possible, granular material underneath the asphalt road was collected by auguring through the road and collecting a grab sample, prior to drilling. Granular material was generally encountered at all boreholes (with one exception at BH22-116) that were located on the road and observed at depths between 0.20 to 0.57 m bgs. During the planning of the drilling, it was identified that several locations could not be accessed for drilling due to identified public utilities. As such, seven hand-dug shallow test pits were completed at these locations.

Based on Dillon's review of the sampling data obtained from the program completed June 6 to 7, 2022, it was recommended that a delineation program be completed prior to construction. The scope of the delineation program was to evaluate if the identified Table 3.1 ICC ESQS exceedance areas could be reduced in volume, as well as to further characterize soils in areas that could not be accessed during the original sampling program due to presence of utilities (namely the north and south ends of Division Road). As such, Landshark was retained on December 8 to 9, 2022 to advance eight boreholes to completed depths between 1.77 and 3.71 m bgs. Granular material was encountered at all boreholes that were advanced on the road and observed at depths between 0.20 to 0.72 m bgs. Six hand dug test pit were collected along Division Road and including one collected on Howard Avenue.

Representative soil and granular samples were collected and placed laboratory-supplied jars, labelled and stored on ice. Soil and granular samples were handled using clean nitrile gloves. All samples were screened using an RKI Eagle II photoionization detector (PID) for the presence of petroleum hydrocarbon and volatile organic compound indicators to further assist in submitting the samples for proper analysis. The PID was calibrated with isobutylene for the detection of VOCs and hexane for the detection of PHCs.

Soil stratigraphy was continuously logged and soil cores were classified using ASTM Standard D2488 - *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)* as guidance. A borehole log was prepared for each drilled borehole, documenting the encountered soil conditions, with descriptions indicating soil type, texture, colour, structure, consistency, plasticity, moisture content and other observations (such as sample recovery, weathering features, staining and odours). Borehole logs are presented in Appendix C survey data for borehole and hand dug samples is presented in Appendix D.

3.4 Soil Headspace Screening

Samples from the boreholes and hand dug shallow test pits were recovered for headspace screening and for potential submission to the laboratory. Sample material was placed directly into laboratory-supplied jars for potential analysis and stored in a cooler. The remaining sample material were placed in new, re-sealable plastic bags for field headspace screening. The bags were half-filled with sample material to leave sufficient headspace above the soil sample for vapour testing and were then sealed.

Samples were selected for laboratory analyses based on the field-screening results, visual and olfactory observations and sample location in relation to identified potentially contaminating activities. Samples were handled using clean nitrile or latex gloves that were changed between each sampling location.

3.5 Sample Handling, Custody and Analysis

Samples for laboratory analyses were packed carefully into sample coolers containing cold packs to prevent damage to the sample containers and to maintain laboratory-suggested temperatures between 4°C and 10°C. A chain-of-custody form was completed and included in each sample cooler.

Samples were submitted to Paracel Laboratories Limited (Paracel) located in Hamilton, Ontario for bulk analysis for parameters detailed in Table I. Paracel is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for each of the analytical methods utilized, and have in-house quality assurance/quality control (QA/QC) programs to govern sample analysis and analytical data quality assurance.

Two soil samples were obtained from each borehole (including one granular sample where possible); and one sample was collected from the shallow test pit locations. Granular samples included only the finer fractions. Samples were submitted for contaminants of concern associated with the potential contamination sources identified in the Environmental Review (Dillon, 2021). Upon receipt of bulk analysis laboratory results of each program, select samples were submitted for the modified Synthetic Precipitation Leaching Procedure (mSPLP) for analysis of metals. The mSPLP analysis was triggered based on identification of exceeded parameters that had corresponding leachate values, for both the initial and delineation soil sampling programs. As such, the mSPLP analysis was completed based on identification of Table 1 RPI/ICC ESQS exceedances of molybdenum that were present across the Project Area. Soil sample submission details are further summarized in Table I.

Table I - Soil Sample Laboratory Submission Summary

Sample Collection Type	COCs Analyzed	Number of Samples
Initial Sampling Program – June 6 to 7, 2022		
Geoprobe Drill Rig	Inorganics (pH, EC, SAR, cyanide), metals, BTEX, PHCs	33 (including 4 duplicates)
Geoprobe Drill Rig – Granular Material Grab Sample	Inorganics (pH, EC, SAR, cyanide), metals, BTEX, PHCs	8 (including 1 duplicate)
Hand Dug Test Pit	Inorganics (pH, EC, SAR, cyanide), metals, BTEX, PHCs	7 (including 1 duplicate)
mSPLP Sample Submission	Metals	7
	Total (excluding mSPLP)	48
Delineation Soil Sampling Program – December 8 to 9, 2022		
Geoprobe Drill Rig – Subsoil	Inorganics (pH, EC, SAR, cyanide; excluding 7 samples), metals (excluding 5 samples), BTEX (excluding 2 samples), PHCs (excluding 2 samples).	17 (including 1 duplicate)
Geoprobe Drill Rig – Granular Grab Sample	Inorganics (pH, EC, SAR, cyanide; excluding 2 samples), metals (excluding 1 sample), BTEX (excluding 2 samples), PHCs (excluding 1 sample)	10 (including 1 duplicate)
Shallow Hand Dug Test Pit	Metals	6
mSPLP Sample Submission	Metals	2
	Total (excluding mSPLP)	33

3.6 Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) procedures were implemented in the field and laboratory to demonstrate that the data generated were of a level of quality suitable for their intended purposes. Field QA/QC procedures included use of new sampling equipment and/or appropriate equipment cleaning procedures and adherence to published standards for field methodology. Laboratory QA/QC procedures included following internal protocols and analysis of a laboratory blank sample and laboratory reference standards. In addition, duplicate/replicate samples were collected, and submitted for laboratory analysis.

Samples were labeled prior to submission for analytical testing with sample identification relevant to the location they were collected and/or by the method of collection. In addition to sample identifications, sample labels also included the date and time of collection, the consultant name (Dillon) and Dillon's project number. Immediately following collection, samples were stored in coolers on ice and documented on the Chain of Custody forms. Chain of Custody forms completed by Dillon following each individual Certificate of Analysis are included in Appendix A.

Field duplicate samples were collected at a minimum rate of 10% (one in ten samples). Each duplicate sample was assigned a 'false' identification which was recorded in the field notes connecting the duplicate with the original sample. Where concentrations were measured at values 5x the reportable detection limit (RDL) or higher, the field duplicate concentrations were compared to the parent sample concentrations for relative percent difference (RPD) using the following equation:

$$\mathbf{RPD}\ (\%) = \frac{(\mathbf{C1} - \mathbf{C2})}{(\mathbf{C1} + \mathbf{C2})/\mathbf{2}} \mathbf{X\ 100}$$

Where: C1 = sample concentration
C2 = duplicate concentration

Laboratory QA/QC procedures were implemented by Paracel and included following internal protocols and analysis of laboratory replicates, blanks and reference standards. The data received from the laboratory were compiled and were reviewed to confirm that the data were of satisfactory quality. Laboratory data validation was conducted to document acceptable levels of precision, accuracy, representativeness, comparability and completeness.

The data received from the laboratory were compiled and input into spreadsheets. After checking the spreadsheet entries, the compiled data was reviewed to confirm satisfactory quality, with exceptions discussed in **Section 4.1**. Sample chain-of-custody, holding times, dilution factors, surrogate recoveries, replicate analyses, and analytical quantitation limits were reviewed, and compared to applicable quality control acceptance criteria.

4.0 Reuse and Disposal Options

Reuse and disposal options are presented based on the environmental sampling results reviewed at the date of preparation of this Report and are summarized in the subsections below and in the following attachments:

- Table 1 (Bulk Soil Quality Results), Tables 2A and 2B (Leachate Results – mSPLP and TCLP analysis), and Table 3 (Soil Sample Results Summary).
- Survey data for all boreholes and hand dug test pit locations (Appendix D).
- Illustrated on the attached Site and Sample Locations Plan (Figures 2A to 2D).

Reuse and disposal options discussed below are based on the data reviewed to date, and are subject to the review and acceptance of these results by the project's identified receiver(s), provided other requirements for these sites (e.g. geotechnical) are met and that the construction team will be able to manage the soils during construction as indicated, segregating soils of differing soil qualities. Specific locations within the Project Area and volumes of export will be confirmed by the construction team prior to shipment to the intended receiving site(s).

Any off-site removals of excess soil are required to be managed as summarized below.

4.1 Quality Assurance and Quality Control Results

A summary of QA/QC samples collected during the Soil Characterization Program is provided in Table II below.

Table II - QA/QC Summary

Parent Sample ID	Duplicate ID	Date	Type	Parameter(s)
Initial Soil Sampling Program – June 2022				
BH22-108_2	BH22-DUPA	June 6, 2022	Duplicate	• SAR, EC, cyanide, pH, metals, PHCs, BTEX
BH22-106_2	BH22-DUPB	June 6, 2022	Duplicate	• SAR, EC, cyanide, pH, metals, PHCs, BTEX,
BH22-113_2	BH22-DUPC	June 6, 2022	Duplicate	• SAR, EC, cyanide, pH, metals, PHCs, BTEX
BH22-103_1	BH22-DUPD	June 7, 2022	Duplicate	• SAR, EC, cyanide, pH, metals, PHCs, BTEX
GR22-101	GR22-DUP	June 6, 2022	Duplicate	• SAR, EC, cyanide, pH, metals, PHCs, BTEX
Delineation Soil sampling Program – December 2022				
BH22-204_2	BH22-DUP1	December 8, 2022	Duplicate	• PHCs
BH22-201_2	BH22-DUP2	December 8, 2022	Duplicate	• PHCs

Validation criteria were established that required the analytical data to have an acceptable and documented level of precision, accuracy, representativeness, comparability and completeness (the PARCC criteria). The precision of the data for the samples collected was evaluated by calculating the RPD between the parent sample and its duplicate when the samples had concentrations greater than 5x the laboratory RDL. In accordance with industry-accepted standards, acceptable RPD values for soil samples submitted were determined as less than 50%.

Field duplicate samples were collected during the soil sampling program to determine the precision of the field sampling methods. The analytical results of the duplicate samples and calculated RPDs are presented in Table 1.

Overall, the data collected during the investigations met the QA/QC acceptance requirements. Five field duplicates were completed for soil samples during the initial soil sampling program; and two field duplicates were collected for soil samples during delineation soil program for PHCs. The Relative Percent Difference (RPD) was calculated for each duplicate sample where the chemical constituents were detected in excess of 5 times the laboratory's reportable detection limit (RDL). The submitted samples and corresponding field duplicates were below the 50% threshold with the following three exceptions:

- BH22-103_1 (parent sample: BH22-DUPD) - Antimony (RPD = 97.8%) and PHC F4 (RPD = 50.8 %);
- BH22-106_2 (parent sample: BH22-DUPB) – Arsenic (RPD = 52.0 %); and
- GR22-101 (parent sample: GR22-DUP) – Lead (RPD = 97.0 %).

The noted RPDs are attributed to the heterogeneity of the soil submitted for analysis. Additionally, the shallow samples (i.e. BH22-103_1 and GR22-101) were noted to have high gravel content which can contribute to difference between samples taken at the same locations. As the samples were generally below the ESQS (with the exception of BH22-103_1), these results will not impact the interpretation of the results. The remaining RPDs fell within the acceptable criteria of less than 50% difference for soil, therefore the soil data is considered valid for its intended purpose.

4.2 Summary of Delineation Methodology

Delineation of excess soil qualities described herein are based on results from the soils sampling programs as detailed in **Section 3.0**. Areas of differing excess soil quality have been approximately delineated to:

- The next "clean" point (e.g. concentrations below a specific ESQS, including bulk analysis and leachate).
- The construction area/stage extents.
- Based on QP discretion (e.g., where the Project Area QP considers it is reasonable to expect soil conditions to support disposal or reuse based on review of representative analytical data, field observations and application of statistical analysis in the area).

Salt impacted soil (i.e. ESQS exceedances of EC and SAR) was identified across the Project Area, and is attributed to the historical application of road salt as identified in the Environmental Review (Dillon, June 2022).

These soils should be reviewed by the intended receiver prior to acceptance to confirm that the receiver will be able to manage soils containing EC/SAR exceedances above their applicable excess soil site condition standard as per the requirements of the Soil Rules (managed as salt impacted soil as outlined in Part I Section D Section 1 (3) of the Soil Rules).

4.3 Summary of Leachate Screening Results

As per subsection 1 paragraph 8 of Section A of Part I of the *Soil Rules*, in order for soil to be considered to meet the ESQS, leachate analysis is to be completed (if required) and the results of the leachate analysis cannot exceed the identified leachate screening level values. Based on Dillon's review of results upon receipt, nine samples were submitted for mSPLP analysis of metals. mSPLP samples were selected based on exceeded parameters as outlined in Part I Section B subsection 2 (5) of the Soil Rules. In summary, the mSPLP results for most of the analyzed parameters satisfied the leachate screening values for Table 1 RPI/ICC, Table 2.1 AgO/RPI, Table 3.1 RPI, and Table 3.1 ICC ESQS, with the following exceptions:

- Four Table 3.1 ICC Screening Level exceedances of copper located at BH22-103, BH22-110, BH22-111, and BH22-120.
- One Table 3.1 ICC Screening Level exceedance of cadmium located at BH22-120.
- One Table 2.1 AgO Screening Level exceedance of total chromium located at BH22-103.
- One Table 2.1 AgO Screening Level exceedance of cobalt located at BH22-109.
- Two Table 2.1 AgO Screening Level exceedances of molybdenum, located at BH22-203 and BH22-205.

Of note, the identified exceedances are at locations with existing ESQS exceedances, with the exception of noted screening level exceedances at BH22-111 and BH22-205. However, the zoning delineation as detailed in **Section 4.4 through 4.7** does not change based on these findings. Laboratory results of the mSPLP analysis are detailed in Table 2A and noted in Figures 2A to 2D.

4.4 Soils Requiring Management as Waste

Soils have been identified within the Project Area at concentrations exceeding Table 3.1 ICC ESQS for metals and petroleum hydrocarbon (PHC) parameters, and require management as waste if removed from the Project Area. The project may also consider using these soils on-site, if possible, and where they meet other project requirements (e.g. geotechnical). Soils exceeding the Table 3.1 ICC are represented as red hatching over other zone shading or as red solid shading as detailed in **Sections 4.5 to 4.8**. Details regarding each zone are further specified below, and can be summarized as follows:

- Granular Material underneath roadways (Zone A; see **section 4.4.1**).
- Shallow soil within boulevards along the boulevards of Division Road and including the proposed road extension area southeast of Sydney Avenue, proposed to connect Division Road and Howard Avenue (Zones C and D).
- Shallow soil in the triangle median on Howard Avenue and Division Road (Zone E1).

Zones C and D are located in the unpaved boulevards of Division Road where soils are present and contain Table 3.1 ICC ESQS exceedances of several metals including cadmium, chromium VI, lead and zinc. Metals present in the shallow soils of these zones are interpreted, based on experience, to be the result of long-term use as an urban roadway resulting in deposits of metals (e.g. from car exhaust and brake pads). The method of deposit of these metals, therefore, cannot be attributed to a single point-source of contamination (e.g. such as a spill), and therefore delineating these metals is difficult. As such, and based on the numerous locations of metals exceeding Table 3.1 ICC identified during sampling along Division Road, it was determined that soils excavated from the boulevards along Division Road in Zones C and D (if any) will require management as waste. Zone C extends from BH22-211, to the southeast along the northeast boulevard on Division Road up to BH22-120 to the north Project Area extents on Sydney Avenue along the west boulevard. Zone D extends from the southeast Project Area extents along the boulevard on the south side of Division Road to the intersection for the South Devonshire Mall entrance (see Figures 2A to 2D) and includes the proposed new road extension to be constructed south of Sydney Avenue that will connect Division Road and Howard Avenue. Zones C and D vertically extend from surface to the target depth of construction. It is Dillon's understanding that project works where excess soils is being generated, will be primarily within the road footprint, but may extend onto the shoulders. Dillon notes that within the area of the proposed road extension, additional delineation could be considered during construction to attempt to delineate the Table 3.1 ICC ESQS exceedances currently observed. Currently the zone in this area is characterized by the metals exceedances present at BH22-110 and BH22-111 and laterally delineated at BH22-112. Additional sampling in this area was limited due to access restrictions related to the presence of the rail line and a high pressure gas main identified along the rail line.

Zone E1 encompasses the footprint of the triangle median on Howard Avenue and Division Road from surface to 0.6 mbgs. Collected shallow sample BH22-102_B exceeded the Table 3.1 ICC ESQS for lead. Lead impacts present in this zone are anticipated to be the same source as Zones C and D and related to the long-term urban usage of the area as a roadway. As such, this zone has been limited to the footprint of the median and has been vertically delineated based on the laboratory results obtained from BH22-101 (0.6-1.02 m bgs) where metals results were below the Table 3.1 ICC ESQS[1].

Upon receipt of the soil results from the initial program, a 'worst case' sample (i.e. BH22-103) was submitted for Toxicity Characteristic Leaching Procedure (TCLP) for metals, inorganics, benzene, benzo(a)pyrene, and flammability/ignitability for hazard classification of Project Area waste soils (as detailed above) to support future disposal. The results of the submitted TCLP sample were below the R.R.O. 347 (General – Waste Management) Schedule 4 Leachate Quality Criteria. As a result, the impacted soil was classified as non-hazardous waste and can be disposed at an approved waste receiving site, pending their review and acceptance. The results of the submitted TCLP sample are detailed in Table 2B.

[1] Vanadium exceeded the Table 3.1 ICC ESQS at BH22-101 (0.6-1.02 m bgs) however Dillon has evaluated this result and assessed it using the statistical analysis method permitted under the Soil Rules and has determined that this result is anomalous and not representative of surrounding conditions. As such, this result is not considered to be a Table 3.1 ICC exceedance. Additional details regarding this assessment can be found in Section 4.5.1.

Descriptions of the delineated Table 3.1 ICC ESQS exceedances, where present within the Project Area discussed herein are summarized in Table 3 and presented in the Site and Sample Location Plans (Figure 2A to 2D).

4.4.1 Granular Materials

In Zone A, granular material sampled below the road (fine fraction only) showed detections of PHC fractions F3 and F4 at some locations. The vertical extents of Zone A are assumed to extend from below the asphalt to the surface of the underlying native material (i.e., the zone includes all the granular material present under the road), and laterally extends across the entire Project Area limited to the roadway, with the exceptions of Zone B present on Sydney Avenue (see **Section 4.5**). The lateral and vertical extents of this zone are detailed in Figures 2A to 2D and Table 3. In some cases, the laboratory reported concentrations were elevated relative to the Table 3.1 ICC ESQS; however, these are not considered to represent regulatory exceedances as the material sampled is not considered representative of the bulk material quality (elevated concentrations are flagged in the attached tables for information and transparency purposes only). QA/QC issues related to trace fine asphalt potentially entrained during the sampling, and coarser material being omitted from analysis makes it inherently difficult to capture the soil quality of this material. As such, while the data indicates some contaminants are present, the level of impact is uncertain. Furthermore, the natural properties of this material are not consistent with the assumptions applied by the MECP during the development of the ESQS. These materials are considered to be acceptable for limited and specific reuse purposes (i.e., as recycled granular for a specific engineering purpose, and not as general fill), as detailed in Section 5 below. When reused as specified, the material would not pose any concern or risk of causing an adverse effect.

Dillon further notes that variable electrical conductivity and/or sodium adsorption ratio exceedances above Table 3.1 ICC ESQS were also identified in Zone A. However while these results are not considered to impact the reuse and disposal options where salt-impacted soils may be considered for reuse at a site that can manage the soils in compliance with the Soil Rules, reuse options will remain limited as noted above, and further detailed in Section 5.

4.4.2 Elevated Laboratory Reporting Detection Limits

During the initial soil sampling program in June 2022, eight samples were reported to have elevated reportable detection limits (RDL) for PHC F2 that exceed the Table 3.1 ICC ESQS. The samples with elevated RDLs for PHC F2 were limited to only the shallow hand dug test pit samples and samples collected from granular material underneath the road.

Based on correspondence with the laboratory that conducted the analysis, Paracel stated that the elevated RDLs were attributed to high concentrations of PHC F4 in the samples which required sample dilution. The results of the delineation program however, noted similar or higher concentrations of PHC F4 in the granular, with reported RDLs for PHC F2 below the Table 3.1 ICC ESQS. The lab further elaborated regarding these results, that the decision to dilute a sample for the assessment is subjective and based on the analyst at the time of assessment.

As such, the elevated PHC F2 RDLs for the June 2022 samples are considered to be likely similar to granular samples collected in December, and thus meet the Table 3.1 ICC ESQS.

Email correspondence with Paracel is provided in Appendix B.

4.5 Soils below Table 3.1 ICC and exceed Table 3.1 RPI ESQS

Two areas (Zones B and E2) were identified to meet Table 3.1 ICC ESQS. Zone B extends from the northern Project Area limits on Sydney Avenue to BH22-106, and includes granular material that is present below the asphalt to the bottom of the underlying granular material (at approximately 0.22 to 0.64 mbgs).

Zone E2 located within the footprint of the triangular median, was identified to contain exceedances of the Table 3.1 ICC ESQS standards for PHC F2 and Vanadium at sample location BH22-101. Dillon evaluated this sample using the statistical assessment method permitted within the Soil Rules. The results of this evaluation indicate that the sample may be considered to meet the Table 3.1 RPI as detailed in **Section** 4.5.1 and therefore soils within this zone are considered to be acceptable for reuse at a site accepting soils meeting the Table 3.1 ICC ESQS, pending their review and acceptance of the results and Dillon's assessment.

Zone E2 consists of silty clay extending from the western extents of the triangle median on Howard Avenue and Division Road, to the east Project Area boundaries on Division Road, with the north and south extents in line delineated by BH22-203, BH22-205 and BH22-204. Within the footprint of the median, Zone E2 is interpreted to vertically extend from 0.6 mbgs to the target depth of construction; within the footprint of the roadway to the east of the median, Zone E2 is present in the native material underlying the granular material road base to the target depth of construction.

The soils noted in the zones above are suitable only for reuse at Table 3.1 ICC site. Alternatively, the soils are suitable for use on-site, pending consideration of any geotechnical or other requirements. Zone B and E2 as described above is shown in purple shaded areas on Figure 2A and Figure 2B respectively.

4.5.1 Meeting Table 3.1 ICC ESQS Using the Statistical Method

In Part I Section A subsection 1(8) of the Soil Rules, an excess soil quality standard is met if the results meet the statistical method criteria detailed in subsection 1(10). During the June 2022 soil sampling program Table 3.1 ICC ESQS standards were identified for samples IDs BH22-101_1 for vanadium and BH22-101_2 for PHC F2. The samples meet the criteria as outlined in subsection 1(10) and are summarized in Table III below. Thus, based on the statistical data, the noted exceedances of vanadium and PHC F2 are considered to meet Table 3.1 ICC ESQS.

Table III - Statistical Analysis Summary

Sample ID	Parameter	Number of Samples	Table 3.1 ICC Ceiling Value	Max Result	Table 3.1 ICC ESQS	Upper Confidence Limit on the Mean	90th Pecentile
BH22-101_1	Vanadium	45	130 ug/g	94 ug/g	86 ug/g	39.2 ug/g	44.8
BH22-101_2	PHC F2	48	52 ug/g	43 ug/g	26 ug/g	4.7 ug/g	4.0

Notes:
1)The results in this table include only soil samples collected using the Geoprobe drill rig (excluding granular) during both the June and December 2022 soil sampling programs.
2)The sample pH of the data set ranged from 7.0 to 8.4, which was within the acceptable pH range for surface soil (4 to 9) and subsurface soil (5 to 11).

4.6 Soils Meeting Table 1 RPI/ICC and Table 3.1 RPI ESQS

One area, Zone F, has been identified as described in Table 3 and as shown in the green shaded areas on Figures 2A to 2D. Zone F is present throughout the Project Area underlying the road base gravel material and present in the boulevards as indicated. Soil quality results obtained for Zone F identified the following:

- EC/SAR exceedances of the Table 3.1 ICC ESQS.
- Exceedances of the Table 2.1 AgO ESQS of arsenic and/or lead that were below the Table 1 RPI/ICC ESQS and Table 3.1 RPI ESQS.
- Exceedances of the Table 1 RPI/ICC ESQS for molybdenum below the Table 2.1 Ag/O ESQS and Table 3.1 RPI ESQ.
- Exceedances of the Leachate Screening Values Table 1 RPI/ICC and 2.1 AgO for molybdenum at BH22-203 and BH22-205.

Molybdenum is considered to be naturally occurring for the region. Based on review of the soil quality results, the elevated concentrations of molybdenum are representative of background concentrations, and the following comments are provided to support this position:

- There are no suspected anthropogenic sources of molybdenum in the Project Area.
- Elevated concentrations are present across the Project Area at varying depths.
- Elevated concentrations of molybdenum (similar to the ranges identified in the Project Area) have been documented to be present in the local area (Managing Natural Soils from Construction and Importation of Quarry Rehabilitation Fill in Ontario, Golder Associates Ltd., 2016).

While Dillon does not consider the molybdenum results to represent contamination above the Table 1 RPI/ICC site condition standard at the source site, it is ultimately up to the receiving site if they will accept this material.

Dillon notes that based on the arsenic and lead exceedances (for Table 2.1 AgO only) identified throughout the Project Area, the soils within the zones described below are not understood to be suitable for acceptance at a Table 2.1 AgO receiver, but they may be accepted at a Table 1 RPI/ICC receiver that can accept molybdenum above Table 1 RPI/ICC ESQS (i.e. a local Table 1 receiver present in the region that is knowledgeable of molybdenum's elevated background concentrations). Otherwise these materials are to be managed at a site that accepts soils meeting Table 3.1 RPI ESQS. Additionally, the receiver must be able to accept soils with concentrations of EC and SAR above the Table 3.1 ICC ESQS to be managed according to the provisions listed in Part I Section D Section 1 (3) of the Soil Rules.

Where Table 1 and/or Table 2.1 AgO exceedances are identified within this zone as described above, soil quality impacts are assumed to be present to the maximum vertical and lateral extents of the proposed excavated excess soils where there is not another borehole that meets more conservative ESQS. The soil texture of this material primarily consisted of silty clay collected adjacent or close to the granular material and deeper into the native soil. One exception was noted at BH22-206, where sand was encountered from 0.40 to 0.78 mbgs adjacent to the overlying granular layer.

4.7 Soils Requiring Potential Additional Characterization During Construction

There are two areas where the Project Area intersects with a rail line running northwest to southeast:

- On Howard Road south of the triangle median where the rail line intersects the road.
- Within the proposed roadway construction area where a crossroad is proposed to connect Division Road and Howard Avenue across from Sydney Avenue.

As the City does not own/have permission to access these areas, sampling was restricted. Furthermore, a large high pressure gas main was identified in the utility locates running parallel with the rail line that does not enable safe use of the Geoprobe drilling rig in these areas. Dillon has made assumptions for the soil characterization in these areas based on the available technical information. Additional characterization during construction can be completed to either attempt to reduce the volume of soils requiring management as waste and/or characterize soils near the rail line to satisfy receivers, if required.

4.8 Procedures for Unknown Contamination during Construction

The sample results and this Report have made reasonable efforts to understand and delineate areas that have or are likely to have soils exceeding the acceptance criteria of the identified receiving sites. However, as is possible for many urban construction projects, it is possible that areas of unknown contamination may be identified during construction. Prior to construction, a Excavation Contingency Plan is required to be prepared as per Section 23 of O.Reg. 406/19, that details what actions are required to be taken by the Contractor, and/or the project QP when evidence of contamination is identified during excavation, which may include work stoppage, additional sampling, segregation of materials, etc.

5.0 Results and Recommendations

It is Dillon's opinion, based on the results received and limitations presented herein, that excess soils to be generated during construction as part of the Howard Avenue Corridor Improvements project as described in this Report are suitable for transportation to waste and/or beneficial reuse sites, as described in Section 4, pending a receiver's review and acceptance. Dillon notes that as specific receiving sites were not identified at the time of the preparation of the sampling program and this report, and as receiving sites may have additional receiving site criteria that is in addition to the investigation completed and documented herein, that additional sampling and/or reporting requirements may be required by a specific receiving site prior to acceptance.

Based on the results received, Dillon has interpreted the reuse and disposal options, based on the soil quality in comparison to the Excess Soil Quality Standards (ESQS) identified in Part II of the Ontario Ministry of the Environment's (MECP) document "Rules for Soil Management and Excess Soil Quality Standards" (ESQS, Soil Rules), a companion document to *Ontario Regulation (O.Reg.) 406/19 On-site and Excess Soil Management*. It is our understanding that soils within the Project Area will be handled by the onsite construction team as follows, and as illustrated on the attached Site and Sample Location Plans (Figures 2A to 2D):

- Granular material present under the road surface noted throughout the Project Area is recommended to be transported to an aggregate recycling yard/facility to be reused as granular material for a specific engineering purpose and not for use as general fill. This material can also be used on-site as granular material under the roadway if it meets appropriate specifications. If not being reused for this purpose, this material can also be transported to an MECP approved waste receiving site following requirements of R.R.O. 347 (General – Waste Management), as it would not otherwise be considered suitable as a potential clean fill material for other purposes.
- Excess soils contain concentrations exceeding Table 3.1 Industrial/Commercial/Community (ICC) ESQS (i.e. Zones C, D, and E1) must be transported to an MECP approved waste receiving site following requirements of R.R.O. 347.
- Excess soils that exceed Table 3.1 Residential/ Parkland/ Institutional (RPI) ESQS but were below Table 3.1 ICC ESQS are suitable for beneficial reuse at a site that accepts Table 3.1 ICC ESQS, but are required to be managed as salt impacted soil as outlined in Part I Section D Section 1 (3) of the Soil Rules;
- Excess soils within the Project Area are not suitable for reuse at Table 2.1 AgO ESQS site due to lead and arsenic exceedances across the Project Area; and
- Excess soil area that meets Table 1 RPI/ICC ESQS, however as is expected in the region, there is also naturally occurring molybdenum at concentrations exceeding Table 1 RPI/ICC ESQS. These soils are understood to be suitable for acceptance at a Table 1 RPI/ICC receiver that can accept molybdenum above Table 1 RPI/ICC ESQS (i.e. a local Table 1 receiver present in the region that is knowledgeable of molybdenum's elevated background concentrations). Otherwise, these materials are to be managed at a site that accepts soils meeting Table 3.1 RPI ESQS.

Additionally, the receiver must be able to accept soils with concentrations of EC and SAR above the Table 3.1 ICC ESQS to be managed according to the provisions listed in Part I Section D Section 1 (3) of the Soil Rules.

Additional soil quality standards have not been reviewed as a part of this Report for the purposes of supporting reuse of soils at sites with other acceptance criteria not referenced in this Report. Should the contractor identify receiving sites that do not meet the land use requirements for beneficial reuse, further comparison may be completed.

6.0 Disclaimer and Limiting Conditions

This report was prepared exclusively for the purposes, project and site location(s) outlined in the report. The report is based on information provided to, or obtained by Dillon Consulting Limited ("Dillon") as indicated in the report, and applies solely to site conditions existing at the time of the Site investigation(s). Although a reasonable investigation was conducted by Dillon, Dillon's investigation was by no means exhaustive and cannot be construed as a certification of the absence of any contaminants from the Site(s). Rather, Dillon's report represents a reasonable review of available information within an agreed work scope, schedule and budget. It is therefore possible that currently unrecognized contamination or potentially hazardous materials may exist at the Site(s), and that the levels of contamination or hazardous materials may vary across the Site(s). Further review and updating of the report may be required as local and site conditions, and the regulatory and planning frameworks, change over time.

This report was prepared by Dillon for the sole benefit of our Client, Corporation of the City of Windsor. The material in it reflects Dillon's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

DILLON CONSULTING LIMITED
WINDSOR, ONTARIO

Matthew Antaya, B.Sc.
Environmental Scientist

Brent Loney, M.Sc. P.Geo.
Senior Reviewer

7.0 References

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Figures

HOWARD AVENUE CORRIDOR IMPROVEMENTS

SOIL CHARACTERIZATION REPORT

PROJECT AREA LOCATION

FIGURE 1

- Project Area
- Study Area (100 m)
- Highway
- Major Road
- Minor Road
- Railway

SCALE 1:10,000

0 125 250 500 m

N W E S

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF, COUNTY OF ESSEX

MAP CREATED BY: -DU
MAP CHECKED BY: -AM
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 20-3864
STATUS: FINAL
DATE: 2023-02-07

FILE LOCATION: K:\2020\203864 - Howard - South Cameron Intersection\Product\Client\Soil Characterization\F1_ProjectAreaLocation_203864.mxd

Survey Data			
Location ID	**Easting (m)**	**Northing (m)**	**Elevation (mASL)**
BH22-101	334722.32	4681991.59	187.35
BH22-102	334759.33	4681917.45	186.87
BH22-102_B	334742.71	4681956.00	187.47
BH22-103	334810.87	4681913.91	186.78
BH22-104	334856.28	4681851.23	187.19
BH22-105	334891.46	4681817.52	187.32
BH22-106	334955.86	4681784.69	187.59
BH22-107	334983.55	4681806.90	187.16
BH22-108	335019.50	4681852.33	186.78
BH22-109	334999.93	4681729.32	187.67
BH22-110	334957.59	4681739.58	187.70
BH22-111	334931.46	4681759.99	187.86
BH22-112	334915.02	4681700.35	187.27
BH22-113	334897.54	4681582.14	187.26
BH22-114	334875.09	4681632.21	187.11
BH22-115	334871.74	4681687.34	187.20
BH22-116	334839.28	4681713.01	187.12
BH22-117	334776.48	4681801.96	187.02
BH22-118	334729.19	4681845.48	186.72
BH22-119	334830.95	4681753.46	187.11
BH22-120	334971.31	4681796.91	187.46
BH22-201	334681.08	4682115.55	186.07
BH22-202	334712.01	4682052.52	186.28
BH22-203	334708.87	4682006.79	187.08
BH22-204	334737.02	4682011.85	186.45
BH22-205	334734.49	4681950.87	187.15
BH22-206	334808.54	4681911.63	186.87
BH22-208	335064.53	4681677.79	187.90
BH22-209	335115.22	4681638.79	187.97
BH22-211	334786.40	4681946.13	186.82
BH22-212	334825.54	4681894.61	186.78
BH22-213	334795.98	4681890.56	187.60
BH22-214	334942.65	4681779.37	187.56
BH22-215	335050.90	4681667.98	187.68

Notes:
1)Boreholes were surveyed using a Trimble GPS R10 with an accuracy of +/- 0.020 m.
2)Elevations were surveyed using City of Windsor Benchmarks.

Howard Avenue Corridor Improvements

Soil Characterization Report

BULK SOIL QUALITY RESULTS - KEY PLAN AND LEGEND

FIGURE 2

Borehole
Hand Test Pit
Alignment Stationing
Project Area

Proposed Watermain
Proposed Storm Sewer
Railway

10 Soil result meets assessed ESQS
10 Soil result exceeds Table 1 RPI/ICC ESQS
10 Soil result exceeds Table 2.1 AgO ESQS
10 Soil result exceeds Table 3.1 RPI ESQS
10 Soil result exceeds Table 3.1 ICC ESQS

Soils below Table 1 RPI/ICC ESQS
Soils exceed Table 3.1 RPI ESQS
Soils exceed Table 3.1 ICC ESQS
Overlying soil and/or granular material exceed Table 3.1 ICC
Overlying soil and/or granular material exceed Table 3.1 RPI

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF

MAP CREATED BY: DU
MAP CHECKED BY: MA
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE 1 : 1,500

0 1020 40 Metres

Notes:
1) 'RPI' means, Residential/Parkland/Institutional Property Uses
2) 'AgO' means, Agricultural and Other Property Uses
3) 'ICC' means, Industrial/Commercial/Community Property Uses
4) 'ESQS' means, Excess Soil Quality Standards
5) '<' indicates, result was below the Reportable Detection Limit (RDL).

PROJECT: 20-3864 STATUS: FINAL DATE: 2023-02-07

FILE LOCATION: K:\2020\203864 - Howard - South Cameron Intersection\Product\Client\Soil Characterization\F2_KeyPlan_203864.mxd

BH22-201

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-201_1 & BH22-DUP[1]	0.28-0.30	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	838[2]
		PHC F4	120	2800	2800	3300	5360[2,4]
		PHC F4G	120	2800	2800	3300	7321[2,4]
BH22-201_2[5]	0.50-0.70	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-201_3[5]	2.60-2.80	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Duplicate result used due to higher concentration than parent sample.
3) Samples analyzed for PHCs only.
4) Table 3.1 ICC ESQS exceedances denoted by red hatching.
5) PHC F4G was not required to be analyzed.

BH22-202

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-202_1[1]	0.28-0.30	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	1090
		PHC F4	120	2800	2800	3300	4070[3]
		PHC F4G	120	2800	2800	3300	8360[3]
BH22-202_2[4]	0.58-0.78	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-202_3[4]	2.48-2.78	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Samples analyzed for PHCs only.
3) Table 3.1 ICC ESQS exceedances denoted by red hatching.
4) PHC F4G was not required to be analyzed.

BH22-203

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-203_1[1]	0.27-0.29	PHC F3	240	240	300	1700	25302
		PHC F4	120	2800	2800	3300	7900[2]
		PHC F4G	120	2800	2800	3300	14900[2]
BH22-203_2[4]	0.57-0.87	Arsenic	18	11	18	18	11.4
		PHC F3	240	240	300	1700	16
		PHC F4	120	2800	2800	3300	<6.0
BH22-203_3[3,4]	2.87-3.27	Arsenic	18	11	18	18	8.8
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Table 3.1 ICC ESQS exceedances denoted by red hatching.
3) BH22-203_3 was submitted for mSPLP analysis of metals and exceeded the Table 2.1 AgO leachate screening levels for molybdenum (see **Table 2A** and **section 4.6**).
4) PHC F4G was not required to be analyzed.

BH22-205

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-205_1[1]	0.20-0.30	PHC F3	240	240	300	1700	1310
		PHC F4	120	2800	2800	3300	5030[2]
		PHC F4G	120	2800	2800	3300	7940[2]
BH22-205_2[4]	0.77-1.27	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-205_3[3,4]	1.7-2.0	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Table 3.1 ICC ESQS exceedances denoted by red hatching.
3) BH22-205_3 was submitted for mSPLP analysis of metals and exceeded the Table 2.1 AgO leachate screening levels for molybdenum (see **Table 2A** and **section 4.6**).
4) PHC F4G was not required to be analyzed.

BH22-102

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-102_1	0.35-0.85	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
BH22-102_2	1.6-2.0	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0

BH22-204

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-204_1[1,3]	0.30-0.32	PHC F3	240	240	300	1700	428[2]
		PHC F4	120	2800	2800	3300	1310
		PHC F4G	120	2800	2800	3300	2890
BH22-204_2[4]	0.40-0.65	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-204_3[4]	1.7-2.0	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Samples analyzed for PHCs only.
3) Table 3.1 RPI ESQS exceedance part of Zone A Table 3.1 ICC Exceedance area.
4) PHC F4G was not required to be analyzed.

BH22-206

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-206_1[1,2]	0.28-0.30	PHC F3	240	240	300	1700	246
		PHC F4	120	2800	2800	3300	1040
		PHC F4G	120	2800	2800	3300	2130
BH22-206_2[3,4]	0.40-0.82	Arsenic	18	11	18	18	14.7
		Cadmium	1.2	1.0	1.2	1.9	<0.5
		Chromium (hexavalent)	0.66	8	8	8	<0.2
		Lead	0.27	0.24	0.27	0.27	13.9
		Zinc	290	340	340	340	59.0
BH22-206_3[3,4]	0.85-1.08	Arsenic	18	11	18	18	13.2
		Cadmium	1.2	1.0	1.2	1.9	<0.5
		Chromium (hexavalent)	0.66	8	8	8	<0.2
		Lead	0.27	0.24	0.27	0.27	10.8
		Zinc	290	340	340	340	64.7

1) Granular sample collected.
2) Samples analyzed for metals and PHCs only.
3) Samples analyzed for metals only.
4) PHC F4G was not required to be analyzed.

Zone A
Zone extends along the entire project area within the confines of the roadway with the exception of Zone B and is limited to the sand and gravel material present below the asphalt to the top of the native underlying material.

Zone is indicated by red hatching across the project area with the exception of Zone E1

Zone F
Laterally extends throughout the Project area, under the road and underlying Zones A and B and excluding areas of Zones C, D and E

HOWARD AVENUE
DIVISION ROAD
KENILWORTH AVE

0+000
0+100
0+200
0+300
0+100

BH22-201
BH22-202
BH22-204
BH22-203
BH22-101
BH22-102-B
BH22-205
BH22-211
BH22-103
BH22-206
BH22-102
BH22-213
BH22-212

Zone E2 (see Figure 2A-2)
Zone E1 (see Figure 2A-2)
Zone C (see Figure 2A-2)
Zone D (see Figure 2B)

Howard Avenue Corridor Improvements

Soil Characterization Report

BULK SOIL QUALITY RESULTS - DIVISION ROAD (NORTH)

FIGURE 2A-1

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF

MAP CREATED BY: DU
MAP CHECKED BY: MA
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE 1 : 1,500
0 10 20 40 Metres

N W E S

Notes:
1) 'RPI' means, Residential/Parkland/Institutional Property Uses
2) 'AgO' means, Agricultural and Other Property Uses
3) 'ICC' means, Industrial/Commercial/Community Property Uses
4) 'ESQS' means, Excess Soil Quality Standards
5) '<' indicates, result was below the Reportable Detection Limit (RDL).

PROJECT: 20-3864 STATUS: FINAL DATE: 2023-02-07

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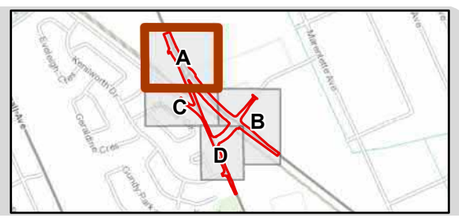

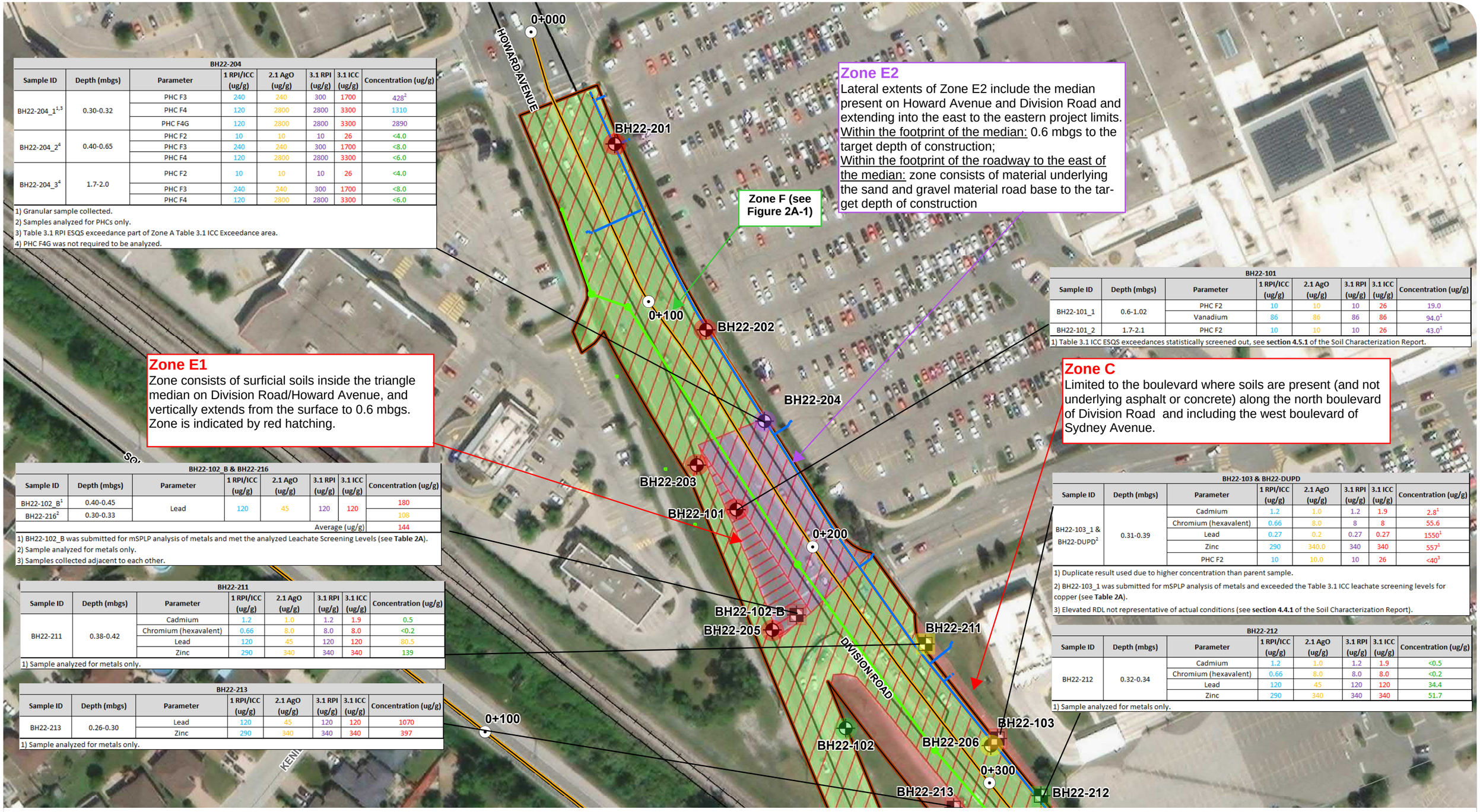

BH22-204

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-204_1[1,3]	0.30-0.32	PHC F3	240	240	300	1700	428[2]
		PHC F4	120	2800	2800	3300	1310
		PHC F4G	120	2800	2800	3300	2890
BH22-204_2[4]	0.40-0.65	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-204_3[4]	1.7-2.0	PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Samples analyzed for PHCs only.
3) Table 3.1 RPI ESQS exceedance part of Zone A Table 3.1 ICC Exceedance area.
4) PHC F4G was not required to be analyzed.

Zone E2

Lateral extents of Zone E2 include the median present on Howard Avenue and Division Road and extending into the east to the eastern project limits.
Within the footprint of the median: 0.6 mbgs to the target depth of construction;
Within the footprint of the roadway to the east of the median: zone consists of material underlying the sand and gravel material road base to the target depth of construction

BH22-101

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-101_1	0.6-1.02	PHC F2	10	10	10	26	19.0
		Vanadium	86	86	86	86	94.0[1]
BH22-101_2	1.7-2.1	PHC F2	10	10	10	26	43.0[1]

1) Table 3.1 ICC ESQS exceedances statistically screened out, see **section 4.5.1** of the Soil Characterization Report.

Zone E1

Zone consists of surficial soils inside the triangle median on Division Road/Howard Avenue, and vertically extends from the surface to 0.6 mbgs. Zone is indicated by red hatching.

Zone C

Limited to the boulevard where soils are present (and not underlying asphalt or concrete) along the north boulevard of Division Road and including the west boulevard of Sydney Avenue.

BH22-102_B & BH22-216

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-102_B[1]	0.40-0.45	Lead	120	45	120	120	180
BH22-216[2]	0.30-0.33						108
						Average (ug/g)	144

1) BH22-102_B was submitted for mSPLP analysis of metals and met the analyzed Leachate Screening Levels (see **Table 2A**).
2) Sample analyzed for metals only.
3) Samples collected adjacent to each other.

BH22-103 & BH22-DUPD

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-103_1 & BH22-DUPD[2]	0.31-0.39	Cadmium	1.2	1.0	1.2	1.9	2.8[1]
		Chromium (hexavalent)	0.66	8.0	8	8	55.6
		Lead	0.27	0.2	0.27	0.27	1550[1]
		Zinc	290	340.0	340	340	557[1]
		PHC F2	10	10.0	10	26	<40[3]

1) Duplicate result used due to higher concentration than parent sample.
2) BH22-103_1 was submitted for mSPLP analysis of metals and exceeded the Table 3.1 ICC leachate screening levels for copper (see **Table 2A**).
3) Elevated RDL not representative of actual conditions (see **section 4.4.1** of the Soil Characterization Report).

BH22-211

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-211	0.38-0.42	Cadmium	1.2	1.0	1.2	1.9	0.5
		Chromium (hexavalent)	0.66	8.0	8.0	8.0	<0.2
		Lead	120	45	120	120	80.5
		Zinc	290	340	340	340	139

1) Sample analyzed for metals only.

BH22-212

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-212	0.32-0.34	Cadmium	1.2	1.0	1.2	1.9	<0.5
		Chromium (hexavalent)	0.66	8.0	8.0	8.0	<0.2
		Lead	120	45	120	120	34.4
		Zinc	290	340	340	340	51.7

1) Sample analyzed for metals only.

BH22-213

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-213	0.26-0.30	Lead	120	45	120	120	1070
		Zinc	290	340	340	340	397

1) Sample analyzed for metals only.

Howard Avenue Corridor Improvements

Soil Characterization Report

BULK SOIL QUALITY RESULTS - DIVISION ROAD (NORTH)

FIGURE 2A-2

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF

MAP CREATED BY: DU
MAP CHECKED BY: MA
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE 1 : 1,500

0 10 20 40 Metres

Notes:
1) 'RPI' means, Residential/Parkland/Institutional Property Uses
2) 'AgO' means, Agricultural and Other Property Uses
3) 'ICC' means, Industrial/Commercial/Community Property Uses
4) 'ESQS' means, Excess Soil Quality Standards
5) '<' indicates, result was below the Reportable Detection Limit (RDL).

PROJECT: 20-3864 STATUS: FINAL DATE: 2023-02-07

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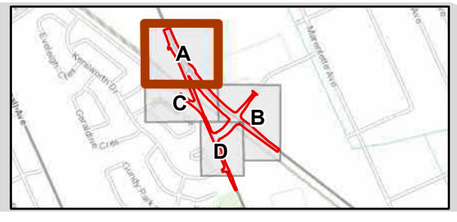

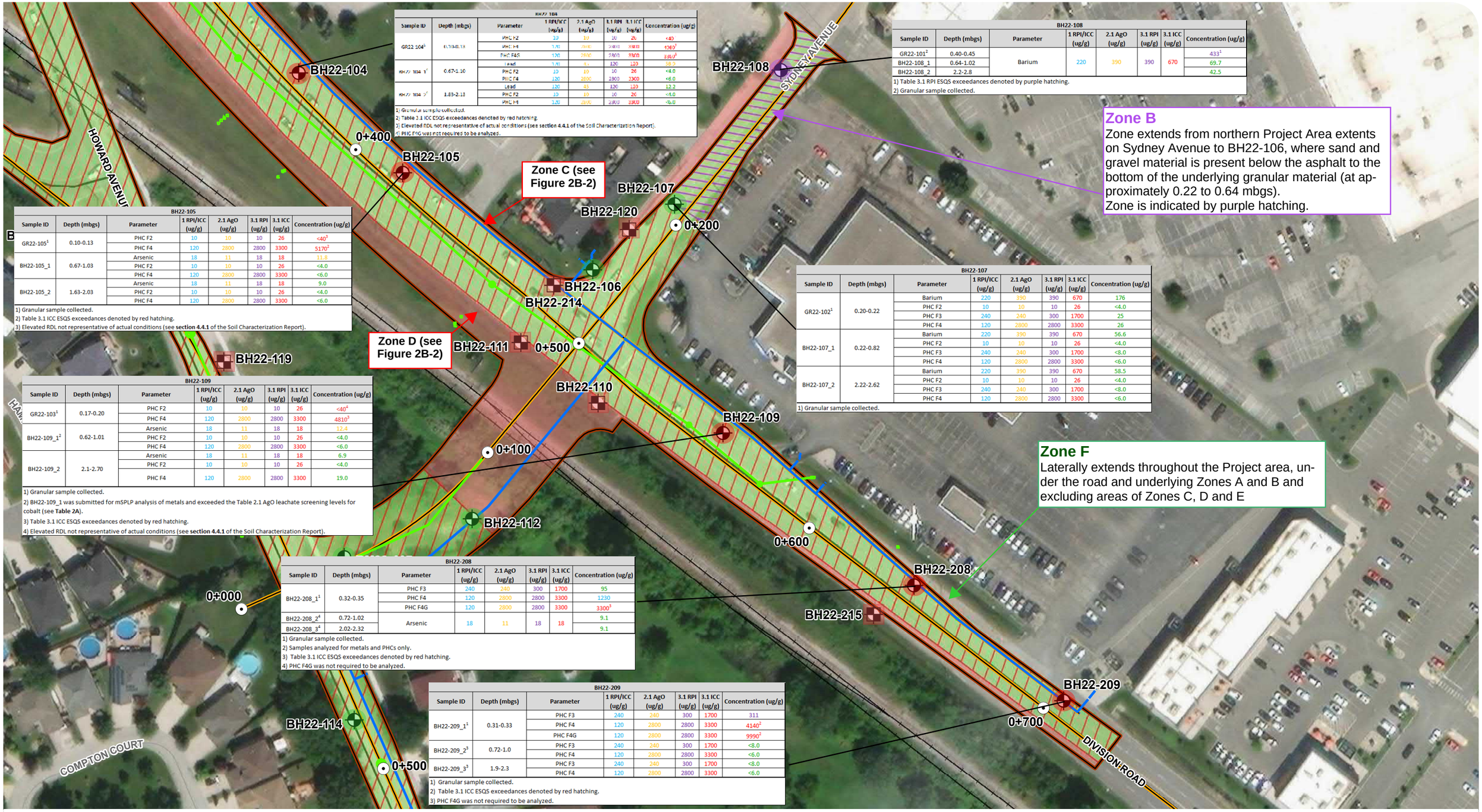

BH22-104

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
GR22-104[2]	0.10-0.18	PHC F2	10	10	10	26	<40[3]
		PHC F4	120	2800	2800	3300	4060[3]
		PHC F4G	120	2800	2800	3300	3300[3]
BH22-104_1[4]	0.67-1.10	Lead	120	45	120	120	58.2
		PHC F2	10	10	10	26	<4.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-104_2[4]	1.83-2.13	Lead	120	45	120	120	12.2
		PHC F2	10	10	10	26	<4.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Table 3.1 ICC ESQS exceedances denoted by red hatching.
3) Elevated RDL not representative of actual conditions (see section 4.4.1 of the Soil Characterization Report).
4) PHC F4G was not required to be analyzed.

BH22-105

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
GR22-105[1]	0.10-0.13	PHC F2	10	10	10	26	<40[3]
		PHC F4	120	2800	2800	3300	5170[2]
BH22-105_1	0.67-1.03	Arsenic	18	11	18	18	11.8
		PHC F2	10	10	10	26	<4.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-105_2	1.63-2.03	Arsenic	18	11	18	18	9.0
		PHC F2	10	10	10	26	<4.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Table 3.1 ICC ESQS exceedances denoted by red hatching.
3) Elevated RDL not representative of actual conditions (see **section 4.4.1** of the Soil Characterization Report).

BH22-108

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
GR22-101[2]	0.40-0.45	Barium	220	390	390	670	433[1]
BH22-108_1	0.64-1.02						69.7
BH22-108_2	2.2-2.8						42.5

1) Table 3.1 RPI ESQS exceedances denoted by purple hatching.
2) Granular sample collected.

Zone B
Zone extends from northern Project Area extents on Sydney Avenue to BH22-106, where sand and gravel material is present below the asphalt to the bottom of the underlying granular material (at approximately 0.22 to 0.64 mbgs).
Zone is indicated by purple hatching.

BH22-107

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
GR22-102[1]	0.20-0.22	Barium	220	390	390	670	176
		PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	25
		PHC F4	120	2800	2800	3300	26
BH22-107_1	0.22-0.82	Barium	220	390	390	670	56.6
		PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-107_2	2.22-2.62	Barium	220	390	390	670	58.5
		PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.

Zone F
Laterally extends throughout the Project area, under the road and underlying Zones A and B and excluding areas of Zones C, D and E

BH22-109

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
GR22-103[1]	0.17-0.20	PHC F2	10	10	10	26	<40[4]
		PHC F4	120	2800	2800	3300	4810[3]
BH22-109_1[2]	0.62-1.01	Arsenic	18	11	18	18	12.4
		PHC F2	10	10	10	26	<4.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-109_2	2.1-2.70	Arsenic	18	11	18	18	6.9
		PHC F2	10	10	10	26	<4.0
		PHC F4	120	2800	2800	3300	19.0

1) Granular sample collected.
2) BH22-109_1 was submitted for mSPLP analysis of metals and exceeded the Table 2.1 AgO leachate screening levels for cobalt (see **Table 2A**).
3) Table 3.1 ICC ESQS exceedances denoted by red hatching.
4) Elevated RDL not representative of actual conditions (see **section 4.4.1** of the Soil Characterization Report).

BH22-208

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-208_1[1]	0.32-0.35	PHC F3	240	240	300	1700	95
		PHC F4	120	2800	2800	3300	1230
		PHC F4G	120	2800	2800	3300	3300[3]
BH22-208_2[4]	0.72-1.02	Arsenic	18	11	18	18	9.1
BH22-208_3[4]	2.02-2.32						9.1

1) Granular sample collected.
2) Samples analyzed for metals and PHCs only.
3) Table 3.1 ICC ESQS exceedances denoted by red hatching.
4) PHC F4G was not required to be analyzed.

BH22-209

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-209_1[1]	0.31-0.33	PHC F3	240	240	300	1700	311
		PHC F4	120	2800	2800	3300	4140[2]
		PHC F4G	120	2800	2800	3300	9990[2]
BH22-209_2[3]	0.72-1.0	PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-209_3[3]	1.9-2.3	PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Table 3.1 ICC ESQS exceedances denoted by red hatching.
3) PHC F4G was not required to be analyzed.

Howard Avenue Corridor Improvements

Soil Characterization Report

BULK SOIL QUALITY RESULTS - DIVISION ROAD (SOUTH)/SYDNEY AVENUE

FIGURE 2B-1

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF

MAP CREATED BY: DU
MAP CHECKED BY: MA
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE 1 : 1,500
0 10 20 40 Metres

Notes:
1) 'RPI' means, Residential/Parkland/Institutional Property Uses
2) 'AgO' means, Agricultural and Other Property Uses
3) 'ICC' means, Industrial/Commercial/Community Property Uses
4) 'ESQS' means, Excess Soil Quality Standards
5) '<' indicates, result was below the Reportable Detection Limit (RDL).

PROJECT: 20-3864 STATUS: FINAL DATE: 2023-02-07

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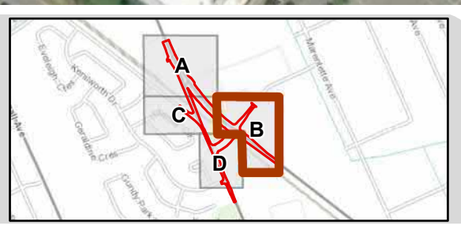
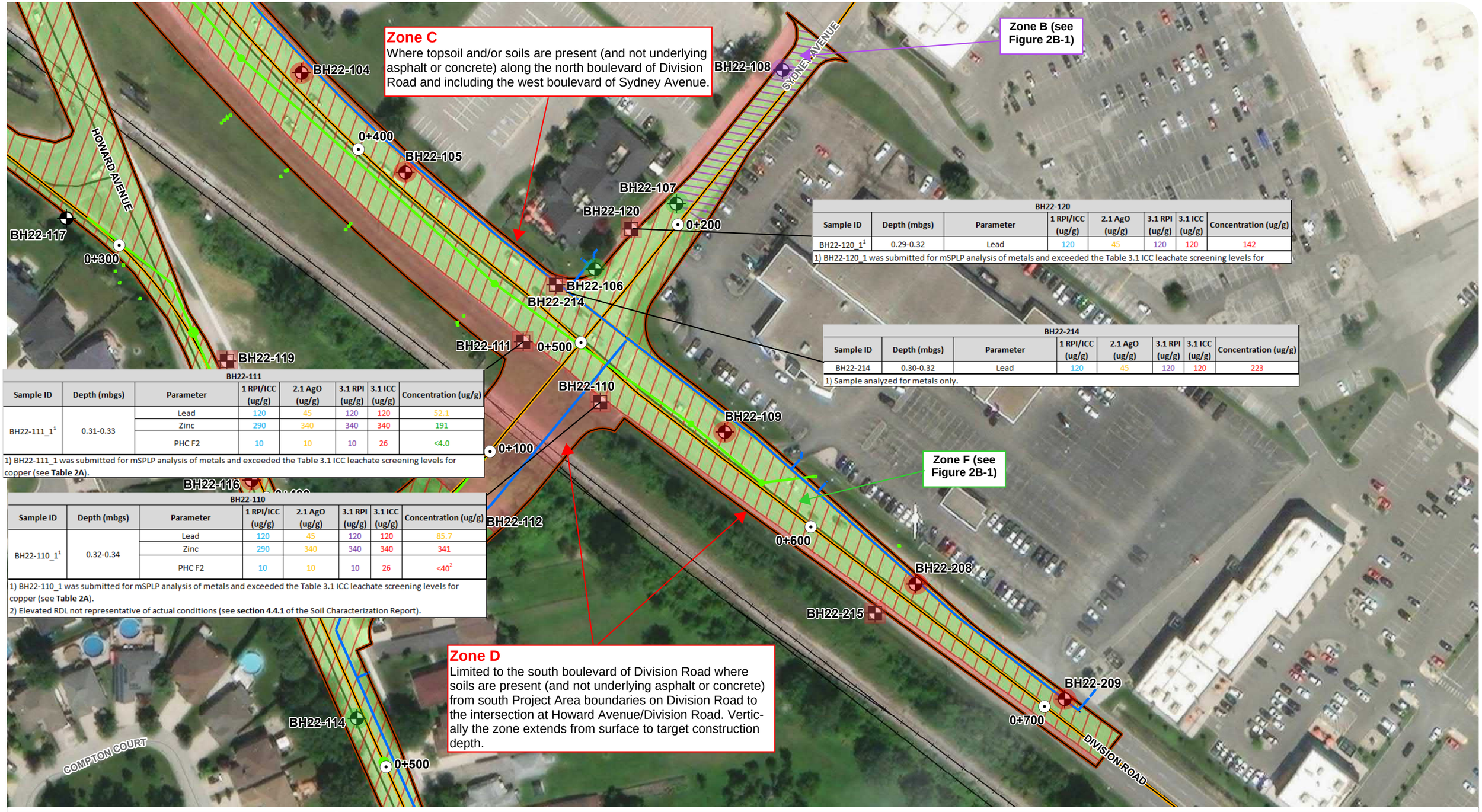




BH22-120

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-120_1[1]	0.29-0.32	Lead	120	45	120	120	142

1) BH22-120_1 was submitted for mSPLP analysis of metals and exceeded the Table 3.1 ICC leachate screening levels for

BH22-214

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-214	0.30-0.32	Lead	120	45	120	120	223

1) Sample analyzed for metals only.

BH22-111

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-111_1[1]	0.31-0.33	Lead	120	45	120	120	52.1
		Zinc	290	340	340	340	191
		PHC F2	10	10	10	26	<4.0

1) BH22-111_1 was submitted for mSPLP analysis of metals and exceeded the Table 3.1 ICC leachate screening levels for copper (see **Table 2A**).

BH22-110

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-110_1[1]	0.32-0.34	Lead	120	45	120	120	85.7
		Zinc	290	340	340	340	341
		PHC F2	10	10	10	26	<40[2]

1) BH22-110_1 was submitted for mSPLP analysis of metals and exceeded the Table 3.1 ICC leachate screening levels for copper (see **Table 2A**).
2) Elevated RDL not representative of actual conditions (see **section 4.4.1** of the Soil Characterization Report).

Howard Avenue Corridor Improvements

Soil Characterization Report

BULK SOIL QUALITY RESULTS - DIVISION ROAD (SOUTH)/SYDNEY AVENUE

FIGURE 2B-2

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF

MAP CREATED BY: DU
MAP CHECKED BY: MA
MAP PROJECTION: NAD 1983 UTM Zone 17N

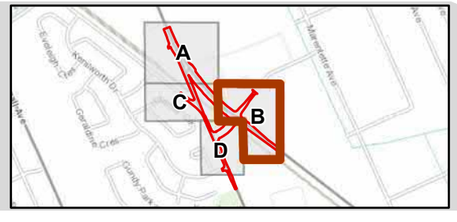
SCALE 1 : 1,500

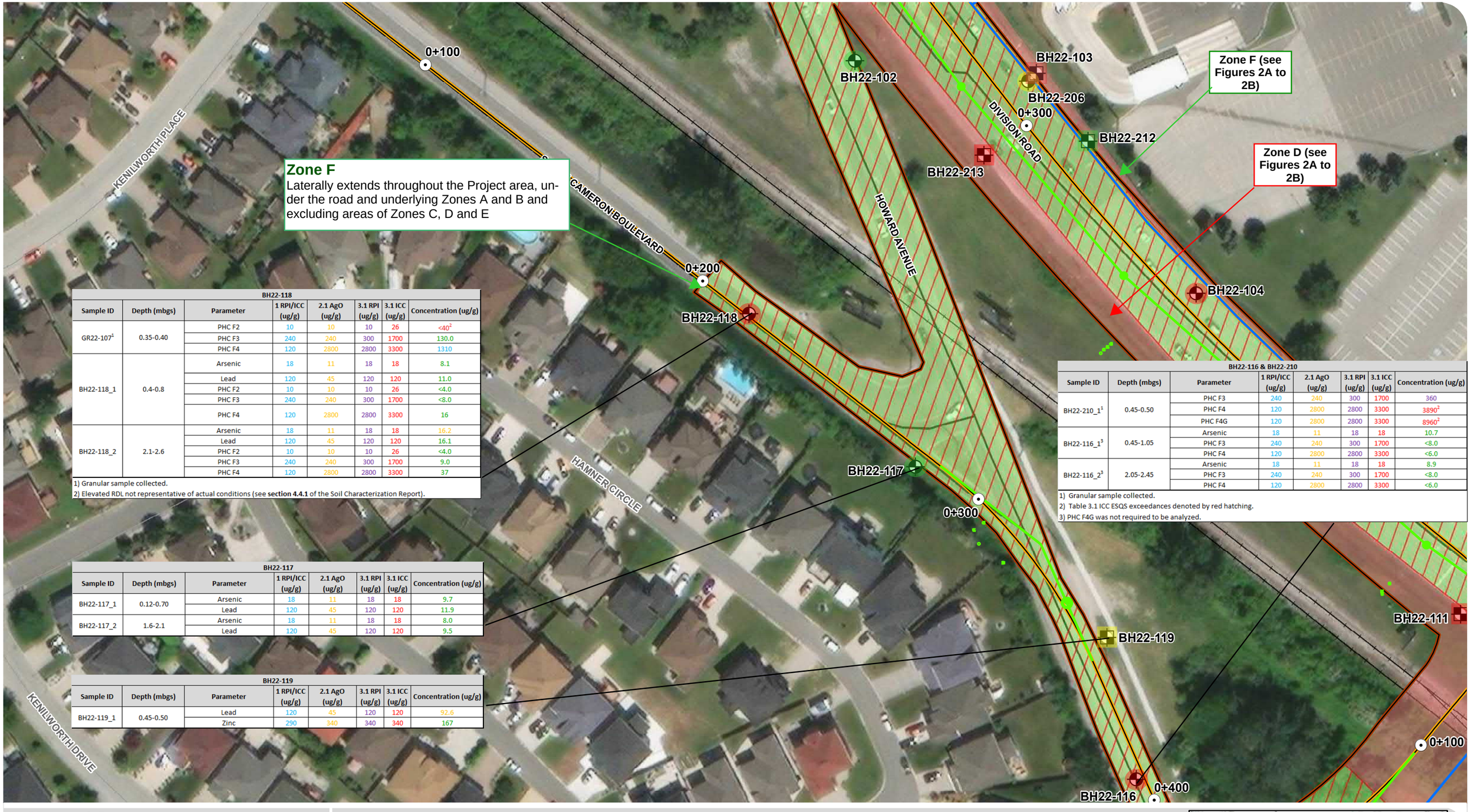
0 10 20 40 Metres

Notes:
1) 'RPI' means, Residential/Parkland/Institutional Property Uses
2) 'AgO' means, Agricultural and Other Property Uses
3) 'ICC' means, Industrial/Commercial/Community Property Uses
4) 'ESQS' means, Excess Soil Quality Standards
5) '<' indicates, result was below the Reportable Detection Limit (RDL).

PROJECT: 20-3864 STATUS: FINAL DATE: 2023-02-07

FILE LOCATION: K:\2020\203864 - Howard - South Cameron Intersection\Product\Client\Soil Characterization\F2_A_D_BulkSoilQualityResultsSummary_V2_203864.mxd





Zone F
Laterally extends throughout the Project area, under the road and underlying Zones A and B and excluding areas of Zones C, D and E

Zone F (see Figures 2A to 2B)

Zone D (see Figures 2A to 2B)

BH22-118

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
GR22-107[1]	0.35-0.40	PHC F2	10	10	10	26	<40[2]
		PHC F3	240	240	300	1700	130.0
		PHC F4	120	2800	2800	3300	1310
BH22-118_1	0.4-0.8	Arsenic	18	11	18	18	8.1
		Lead	120	45	120	120	11.0
		PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	16
BH22-118_2	2.1-2.6	Arsenic	18	11	18	18	16.2
		Lead	120	45	120	120	16.1
		PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	9.0
		PHC F4	120	2800	2800	3300	37

1) Granular sample collected.
2) Elevated RDL not representative of actual conditions (see **section 4.4.1** of the Soil Characterization Report).

BH22-116 & BH22-210

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-210_1[1]	0.45-0.50	PHC F3	240	240	300	1700	360
		PHC F4	120	2800	2800	3300	3890[2]
		PHC F4G	120	2800	2800	3300	8960[2]
BH22-116_1[3]	0.45-1.05	Arsenic	18	11	18	18	10.7
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-116_2[3]	2.05-2.45	Arsenic	18	11	18	18	8.9
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Table 3.1 ICC ESQS exceedances denoted by red hatching.
3) PHC F4G was not required to be analyzed.

BH22-117

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-117_1	0.12-0.70	Arsenic	18	11	18	18	9.7
		Lead	120	45	120	120	11.9
BH22-117_2	1.6-2.1	Arsenic	18	11	18	18	8.0
		Lead	120	45	120	120	9.5

BH22-119

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-119_1	0.45-0.50	Lead	120	45	120	120	92.6
		Zinc	290	340	340	340	167

Howard Avenue Corridor Improvements

Soil Characterization Report

BULK SOIL QUALITY RESULTS - SOUTH CAMERON/HOWARD AVENUE (NORTH)

FIGURE 2C

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF

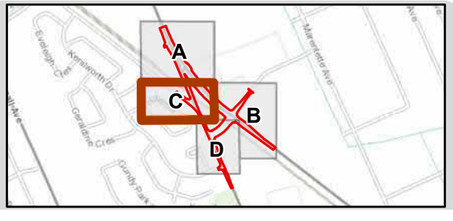
MAP CREATED BY: DU
MAP CHECKED BY: MA
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE 1 : 1,500

0 10 20 40 Metres

Notes:
1) 'RPI' means, Residential/Parkland/Institutional Property Uses
2) 'AgO' means, Agricultural and Other Property Uses
3) 'ICC' means, Industrial/Commercial/Community Property Uses
4) 'ESQS' means, Excess Soil Quality Standards
5) '<' indicates, result was below the Reportable Detection Limit (RDL).

PROJECT: 20-3864 STATUS: FINAL DATE: 2023-02-07



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BH22-119

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-119_1	0.45-0.50	Lead	120	45	120	120	92.6
		Zinc	290	340	340	340	167

BH22-116 & BH22-210

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-210_1[1]	0.45-0.50	PHC F3	240	240	300	1700	360
		PHC F4	120	2800	2800	3300	3890[2]
		PHC F4G	120	2800	2800	3300	8960[2]
BH22-116_1[3]	0.45-1.05	Arsenic	18	11	18	18	10.7
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-116_2[3]	2.05-2.45	Arsenic	18	11	18	18	8.9
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Table 3.1 ICC ESQS exceedances denoted by red hatching.
3) PHC F4G was not required to be analyzed.

BH22-114

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-114_1	0.57-1.07	Arsenic	18	11	18	18	9.9
BH22-114_2	1.97-2.27						8.2

BH22-113

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC	2.1 AgO	3.1 RPI	3.1 ICC	Concentration (ug/g)
GR22-106[1,4]	0.40-0.45	PHC F2	10	10	10	26	<40[2]
		PHC F3	240	240	300	1700	<80
		PHC F4	120	2800	2800	3300	203
BH22-113_1	0.45-0.85	Arsenic	18	11	18	18	11.6
		PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0
BH22-113_2	1.97-2.15	Arsenic	18	11	18	18	6.5
		PHC F2	10	10	10	26	<4.0
		PHC F3	240	240	300	1700	<8.0
		PHC F4	120	2800	2800	3300	<6.0

1) Granular sample collected.
2) Table 3.1 ICC ESQS exceedances denoted by red hatching.
3) Elevated RDL not representative of actual conditions (see section 4.4.1 of the Soil Characterization Report).
4) GR22-106 was submitted for mSPLP analysis of metals and met the analyzed Leachate Screening Levels (see **Table 2A**).

BH22-112

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-112_1	0.20-0.70	Lead	120	45	120	120	12
		Zinc	290	340	340	340	50.2
		PHC F2	10	10	10	26	<4.0
BH22-112_2	1.60-2.10	Lead	120	45	120	120	7.9
		Zinc	290	340	340	340	40.4
		PHC F2	10	10	10	26	<4.0

BH22-115

Sample ID	Depth (mbgs)	Parameter	1 RPI/ICC (ug/g)	2.1 AgO (ug/g)	3.1 RPI (ug/g)	3.1 ICC (ug/g)	Concentration (ug/g)
BH22-115_1	0.50-1.0	Lead	120	45	120	120	16.4
		Zinc	290	340	340	340	54.5
		PHC F2	10	10	10	26	<4.0
BH22-115_2	1.70-2.10	Lead	120	45	120	120	11.3
		Zinc	290	340	340	340	59.9
		PHC F2	10	10	10	26	<4.0

BH22-119
BH22-111
0+500
Zone D (see Figures 2A to 2B)
BH22-110
BH22-109
0+100
BH22-116
0+400
BH22-112
0+600
BH22-115
0+000
BH22-209
0+700
DIVISION ROAD
BH22-114
0+500
COMPTON COURT
BH22-113
0+600
HOWARD AVENUE
KENILWORTH DRIVE

Zone F
Laterally extends throughout the Project area, under the road and underlying Zones A and B and excluding areas of Zones C, D and E

Howard Avenue Corridor Improvements

Soil Characterization Report

BULK SOIL QUALITY RESULTS - HOWARD AVENUE (SOUTH)

FIGURE 2D

DILLON CONSULTING

MAP DRAWING INFORMATION:
DATA PROVIDED BY MNRF

MAP CREATED BY: DU
MAP CHECKED BY: MA
MAP PROJECTION: NAD 1983 UTM Zone 17N

SCALE 1 : 1,500
0 10 20 40 Metres

Notes:
1) 'RPI' means, Residential/Parkland/Institutional Property Uses
2) 'AgO' means, Agricultural and Other Property Uses
3) 'ICC' means, Industrial/Commercial/Community Property Uses
4) 'ESQS' means, Excess Soil Quality Standards
5) '<' indicates, result was below the Reportable Detection Limit (RDL).

PROJECT: 20-3864 STATUS: FINAL DATE: 2023-02-07

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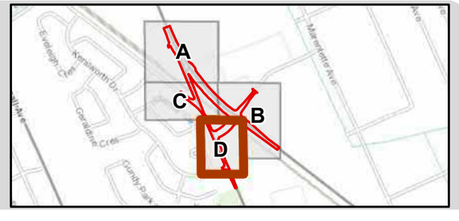

Tables

Table 1 - Soil Quality Results
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

Location Code							BH22-101		BH22-102		BH22-102_B	BH22-103			BH22-104	
Field ID							BH22-101_1	BH22-101_2	BH22-102_1	BH22-102_2	BH22-102_B	BH22-103_1	BH22-DUPD	RPD (%)	GR22-104	BH22-104_1
Date							07 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022		06 Jun 2022	06 Jun 2022
Depth							0.6 - 1.02	1.7 - 2.1	0.35 - 0.85	1.6 - 2	0.4 - 0.45	0.31 - 0.39	0.31 - 0.39		0.1 - 0.13	0.67 - 1.1
Sample Method							Geoprobe	Geoprobe	Geoprobe	Geoprobe	Shallow TP	Shallow TP	Shallow TP		Granular	Geoprobe
	Unit	RDL	Table 1 RPI/ICC	Table 2.1 AgO	Table 3.1 RPI	Table 3.1 ICC										
Calculated Parameters																
Percentage Solids	% by Wt.		-	-	-	-	85.4	81.5	83	86.9	84.3	89	89.4	-	97.2	85.4
General Chemistry																
Cyanide, free	ug/g		-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	NC	<0.03	<0.03
Electrical Conductivity (Lab)	µS/cm	5	570	700	700	1,400	1,100	1,140	1,080	713	259	716	764	6.5	2,160	2,740
pH (Lab)		0.05	-	-	-	-	7.53	7.37	7.1	8.73	7.27	7.69	7.66	0.4	7.74	7.57
Sodium Adsorption Ratio (SAR)		0.01	2.4	5	5	12	6.06	3	5.46	6.19	0.93	8.22	9.59	15.4	6.26	12.8
Metals																
Antimony	ug/g	1	1.3	7.5	7.5	40	<1.0	<1.0	<1.0	<1.0	<1.0	6.9	20.1	*97.8*	<1.0	<1.0
Arsenic	ug/g	1	18	11	18	18	12.4	8.1	9.3	7.9	9.6	5.4	7.2	28.6	3.6	8.5
Barium	ug/g	1	220	390	390	670	87.1	47.6	95.5	72.8	121	144	202	33.5	153	67.8
Beryllium	ug/g	0.5	2.5	4	4	8	0.9	0.6	1	0.6	0.9	<0.5	<0.5	NC	<0.5	0.8
Boron	ug/g	5	36	120	120	120	11.9	8.1	14.3	13.4	12	10	11.6	NC	10.8	9.9
Cadmium	ug/g	0.5	1.2	1	1.2	1.9	<0.5	<0.5	<0.5	<0.5	1.1	2.4	2.8	NC	<0.5	<0.5
Chromium (Total, III+VI)	ug/g	5	70	160	160	160	26	14.3	28.6	21.4	28.5	111	124	11.1	6.5	19.5
Chromium (Hexavalent)	ug/g	0.2	0.66	8	8	8	<0.2	<0.2	<0.2	<0.2	<0.2	55.6	1.8	NC	<0.2	<0.2
Cobalt	ug/g	1	21	22	22	80	11.9	5.6	12.1	10.4	8.2	5.8	6.8	15.9	2.6	7.6
Copper	ug/g	5	92	140	140	230	18.3	13.4	19.5	16.5	62.3	109	114	4.5	12.9	18.3
Lead	ug/g	1	120	45	120	120	33.3	14.9	13.9	9.3	180	1,050	1,550	38.5	16.9	58.9
Mercury	ug/g	0.1	0.27	0.24	0.27	0.27	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	NC	<0.1	0.2
Boron (hot water soluble)	ug/g	0.5	-	1.5	1.5	2	0.5	1	0.9	<0.5	0.8	<0.5	<0.5	NC	<0.5	1.2
Molybdenum	ug/g	1	2	6.9	6.9	40	2.3	1.4	2.4	2.5	1.7	5.8	7.9	30.7	2.1	1.5
Nickel	ug/g	5	82	100	100	270	31.6	14.5	27.1	25	24.6	34.9	40	13.6	11.5	19.3
Selenium	ug/g	1	1.5	2.4	2.4	5.5	<1.0	<1.0	<1.0	<1.0	1	<1.0	<1.0	NC	<1.0	<1.0
Silver	ug/g	0.3	0.5	20	20	40	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	NC	<0.3	<0.3
Thallium	ug/g	1	1	1	1	3.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NC	<1.0	<1.0
Uranium	ug/g	1	2.5	23	23	33	<1.0	<1.0	1.1	<1.0	<1.0	1	1.1	NC	1.1	<1.0
Vanadium	ug/g	10	86	86	86	86	94	25.8	48.9	32.3	36.6	23	28.5	NC	21.8	31.4
Zinc	ug/g	20	290	340	340	340	71.9	47.8	70.9	59.6	231	493	557	NC	25.5	63.5
BTEX																
Benzene	ug/g	0.02	0.02	0.02	0.02	0.034	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	NC	<0.02	<0.02
Toluene	ug/g	0.05	0.2	0.2	0.99	7.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Ethylbenzene	ug/g	0.05	0.05	0.05	1.9	1.9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Xylene (o)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Xylene (m & p)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Xylene Total	ug/g	0.05	0.05	0.091	0.9	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Petroleum Hydrocarbons (PHCs)																
PHC F1 (C6-C10)	ug/g	7	25	17	25	25	<7	<7	<7	<7	<7	<7	<7	NC	<7	<7
PHC F2 (>C10-C16)	ug/g	4	10	10	10	26	19	43	<4	<4	<4	<40	<40	NC	<40	<4
PHC F3 (>C16-C34)	ug/g	8	240	240	300	1,700	191	258	<8	<8	51	150	147	2.0	719	<8
PHC F4 (>C34-C50)	ug/g	6	120	2,800	2,800	3,300	40	123	<6	<6	33	1,020	607	*50.8*	4,980	<6
F4G-SG	ug/g	50	120	2,800	2,800	3,300	-	245	-	-	-	753	559	29.6	3,860	-

Notes:
1) 'Table 1 RPI/ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 1 RPI and ICC Full Depth Background SCS, represented by bolding and blue shading.
2) 'Table 2.1 AgO' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 2.1 VI Full Depth ESQS Potable GW Agr and Other, represented by yellow shading.
3) 'Table 3.1 RPI' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS Non-Potable GW RPI, represented by purple shading.
4) 'Table 3.1 ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS Non-Potable GW ICC, represented by red shading.
5) RDL refers to 'Reportable Detection Limit'.
6) µS/cm refers tp MicroSiemens per centimetre.
7) µg/g refers to Microgram per gram.
8) A less than symobol (<) next to a soil result indicates that the parameter was below the laboratory RDL.
9) A dash (-) symbol indicates that that parameter was not analyzed.
10) ICC refers to Industrial/Commercial/Community Property Use.
11) RPI refers to Residential/Parkland/Intuitional Property Use.
12) AgO refers to Agricultural and Other Property Use.
13) ESQS refers to Excess Soil Quality Standards.
14) 'RPD' refers to relative percent difference.
15) 'Shallow TP' refers to shallow test pit.

Table 1 - Soil Quality Results
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

						Location Code		BH22-105			BH22-106				BH22-107	
						Field ID	BH22-104_2	GR22-105	BH22-105_1	BH22-105_2	BH22-106_1	BH22-106_2	BH22-DUPB	RPD (%)	GR22-102	BH22-107_1
						Date	06 Jun 2022	06 Jun 2022	06 Jun 2022	06 Jun 2022	06 Jun 2022	06 Jun 2022	06 Jun 2022		06 Jun 2022	06 Jun 2022
						Depth	1.83 - 2.13	0.1 - 0.13	0.67 - 1.03	1.63 - 2.03	0.36 - 1	1.7 - 2.6	1.7 - 2.6		0.2 - 0.22	0.22 - 0.82
						Sample Method	Geoprobe	Granular	Geoprobe	Geoprobe	Geoprobe	Geoprobe	Geoprobe		Granular	Geoprobe
	Unit	RDL	Table 1 RPI/ICC	Table 2.1 AgO	Table 3.1 RPI	Table 3.1 ICC										
Calculated Parameters																
Percentage Solids	% by Wt.		-	-	-	-	87.3	97.1	87.2	88.5	78	89.3	88.8	-	87.1	82.8
General Chemistry																
Cyanide, free	ug/g		-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	NC	<0.03	<0.03
Electrical Conductivity (Lab)	µS/cm	5	570	700	700	1,400	828	1,660	1,480	1,010	170	183	187	2.2	4,170	351
pH (Lab)		0.05	-	-	-	-	7.71	11.56	7.46	7.69	7.45	7.75	7.62	1.7	12.14	7.5
Sodium Adsorption Ratio (SAR)		0.01	2.4	5	5	12	2.98	8.04	7.3	2.98	0.48	0.31	0.48	43.0	0.69	0.59
Metals																
Antimony	ug/g	1	1.3	7.5	7.5	40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NC	<1.0	<1.0
Arsenic	ug/g	1	18	11	18	18	9.5	3.1	11.8	9	8.2	6.4	10.9	*52.0*	2.4	7.4
Barium	ug/g	1	220	390	390	670	80.2	102	89.3	85.3	61.6	59.6	98	48.7	176	56.6
Beryllium	ug/g	0.5	2.5	4	4	8	0.7	<0.5	1	0.7	0.5	<0.5	0.8	NC	<0.5	0.7
Boron	ug/g	5	36	120	120	120	14.6	5.6	13.3	14.8	11.2	10.3	16.1	43.9	7.1	13.8
Cadmium	ug/g	0.5	1.2	1	1.2	1.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NC	<0.5	<0.5
Chromium (Total, III+VI)	ug/g	5	70	160	160	160	24.4	5.1	27.8	23	18.5	16.3	26.1	NC	14.3	21
Chromium (Hexavalent)	ug/g	0.2	0.66	8	8	8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NC	<0.2	<0.2
Cobalt	ug/g	1	21	22	22	80	12.8	1.9	11.6	11.5	9	9	13	36.4	1.7	10.3
Copper	ug/g	5	92	140	140	230	19.2	9.9	21.4	17.9	14.7	13.4	20.9	NC	6.2	16.2
Lead	ug/g	1	120	45	120	120	12.2	26.1	14.5	10.5	8.5	8.6	14	47.8	8.8	9
Mercury	ug/g	0.1	0.27	0.24	0.27	0.27	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NC	<0.1	<0.1
Boron (hot water soluble)	ug/g	0.5	-	1.5	1.5	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NC	<0.5	<0.5
Molybdenum	ug/g	1	2	6.9	6.9	40	3.7	1.9	2.4	3.5	2.5	2.5	3.9	NC	1.5	3.0
Nickel	ug/g	5	82	100	100	270	29.7	10.1	31.1	27.9	23.2	20.6	32.7	45.4	7	25.8
Selenium	ug/g	1	1.5	2.4	2.4	5.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NC	<1.0	<1.0
Silver	ug/g	0.3	0.5	20	20	40	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	NC	<0.3	<0.3
Thallium	ug/g	1	1	1	1	3.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NC	<1.0	<1.0
Uranium	ug/g	1	2.5	23	23	33	1.2	1.2	1	<1.0	<1.0	<1.0	1.3	NC	1.3	1
Vanadium	ug/g	10	86	86	86	86	37.2	16	45.4	35.8	28.9	24.5	39	NC	13	31.4
Zinc	ug/g	20	290	340	340	340	56.6	25.7	60	53.2	40.4	37.7	59.8	NC	27.1	60.6
BTEX																
Benzene	ug/g	0.02	0.02	0.02	0.02	0.034	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	NC	<0.02	<0.02
Toluene	ug/g	0.05	0.2	0.2	0.99	7.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Ethylbenzene	ug/g	0.05	0.05	0.05	1.9	1.9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Xylene (o)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Xylene (m & p)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Xylene Total	ug/g	0.05	0.05	0.091	0.9	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Petroleum Hydrocarbons (PHCs)																
PHC F1 (C6-C10)	ug/g	7	25	17	25	25	<7	<7	<7	<7	<7	<7	<7	NC	<7	<7
PHC F2 (>C10-C16)	ug/g	4	10	10	10	26	<4	<40	<4	<4	<4	<4	<4	NC	<4	<4
PHC F3 (>C16-C34)	ug/g	8	240	240	300	1,700	<8	806	<8	<8	13	<8	<8	NC	25	<8
PHC F4 (>C34-C50)	ug/g	6	120	2,800	2,800	3,300	<6	5,170	<6	<6	8	<6	<6	NC	26	<6
F4G-SG	ug/g	50	120	2,800	2,800	3,300	-	2600	-	-	-	-	-	-	-	-

Notes:
1) 'Table 1 RPI/ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 1 RPI and ICC Full D
2) 'Table 2.1 AgO' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 2.1 VI Full Depth ESQ
3) 'Table 3.1 RPI' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
4) 'Table 3.1 ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
5) RDL refers to 'Reportable Detection Limit'.
6) µS/cm refers tp MicroSiemens per centimetre.
7) µg/g refers to Microgram per gram.
8) A less than symobol (<) next to a soil result indicates that the parameter was below the laboratory RDL.
9) A dash (-) symbol indicates that that parameter was not analyzed.
10) ICC refers to Industrial/Commercial/Community Property Use.
11) RPI refers to Residential/Parkland/Intuitional Property Use.
12) AgO refers to Agricultural and Other Property Use.
13) ESQS refers to Excess Soil Quality Standards.
14) 'RPD' refers to relative percent difference.
15) 'Shallow TP' refers to shallow test pit.

Table 1 - Soil Quality Results
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

Location Code								BH22-108								BH22-109	
Field ID							BH22-107_2	GR22-101	GR22-DUP	RPD (%)	BH22-108_1	BH22-108_2	BH22-DUPA	RPD (%)	GR22-103	BH22-109_1
Date							06 Jun 2022	06 Jun 2022	06 Jun 2022		07 Jun 2022	07 Jun 2022	06 Jun 2022		06 Jun 2022	06 Jun 2022
Depth							2.22 - 2.62	0.4 - 0.45	0.4 - 0.45		0.64 - 1.02	2.2 - 2.8	2.2 - 2.8		0.17 - 0.2	0.62 - 1.01
Sample Method							Geoprobe	Granular	Granular		Geoprobe	Geoprobe	Geoprobe		Granular	Geoprobe
	Unit	RDL	Table 1 RPI/ICC	Table 2.1 AgO	Table 3.1 RPI	Table 3.1 ICC										
Calculated Parameters																
Percentage Solids	% by Wt.		-	-	-	-	87.8	93.2	92.7	-	85.3	89.9	86.3		97.5	83.8
General Chemistry																
Cyanide, free	ug/g		-	-	-	-	<0.03	<0.03	<0.03	NC	<0.03	<0.03	<0.03		<0.03	<0.03
Electrical Conductivity (Lab)	µS/cm	5	570	700	700	1,400	347	1,840	1,960	6.3	726	453	443	2.2	1,320	1,740
pH (Lab)		0.05	-	-	-	-	7.73	12.17	12.17	0.0	7.58	7.71	7.63	1.0	8.31	7.58
Sodium Adsorption Ratio (SAR)		0.01	2.4	5	5	12	0.65	0.92	0.97	5.3	6.61	1.8	1.33	30.0	9.59	7.37
Metals																
Antimony	ug/g	1	1.3	7.5	7.5	40	<1.0	<1.0	<1.0	NC	<1.0	<1.0	<1.0	NC	<1.0	<1.0
Arsenic	ug/g	1	18	11	18	18	6.7	1.4	1.3	NC	8.4	7.4	8.1	9.0	2.7	12.4
Barium	ug/g	1	220	390	390	670	58.5	433	392	9.9	69.7	42.5	61	35.7	196	106
Beryllium	ug/g	0.5	2.5	4	4	8	0.6	<0.5	<0.5	NC	0.6	0.6	0.6	NC	<0.5	0.9
Boron	ug/g	5	36	120	120	120	12.6	6.8	6	NC	7.6	11.6	11.5	NC	20.2	10.2
Cadmium	ug/g	0.5	1.2	1	1.2	1.9	<0.5	<0.5	<0.5	NC	<0.5	<0.5	<0.5	NC	<0.5	<0.5
Chromium (Total, III+VI)	ug/g	5	70	160	160	160	20	12.2	10.9	NC	17.5	17.6	18.6	NC	<5.0	26.7
Chromium (Hexavalent)	ug/g	0.2	0.66	8	8	8	<0.2	<0.2	0.2	NC	<0.2	<0.2	<0.2	NC	<0.2	<0.2
Cobalt	ug/g	1	21	22	22	80	9.8	1.6	1.4	NC	8	8.2	10.7	26.5	3.5	12.8
Copper	ug/g	5	92	140	140	230	15.7	6	<5.0	NC	14.1	13.1	14	NC	18.6	21.2
Lead	ug/g	1	120	45	120	120	8.7	9.8	3.4	*97.0*	8.6	8.2	10.1	20.8	6.6	13.4
Mercury	ug/g	0.1	0.27	0.24	0.27	0.27	<0.1	<0.1	<0.1	NC	<0.1	<0.1	<0.1	NC	<0.1	<0.1
Boron (hot water soluble)	ug/g	0.5	-	1.5	1.5	2	<0.5	<0.5	<0.5	NC	<0.5	<0.5	<0.5	NC	<0.5	<0.5
Molybdenum	ug/g	1	2	6.9	6.9	40	2.9	1.5	1.5	NC	2.6	2.1	2.4	13.3	1.6	4.8
Nickel	ug/g	5	82	100	100	270	24	8.6	8.1	NC	21	20.1	22.8	12.6	8.9	32.3
Selenium	ug/g	1	1.5	2.4	2.4	5.5	<1.0	<1.0	<1.0	NC	<1.0	<1.0	<1.0	NC	<1.0	<1.0
Silver	ug/g	0.3	0.5	20	20	40	<0.3	<0.3	<0.3	NC	<0.3	<0.3	<0.3	NC	<0.3	<0.3
Thallium	ug/g	1	1	1	1	3.3	<1.0	<1.0	<1.0	NC	<1.0	<1.0	<1.0	NC	<1.0	<1.0
Uranium	ug/g	1	2.5	23	23	33	<1.0	1.3	1.2	NC	<1.0	<1.0	<1.0	NC	1.3	<1.0
Vanadium	ug/g	10	86	86	86	86	29.3	12.9	11.9	NC	29.1	29.4	30.1	NC	14.5	44
Zinc	ug/g	20	290	340	340	340	45.9	37.5	33	NC	43	40.5	41	NC	<20.0	57.9
BTEX																
Benzene	ug/g	0.02	0.02	0.02	0.02	0.034	<0.02	<0.02	<0.02	NC	<0.02	<0.02	<0.02	NC	<0.02	<0.02
Toluene	ug/g	0.05	0.2	0.2	0.99	7.8	<0.05	<0.05	<0.05	NC	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Ethylbenzene	ug/g	0.05	0.05	0.05	1.9	1.9	<0.05	<0.05	<0.05	NC	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Xylene (o)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	NC	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Xylene (m & p)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	NC	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Xylene Total	ug/g	0.05	0.05	0.091	0.9	3	<0.05	<0.05	<0.05	NC	<0.05	<0.05	<0.05	NC	<0.05	<0.05
Petroleum Hydrocarbons (PHCs)																
PHC F1 (C6-C10)	ug/g	7	25	17	25	25	<7	<7	<7	NC	<7	<7	<7	NC	<7	<7
PHC F2 (>C10-C16)	ug/g	4	10	10	10	26	<4	<4	<4	NC	<4	<4	<4	NC	<40	<4
PHC F3 (>C16-C34)	ug/g	8	240	240	300	1,700	<8	21	23	NC	<8	<8	<8	NC	1,330	<8
PHC F4 (>C34-C50)	ug/g	6	120	2,800	2,800	3,300	<6	20	20	NC	<6	<6	<6	NC	4,810	<6
F4G-SG	ug/g	50	120	2,800	2,800	3,300	-	-	-		-	-	-	-	2340	-

Notes:
1) 'Table 1 RPI/ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 1 RPI and ICC Full D
2) 'Table 2.1 AgO' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 2.1 VI Full Depth ESQ
3) 'Table 3.1 RPI' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
4) 'Table 3.1 ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
5) RDL refers to 'Reportable Detection Limit'.
6) µS/cm refers tp MicroSiemens per centimetre.
7) µg/g refers to Microgram per gram.
8) A less than symobol (<) next to a soil result indicates that the parameter was below the laboratory RDL.
9) A dash (-) symbol indicates that that parameter was not analyzed.
10) ICC refers to Industrial/Commercial/Community Property Use.
11) RPI refers to Residential/Parkland/Intuitional Property Use.
12) AgO refers to Agricultural and Other Property Use.
13) ESQS refers to Excess Soil Quality Standards.
14) 'RPD' refers to relative percent difference.
15) 'Shallow TP' refers to shallow test pit.

Table 1 - Soil Quality Results
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

Location Code								BH22-110	BH22-111	BH22-112		BH22-113				
Field ID								BH22-110_1	BH22-111_1	BH22-112_1	BH22-112_2	GR22-106	BH22-113_1	BH22-113_2	BH22-DUPC	RPD (%)
Date								06 Jun 2022	06 Jun 2022	07 Jun 2022	07 Jun 2022	06 Jun 2022	06 Jun 2022	06 Jun 2022	06 Jun 2022	
Depth								0.32 - 0.34	0.31 - 0.33	0.2 - 0.7	1.6 - 2.1	0.4 - 0.45	0.45 - 0.85	1.97 - 2.15	1.97 - 2.16	
Sample Method								Shallow TP	Shallow TP	Geoprobe	Geoprobe	Granular	Geoprobe	Geoprobe	Geoprobe	
	Unit	RDL	Table 1 RPI/ICC	Table 2.1 AgO	Table 3.1 RPI	Table 3.1 ICC										
Calculated Parameters																
Percentage Solids	% by Wt.		-	-	-	-	81.9	91.9	90.8	86.8	87.8	88.8	87.6	88.5	88.2	-
General Chemistry																
Cyanide, free	ug/g		-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-
Electrical Conductivity (Lab)	µS/cm	5	570	700	700	1,400	1,260	541	485	303	275	3,710	2,870	1,490	1,360	9.1
pH (Lab)		0.05	-	-	-	-	7.65	7.35	7.64	7.51	7.96	11.34	7.4	7.57	7.61	0.5
Sodium Adsorption Ratio (SAR)		0.01	2.4	5	5	12	2.44	4.01	3.32	0.98	0.62	20.9	8.37	3.35	3.2	4.6
Metals																
Antimony	ug/g	1	1.3	7.5	7.5	40	<1.0	4.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NC
Arsenic	ug/g	1	18	11	18	18	6.9	5	5.2	6.9	6.7	5.4	11.6	6.5	7.9	19.4
Barium	ug/g	1	220	390	390	670	58.3	94.1	88.6	65.5	72.1	68.6	67.7	66.0	68.3	3.4
Beryllium	ug/g	0.5	2.5	4	4	8	0.6	<0.5	0.6	0.6	0.5	0.6	0.8	0.6	0.8	NC
Boron	ug/g	5	36	120	120	120	9.3	10.5	10	9.5	10.5	9.9	11.4	11.9	16.0	NC
Cadmium	ug/g	0.5	1.2	1	1.2	1.9	<0.5	0.7	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NC
Chromium (Total, III+VI)	ug/g	5	70	160	160	160	17.8	95.8	51.1	19.6	16.7	18.1	22.1	18.2	24.2	NC
Chromium (Hexavalent)	ug/g	0.2	0.66	8	8	8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NC
Cobalt	ug/g	1	21	22	22	80	5.7	5.4	5	7.5	9.2	7.2	9.8	8.8	9.3	5.5
Copper	ug/g	5	92	140	140	230	13.7	111	65.5	13	13.4	12	19.3	14.2	18.0	NC
Lead	ug/g	1	120	45	120	120	7.5	85.7	52.1	12	7.9	8	10.6	8.3	10.3	21.5
Mercury	ug/g	0.1	0.27	0.24	0.27	0.27	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NC
Boron (hot water soluble)	ug/g	0.5	-	1.5	1.5	2	<0.5	0.7	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NC
Molybdenum	ug/g	1	2	6.9	6.9	40	2.7	7.9	3.8	1.6	2.9	1.1	2.6	2.9	2.9	NC
Nickel	ug/g	5	82	100	100	270	16.2	33.6	22.7	19.4	22.6	14.9	26.5	22	26.5	NC
Selenium	ug/g	1	1.5	2.4	2.4	5.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NC
Silver	ug/g	0.3	0.5	20	20	40	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	NC
Thallium	ug/g	1	1	1	1	3.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NC
Uranium	ug/g	1	2.5	23	23	33	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1	NC
Vanadium	ug/g	10	86	86	86	86	28.4	21.1	25	30.4	25.6	28.8	35.9	27.8	35.3	NC
Zinc	ug/g	20	290	340	340	340	43.7	341	191	50.2	40.4	55	53.2	42	53.7	NC
BTEX																
Benzene	ug/g	0.02	0.02	0.02	0.02	0.034	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	NC
Toluene	ug/g	0.05	0.2	0.2	0.99	7.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC
Ethylbenzene	ug/g	0.05	0.05	0.05	1.9	1.9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC
Xylene (o)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC
Xylene (m & p)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC
Xylene Total	ug/g	0.05	0.05	0.091	0.9	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NC
Petroleum Hydrocarbons (PHCs)																
PHC F1 (C6-C10)	ug/g	7	25	17	25	25	<7	<7	<7	<7	<7	<7	<7	<7	<7	NC
PHC F2 (>C10-C16)	ug/g	4	10	10	10	26	<4	<40	<4	<4	<4	<40	<4	<4	<4	NC
PHC F3 (>C16-C34)	ug/g	8	240	240	300	1,700	10	304	89	<8	<8	<80	<8	<8	<8	NC
PHC F4 (>C34-C50)	ug/g	6	120	2,800	2,800	3,300	19	910	131	<6	<6	203	<6	<6	<6	NC
F4G-SG	ug/g	50	120	2,800	2,800	3,300	-	272	77	-	-	439	-	-	-	-

Notes:
1) 'Table 1 RPI/ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 1 RPI and ICC Full D
2) 'Table 2.1 AgO' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 2.1 VI Full Depth ESQ
3) 'Table 3.1 RPI' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
4) 'Table 3.1 ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
5) RDL refers to 'Reportable Detection Limit'.
6) µS/cm refers tp MicroSiemens per centimetre.
7) µg/g refers to Microgram per gram.
8) A less than symobol (<) next to a soil result indicates that the parameter was below the laboratory RDL.
9) A dash (-) symbol indicates that that parameter was not analyzed.
10) ICC refers to Industrial/Commercial/Community Property Use.
11) RPI refers to Residential/Parkland/Intuitional Property Use.
12) AgO refers to Agricultural and Other Property Use.
13) ESQS refers to Excess Soil Quality Standards.
14) 'RPD' refers to relative percent difference.
15) 'Shallow TP' refers to shallow test pit.

Table 1 - Soil Quality Results
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

Location Code							BH22-114		BH22-115		BH22-116			BH22-117			
Field ID							BH22-114_1	BH22-114_2	BH22-115_1	BH22-115_2	BH22-210	BH22-116_1	BH22-116_2	BH22-117_1	BH22-117_2	GR22-107	
Date							06 Jun 2022	06 Jun 2022	07 Jun 2022	07 Jun 2022	08 Dec 2022	06 Jun 2022	06 Jun 2022	07 Jun 2022	07 Jun 2022	07 Jun 2022	
Depth							0.57 - 1.07	1.97 - 2.27	0.5 - 1	1.7 - 2.1	0.45 - 0.5	0.45 - 1.05	2.05 - 2.45	0.12 - 0.7	1.6 - 2.1	0.35 - 0.4	
Sample Method							Geoprobe	Geoprobe	Geoprobe	Geoprobe	Granular	Geoprobe	Geoprobe	Geoprobe	Geoprobe	Granular	
	Unit	RDL	Table 1 RPI/ICC	Table 2.1 AgO	Table 3.1 RPI	Table 3.1 ICC											
Calculated Parameters																	
Percentage Solids	% by Wt.		-	-	-	-	85.9	88.3	81.3	88.4	96.2	87.1	88.7	84	88.5	91.3	
General Chemistry																	
Cyanide, free	ug/g		-	-	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	
Electrical Conductivity (Lab)	µS/cm	5	570	700	700	1,400	2,390	1,650	133	180	3,400	3,400	1,860	2,080	856	1,970	
pH (Lab)		0.05	-	-	-	-	7.64	7.95	7.41	7.79	11.93	7.72	7.8	7.66	7.77	11.3	
Sodium Adsorption Ratio (SAR)		0.01	2.4	5	5	12	6.72	11.7	0.3	0.97	4.35	27	6.03	24.6	7.92	10.4	
Metals																	
Antimony	ug/g	1	1.3	7.5	7.5	40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Arsenic	ug/g	1	18	11	18	18	9.9	8.2	5.8	10.7	3.2	10.7	8.9	9.7	8	4.5	
Barium	ug/g	1	220	390	390	670	96.2	100	79.9	89	35.9	78.5	81.3	134	93.6	75.3	
Beryllium	ug/g	0.5	2.5	4	4	8	0.9	0.7	0.8	0.8	<0.5	0.8	0.6	1.3	0.6	<0.5	
Boron	ug/g	5	36	120	120	120	12.2	11.5	7.8	15.4	<5.0	12.7	12.9	8.7	12.1	9.6	
Cadmium	ug/g	0.5	1.2	1	1.2	1.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Chromium (Total, III+VI)	ug/g	5	70	160	160	160	26.7	19.9	22	25.3	22.9	23.7	22.1	28.9	20.2	13	
Chromium (Hexavalent)	ug/g	0.2	0.66	8	8	8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Cobalt	ug/g	1	21	22	22	80	13.3	11.4	7.1	13	7.2	11.2	10.1	14.3	11.3	4.2	
Copper	ug/g	5	92	140	140	230	19.1	16.2	12.2	19.8	8.6	19.1	18.3	20	16.5	12.7	
Lead	ug/g	1	120	45	120	120	11.6	10.6	16.4	11.3	4.5	10.9	9.9	11.9	9.5	7.8	
Mercury	ug/g	0.1	0.27	0.24	0.27	0.27	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Boron (hot water soluble)	ug/g	0.5	-	1.5	1.5	2	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	
Molybdenum	ug/g	1	2	6.9	6.9	40	2.4	3.4	1.4	3.6	1.6	3.7	3.3	1.9	3.4	1.1	
Nickel	ug/g	5	82	100	100	270	32.5	26	21.8	30.5	10.6	27.7	26.6	31.7	27.6	10.8	
Selenium	ug/g	1	1.5	2.4	2.4	5.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Silver	ug/g	0.3	0.5	20	20	40	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Thallium	ug/g	1	1	1	1	3.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Uranium	ug/g	1	2.5	23	23	33	1.1	1.2	<1.0	1.3	<1.0	1.1	1.2	1.2	1	<1.0	
Vanadium	ug/g	10	86	86	86	86	39.4	29.8	31.7	38.7	16.5	38.9	33.9	42.5	31.1	21.5	
Zinc	ug/g	20	290	340	340	340	61.3	47	54.5	59.9	96.3	56.9	54.8	60	50.7	47.4	
BTEX																	
Benzene	ug/g	0.02	0.02	0.02	0.02	0.034	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Toluene	ug/g	0.05	0.2	0.2	0.99	7.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Ethylbenzene	ug/g	0.05	0.05	0.05	1.9	1.9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Xylene (o)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Xylene (m & p)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Xylene Total	ug/g	0.05	0.05	0.091	0.9	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Petroleum Hydrocarbons (PHCs)																	
PHC F1 (C6-C10)	ug/g	7	25	17	25	25	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	
PHC F2 (>C10-C16)	ug/g	4	10	10	10	26	<4	<4	<4	<4	<4	<4	<4	<4	<4	<40	
PHC F3 (>C16-C34)	ug/g	8	240	240	300	1,700	<8	<8	<8	<8	360	<8	<8	<8	<8	130	
PHC F4 (>C34-C50)	ug/g	6	120	2,800	2,800	3,300	<6	<6	<6	<6	3,890	<6	<6	<6	<6	1,310	
F4G-SG	ug/g	50	120	2,800	2,800	3,300	-	-	-	-	8960	-	-	-	-	1,140	

Notes:
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4) 'Table 3.1 ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
5) RDL refers to 'Reportable Detection Limit'.
6) µS/cm refers tp MicroSiemens per centimetre.
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11) RPI refers to Residential/Parkland/Intuitional Property Use.
12) AgO refers to Agricultural and Other Property Use.
13) ESQS refers to Excess Soil Quality Standards.
14) 'RPD' refers to relative percent difference.
15) 'Shallow TP' refers to shallow test pit.

Table 1 - Soil Quality Results
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

Location Code							BH22-118		BH22-119	BH22-120	BH22-201						
Field ID							BH22-118_1	BH22-118_2	BH22-119_1	BH22-120_1	BH22-201_1	BH22-DUP2	RPD (%)	BH22-201_2	BH22-201_3	BH22-202_1	
Date							07 Jun 2022	07 Jun 2022	07 Jun 2022	06 Jun 2022	08 Dec 2022	08 Dec 2022		08 Dec 2022	08 Dec 2022	08 Dec 2022	
Depth							0.4 - 0.8	2.1 - 2.6	0.45 - 0.5	0.29 - 0.32	0.28 - 0.3	0.28 - 0.3		0.5 - 0.7	2.6 - 2.8	0.28 - 0.3	
Sample Method							Geoprobe	Geoprobe	Shallow TP	Shallow TP	Granular	Granular		Geoprobe	Geoprobe	Granular	
	Unit	RDL	Table 1 RPI/ICC	Table 2.1 AgO	Table 3.1 RPI	Table 3.1 ICC											
Calculated Parameters																	
Percentage Solids	% by Wt.		-	-	-	-	81.8	82.3	81.2	88	96.2	96.1	NC	83.4	88.4	95	
General Chemistry																	
Cyanide, free	ug/g		-	-	-	-	<0.03	<0.03	<0.03	<0.03	-	<0.03	NC	-	-	-	
Electrical Conductivity (Lab)	µS/cm	5	570	700	700	1,400	1,970	2,000	199	542	-	950	NC	-	-	-	
pH (Lab)		0.05	-	-	-	-	7.94	7.8	7.31	7.75	-	8.59	NC	-	-	-	
Sodium Adsorption Ratio (SAR)		0.01	2.4	5	5	12	10.1	7.12	0.19	5.56	-	4.1	NC	-	-	-	
Metals																	
Antimony	ug/g	1	1.3	7.5	7.5	40	<1.0	<1.0	<1.0	<1.0	-	<1.0	NC	-	-	-	
Arsenic	ug/g	1	18	11	18	18	8.1	16.2	8.1	5.8	-	1.4	NC	-	-	-	
Barium	ug/g	1	220	390	390	670	91.1	104	104	112	-	47.2	NC	-	-	-	
Beryllium	ug/g	0.5	2.5	4	4	8	0.9	1.1	0.7	0.5	-	<0.5	NC	-	-	-	
Boron	ug/g	5	36	120	120	120	10.4	17.5	9.7	8.9	-	<5.0	NC	-	-	-	
Cadmium	ug/g	0.5	1.2	1	1.2	1.9	<0.5	<0.5	0.5	1.1	-	<0.5	NC	-	-	-	
Chromium (Total, III+VI)	ug/g	5	70	160	160	160	26.1	33	21.2	48.3	-	<5.0	NC	-	-	-	
Chromium (Hexavalent)	ug/g	0.2	0.66	8	8	8	<0.2	<0.2	<0.2	<0.2	-	<0.2	NC	-	-	-	
Cobalt	ug/g	1	21	22	22	80	8.8	14.6	6.5	5.2	-	1.2	NC	-	-	-	
Copper	ug/g	5	92	140	140	230	14.1	28.2	22	47.4	-	<5.0	NC	-	-	-	
Lead	ug/g	1	120	45	120	120	11	16.1	92.6	142	-	4.9	NC	-	-	-	
Mercury	ug/g	0.1	0.27	0.24	0.27	0.27	<0.1	<0.1	<0.1	<0.1	-	<0.1	NC	-	-	-	
Boron (hot water soluble)	ug/g	0.5	-	1.5	1.5	2	<0.5	<0.5	<0.5	0.7	-	<0.5	NC	-	-	-	
Molybdenum	ug/g	1	2	6.9	6.9	40	2.2	4.1	2	2.8	-	<1.0	NC	-	-	-	
Nickel	ug/g	5	82	100	100	270	22.7	37.7	18.9	19.9	-	<5.0	NC	-	-	-	
Selenium	ug/g	1	1.5	2.4	2.4	5.5	<1.0	<1.0	<1.0	<1.0	-	<1.0	NC	-	-	-	
Silver	ug/g	0.3	0.5	20	20	40	<0.3	<0.3	<0.3	<0.3	-	<0.3	NC	-	-	-	
Thallium	ug/g	1	1	1	1	3.3	<1.0	<1.0	<1.0	<1.0	-	<1.0	NC	-	-	-	
Uranium	ug/g	1	2.5	23	23	33	<1.0	1.3	<1.0	<1.0	-	<1.0	NC	-	-	-	
Vanadium	ug/g	10	86	86	86	86	42.8	54.5	29.7	26.4	-	<10.0	NC	-	-	-	
Zinc	ug/g	20	290	340	340	340	75.8	78.3	167	220	-	<20.0	NC	-	-	-	
BTEX																	
Benzene	ug/g	0.02	0.02	0.02	0.02	0.034	<0.02	<0.02	<0.02	<0.02	-	<0.02	NC	-	-	-	
Toluene	ug/g	0.05	0.2	0.2	0.99	7.8	<0.05	<0.05	<0.05	<0.05	-	<0.05	NC	-	-	-	
Ethylbenzene	ug/g	0.05	0.05	0.05	1.9	1.9	<0.05	<0.05	<0.05	<0.05	-	<0.05	NC	-	-	-	
Xylene (o)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	-	<0.05	NC	-	-	-	
Xylene (m & p)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.05	-	<0.05	NC	-	-	-	
Xylene Total	ug/g	0.05	0.05	0.091	0.9	3	<0.05	<0.05	<0.05	<0.05	-	<0.05	NC	-	-	-	
Petroleum Hydrocarbons (PHCs)																	
PHC F1 (C6-C10)	ug/g	7	25	17	25	25	<7	<7	<7	<7	<7	<7	NC	<7	<7	<7	
PHC F2 (>C10-C16)	ug/g	4	10	10	10	26	<4	<4	<4	<4	<4	<4	NC	<4	<4	<4	
PHC F3 (>C16-C34)	ug/g	8	240	240	300	1,700	<8	9	56	162	723	838	14.7	<8	<8	1,090	
PHC F4 (>C34-C50)	ug/g	6	120	2,800	2,800	3,300	16	37	78	214	3,260	5,360	48.7	<6	<6	4,070	
F4G-SG	ug/g	50	120	2,800	2,800	3,300	-	-	-	125	7320	7321	0.01	-	-	8360	

Notes:
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2) 'Table 2.1 AgO' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 2.1 VI Full Depth ESQ
3) 'Table 3.1 RPI' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
4) 'Table 3.1 ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
5) RDL refers to 'Reportable Detection Limit'.
6) µS/cm refers tp MicroSiemens per centimetre.
7) µg/g refers to Microgram per gram.
8) A less than symobol (<) next to a soil result indicates that the parameter was below the laboratory RDL.
9) A dash (-) symbol indicates that that parameter was not analyzed.
10) ICC refers to Industrial/Commercial/Community Property Use.
11) RPI refers to Residential/Parkland/Intuitional Property Use.
12) AgO refers to Agricultural and Other Property Use.
13) ESQS refers to Excess Soil Quality Standards.
14) 'RPD' refers to relative percent difference.
15) 'Shallow TP' refers to shallow test pit.

Table 1 - Soil Quality Results
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

Location Code							BH22-202		BH22-203			BH22-204				
Field ID							BH22-202_2	BH22-202_3	BH22-203_1	BH22-203_2	BH22-203_3	BH22-204_1	BH22-DUP1	RPD (%)	BH22-204_2	BH22-204_3
Date							08 Dec 2022	08 Dec 2022	08 Dec 2022	08 Dec 2022	08 Dec 2022	08 Dec 2022	08 Dec 2022		08 Dec 2022	08 Dec 2022
Depth							0.58 - 0.78	2.48 - 2.78	0.27 - 0.29	0.57 - 0.87	2.87 - 3.27	0.3 - 0.32	0.4 - 0.65		0.4 - 0.65	1.7 - 2
Sample Method							Geoprobe	Geoprobe	Granular	Geoprobe	Geoprobe	Granular	Geoprobe		Geoprobe	Geoprobe
	Unit	RDL	Table 1 RPI/ICC	Table 2.1 AgO	Table 3.1 RPI	Table 3.1 ICC										
Calculated Parameters																
Percentage Solids	% by Wt.		-	-	-	-	84.3	86.8	96.6	83.9	87.5	94.7	87.8	-	86.3	87.7
General Chemistry																
Cyanide, free	ug/g		-	-	-	-	-	-	<0.03	<0.03	<0.03	-	<0.03	NC	-	<0.03
Electrical Conductivity (Lab)	µS/cm	5	570	700	700	1,400	-	-	583	1,120	454	-	789	NC	-	718
pH (Lab)		0.05	-	-	-	-	-	-	8.22	7.85	7.91	-	8.94	NC	-	7.91
Sodium Adsorption Ratio (SAR)		0.01	2.4	5	5	12	-	-	1.46	9.04	1.62	-	4.84	NC	-	3.85
Metals																
Antimony	ug/g	1	1.3	7.5	7.5	40	-	-	<1.0	<1.0	<1.0	-	<1.0	NC	-	<1.0
Arsenic	ug/g	1	18	11	18	18	-	-	3.2	11.4	8.8	-	7.9	NC	-	8.3
Barium	ug/g	1	220	390	390	670	-	-	67.5	101	67.8	-	58.3	NC	-	68.7
Beryllium	ug/g	0.5	2.5	4	4	8	-	-	<0.5	0.7	0.6	-	0.5	NC	-	0.6
Boron	ug/g	5	36	120	120	120	-	-	<5.0	5.6	8.5	-	<5.0	NC	-	12
Cadmium	ug/g	0.5	1.2	1	1.2	1.9	-	-	<0.5	<0.5	<0.5	-	<0.5	NC	-	<0.5
Chromium (Total, III+VI)	ug/g	5	70	160	160	160	-	-	5.2	25.5	22.9	-	19.8	NC	-	20.8
Chromium (Hexavalent)	ug/g	0.2	0.66	8	8	8	-	-	<0.2	<0.2	<0.2	-	<0.2	NC	-	<0.2
Cobalt	ug/g	1	21	22	22	80	-	-	2.1	11.3	9.7	-	9	NC	-	9.9
Copper	ug/g	5	92	140	140	230	-	-	7.4	22.3	17.5	-	15.1	NC	-	16.2
Lead	ug/g	1	120	45	120	120	-	-	3.7	16.9	9	-	8.8	NC	-	9.9
Mercury	ug/g	0.1	0.27	0.24	0.27	0.27	-	-	<0.1	<0.1	<0.1	-	<0.1	NC	-	<0.1
Boron (hot water soluble)	ug/g	0.5	-	1.5	1.5	2	-	-	<0.5	<0.5	0.6	-	<0.5	NC	-	<0.5
Molybdenum	ug/g	1	2	6.9	6.9	40	-	-	3.1	3	2.6	-	2.3	NC	-	3.1
Nickel	ug/g	5	82	100	100	270	-	-	6.7	27.7	24.3	-	21.4	NC	-	25.6
Selenium	ug/g	1	1.5	2.4	2.4	5.5	-	-	2	1.3	<1.0	-	<1.0	NC	-	<1.0
Silver	ug/g	0.3	0.5	20	20	40	-	-	0.4	0.6	0.5	-	<0.3	NC	-	2.3
Thallium	ug/g	1	1	1	1	3.3	-	-	<1.0	<1.0	<1.0	-	<1.0	NC	-	<1.0
Uranium	ug/g	1	2.5	23	23	33	-	-	1.2	<1.0	1	-	<1.0	NC	-	<1.0
Vanadium	ug/g	10	86	86	86	86	-	-	12	39.5	33.2	-	30.1	NC	-	30
Zinc	ug/g	20	290	340	340	340	-	-	<20.0	64.9	51.8	-	44.2	NC	-	48.3
BTEX																
Benzene	ug/g	0.02	0.02	0.02	0.02	0.034	-	-	<0.02	<0.02	<0.02	-	<0.02	NC	-	<0.02
Toluene	ug/g	0.05	0.2	0.2	0.99	7.8	-	-	<0.05	<0.05	<0.05	-	<0.05	NC	-	<0.05
Ethylbenzene	ug/g	0.05	0.05	0.05	1.9	1.9	-	-	<0.05	<0.05	<0.05	-	<0.05	NC	-	<0.05
Xylene (o)	ug/g	0.05	-	-	-	-	-	-	<0.05	<0.05	<0.05	-	<0.05	NC	-	<0.05
Xylene (m & p)	ug/g	0.05	-	-	-	-	-	-	<0.05	<0.05	<0.05	-	<0.05	NC	-	<0.05
Xylene Total	ug/g	0.05	0.05	0.091	0.9	3	-	-	<0.05	<0.05	<0.05	-	<0.05	NC	-	<0.05
Petroleum Hydrocarbons (PHCs)																
PHC F1 (C6-C10)	ug/g	7	25	17	25	25	<7	<7	<7	<7	<7	<7	<7	NC	<7	<7
PHC F2 (>C10-C16)	ug/g	4	10	10	10	26	<4	<4	<4	<4	<4	<4	<4	NC	<4	<4
PHC F3 (>C16-C34)	ug/g	8	240	240	300	1,700	<8	<8	2,530	16	<8	428	<8	NC	<8	<8
PHC F4 (>C34-C50)	ug/g	6	120	2,800	2,800	3,300	<6	<6	7,900	<6	<6	1,310	<6	NC	<6	<6
F4G-SG	ug/g	50	120	2,800	2,800	3,300	-	-	14900	-	-	2890	-	-	-	-

Notes:
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8) A less than symobol (<) next to a soil result indicates that the parameter was below the laboratory RDL.
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15) 'Shallow TP' refers to shallow test pit.

Table 1 - Soil Quality Results
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

Location Code							BH22-205			BH22-206			BH22-208				
Field ID							BH22-205_1	BH22-205_2	BH22-205_3	BH22-206_1	BH22-206_2	BH22-206_3	BH22-208_1	BH22-208_2	BH22-208_3	BH22-209_1	
Date							08 Dec 2022	08 Dec 2022	08 Dec 2022	08 Dec 2022	08 Dec 2022	08 Dec 2022	08 Dec 2022	08 Dec 2022	08 Dec 2022	08 Dec 2022	
Depth							0.2 - 0.3	0.77 - 1.27	1.7 - 2	0.28 - 0.3	0.4 - 0.82	0.85 - 1.08	0.32 - 0.35	0.72 - 1.02	2.02 - 2.32	0.31 - 0.33	
Sample Method							Granular	Geoprobe	Geoprobe	Granular	Geoprobe	Geoprobe	Granular	Geoprobe	Geoprobe	Granular	
	Unit	RDL	Table 1 RPI/ICC	Table 2.1 AgO	Table 3.1 RPI	Table 3.1 ICC											
Calculated Parameters																	
Percentage Solids	% by Wt.		-	-	-	-	96.9	82.8	86.6	92.9	86.6	82.6	93.9	88.4	88.5	95.5	
General Chemistry																	
Cyanide, free	ug/g		-	-	-	-	<0.03	<0.03	<0.03	-	-	-	<0.03	<0.03	<0.03	<0.03	
Electrical Conductivity (Lab)	µS/cm	5	570	700	700	1,400	1,880	1,080	710	-	-	-	3,030	2,440	924	1,360	
pH (Lab)		0.05	-	-	-	-	8.12	8.54	8.12	-	-	-	8.16	7.96	7.99	8.13	
Sodium Adsorption Ratio (SAR)		0.01	2.4	5	5	12	1.94	10.6	6.59	-	-	-	5.31	11.2	2.13	5.8	
Metals																	
Antimony	ug/g	1	1.3	7.5	7.5	40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Arsenic	ug/g	1	18	11	18	18	1.3	10.4	8.1	3.8	14.7	13.2	1.5	9.1	9.1	1.9	
Barium	ug/g	1	220	390	390	670	7	99.4	74.6	168	33.1	76.3	189	73	109	118	
Beryllium	ug/g	0.5	2.5	4	4	8	<0.5	0.9	0.7	<0.5	<0.5	0.7	<0.5	0.6	0.6	<0.5	
Boron	ug/g	5	36	120	120	120	<5.0	6.5	7.6	<5.0	<5.0	<5.0	<5.0	<5.0	7	<5.0	
Cadmium	ug/g	0.5	1.2	1	1.2	1.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Chromium (Total, III+VI)	ug/g	5	70	160	160	160	<5.0	30.1	22.5	8.1	18.1	26.8	<5.0	22.3	22.3	<5.0	
Chromium (Hexavalent)	ug/g	0.2	0.66	8	8	8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Cobalt	ug/g	1	21	22	22	80	1.2	12.5	8.8	2.8	8.4	13.5	1.5	8.8	12.1	2.3	
Copper	ug/g	5	92	140	140	230	<5.0	20.6	17.5	8.1	25	24	<5.0	16.6	16.9	16	
Lead	ug/g	1	120	45	120	120	3	11.9	8.5	7.9	13.9	10.8	3	10	9	3.9	
Mercury	ug/g	0.1	0.27	0.24	0.27	0.27	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Boron (hot water soluble)	ug/g	0.5	-	1.5	1.5	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Molybdenum	ug/g	1	2	6.9	6.9	40	1.3	3	3.3	1.9	4.5	2.6	<1.0	2.3	3.5	1.1	
Nickel	ug/g	5	82	100	100	270	<5.0	32.1	23.4	8.5	25.5	35.4	<5.0	22.8	26.2	6.4	
Selenium	ug/g	1	1.5	2.4	2.4	5.5	<1.0	1.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Silver	ug/g	0.3	0.5	20	20	40	<0.3	0.4	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Thallium	ug/g	1	1	1	1	3.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Uranium	ug/g	1	2.5	23	23	33	<1.0	<1.0	1.6	1.7	2.4	<1.0	2	1.1	1.3	1.8	
Vanadium	ug/g	10	86	86	86	86	<10.0	45.4	33.9	16	40.4	38.9	<10.0	36.5	33.5	10.4	
Zinc	ug/g	20	290	340	340	340	<20.0	69.5	51.3	21.8	59	64.7	<20.0	49.7	51.7	<20.0	
BTEX																	
Benzene	ug/g	0.02	0.02	0.02	0.02	0.034	<0.02	<0.02	<0.02	-	-	-	<0.02	-	-	<0.02	
Toluene	ug/g	0.05	0.2	0.2	0.99	7.8	0.11	<0.05	<0.05	-	-	-	<0.05	-	-	<0.05	
Ethylbenzene	ug/g	0.05	0.05	0.05	1.9	1.9	<0.05	<0.05	<0.05	-	-	-	<0.05	-	-	<0.05	
Xylene (o)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	-	-	-	<0.05	-	-	<0.05	
Xylene (m & p)	ug/g	0.05	-	-	-	-	<0.05	<0.05	<0.05	-	-	-	<0.05	-	-	<0.05	
Xylene Total	ug/g	0.05	0.05	0.091	0.9	3	<0.05	<0.05	<0.05	-	-	-	<0.05	-	-	<0.05	
Petroleum Hydrocarbons (PHCs)																	
PHC F1 (C6-C10)	ug/g	7	25	17	25	25	<7	<7	<7	<7	-	-	<7	<7	<7	<7	
PHC F2 (>C10-C16)	ug/g	4	10	10	10	26	<4	<4	<4	<4	-	-	<4	<4	<4	<4	
PHC F3 (>C16-C34)	ug/g	8	240	240	300	1,700	1,310	<8	<8	246	-	-	95	<8	<8	311	
PHC F4 (>C34-C50)	ug/g	6	120	2,800	2,800	3,300	5,030	<6	<6	1,040	-	-	1,230	<6	<6	4,140	
F4G-SG	ug/g	50	120	2,800	2,800	3,300	7940	-	-	2,130	-	-	3300	-	-	9,990	

Notes:
1) 'Table 1 RPI/ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 1 RPI and ICC Full D
2) 'Table 2.1 AgO' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 2.1 VI Full Depth ESQ
3) 'Table 3.1 RPI' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
4) 'Table 3.1 ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
5) RDL refers to 'Reportable Detection Limit'.
6) µS/cm refers tp MicroSiemens per centimetre.
7) µg/g refers to Microgram per gram.
8) A less than symobol (<) next to a soil result indicates that the parameter was below the laboratory RDL.
9) A dash (-) symbol indicates that that parameter was not analyzed.
10) ICC refers to Industrial/Commercial/Community Property Use.
11) RPI refers to Residential/Parkland/Intuitional Property Use.
12) AgO refers to Agricultural and Other Property Use.
13) ESQS refers to Excess Soil Quality Standards.
14) 'RPD' refers to relative percent difference.
15) 'Shallow TP' refers to shallow test pit.

Table 1 - Soil Quality Results
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

						Location Code	BH22-209		BH22-211	BH22-212	BH22-213	BH22-214	BH22-215	BH22-216
						Field ID	BH22-209_2	BH22-209_3	BH22-211	BH22-212	BH22-213	BH22-214	BH22-215	BH22-216
						Date	08 Dec 2022	08 Dec 2022	09 Dec 2022	09 Dec 2022	09 Dec 2022	09 Dec 2022	09 Dec 2022	09 Dec 2022
						Depth	0.72 - 1	1.9 - 2.3	0.38 - 0.42	0.32 - 0.34	0.26 - 0.3	0.3 - 0.32	0.41 - 0.44	0.3 - 0.33
						Sample Method	Geoprobe	Geoprobe	Shallow TP	Shallow TP	Shallow TP	Shallow TP	Shallow TP	Shallow TP
	Unit	RDL	Table 1 RPI/ICC	Table 2.1 AgO	Table 3.1 RPI	Table 3.1 ICC								
Calculated Parameters														
Percentage Solids	% by Wt.		-	-	-	-	84.8	81.5	88.3	88.8	93.2	93.2	85.4	87.7
General Chemistry														
Cyanide, free	ug/g		-	-	-	-	<0.03	<0.03	-	-	-	-	-	-
Electrical Conductivity (Lab)	µS/cm	5	570	700	700	1,400	1,740	1,030	-	-	-	-	-	-
pH (Lab)		0.05	-	-	-	-	7.89	7.83	-	-	-	-	-	-
Sodium Adsorption Ratio (SAR)		0.01	2.4	5	5	12	13.1	2.74	-	-	-	-	-	-
Metals														
Antimony	ug/g	1	1.3	7.5	7.5	40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic	ug/g	1	18	11	18	18	9.5	9.8	6.5	7.2	6.8	7	9.2	8.3
Barium	ug/g	1	220	390	390	670	98.5	76.9	89	63.5	147	127	125	97.3
Beryllium	ug/g	0.5	2.5	4	4	8	0.7	0.7	<0.5	<0.5	<0.5	0.6	0.6	0.7
Boron	ug/g	5	36	120	120	120	<5.0	<5.0	<5.0	<5.0	<5.0	8.5	<5.0	<5.0
Cadmium	ug/g	0.5	1.2	1	1.2	1.9	<0.5	<0.5	0.5	<0.5	1.4	0.7	1.6	0.7
Chromium (Total, III+VI)	ug/g	5	70	160	160	160	25	28.4	35.2	15.3	62	39.7	28.9	25.4
Chromium (Hexavalent)	ug/g	0.2	0.66	8	8	8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cobalt	ug/g	1	21	22	22	80	11.7	12.6	6.6	6.5	5	6.6	6.5	7.2
Copper	ug/g	5	92	140	140	230	17	19.9	46.1	22.7	107	48.9	122	43.2
Lead	ug/g	1	120	45	120	120	10.5	11.9	80.5	34.4	1,070	223	482	108
Mercury	ug/g	0.1	0.27	0.24	0.27	0.27	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Boron (hot water soluble)	ug/g	0.5	-	1.5	1.5	2	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5
Molybdenum	ug/g	1	2	6.9	6.9	40	2.2	2.8	2.5	2.3	5.2	3.7	3	1.9
Nickel	ug/g	5	82	100	100	270	28.1	29.6	20.3	14.6	28.4	22.8	26.5	21.2
Selenium	ug/g	1	1.5	2.4	2.4	5.5	<1.0	1.1	<1.0	<1.0	<1.0	1.6	1.6	1.3
Silver	ug/g	0.3	0.5	20	20	40	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Thallium	ug/g	1	1	1	1	3.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Uranium	ug/g	1	2.5	23	23	33	<1.0	<1.0	<1.0	1.1	1.2	<1.0	<1.0	<1.0
Vanadium	ug/g	10	86	86	86	86	39.2	39.2	28.5	25.4	21.1	28.3	26.7	30
Zinc	ug/g	20	290	340	340	340	52.1	63.7	139	51.7	397	223	378	191
BTEX														
Benzene	ug/g	0.02	0.02	0.02	0.02	0.034	<0.02	<0.02	-	-	-	-	-	-
Toluene	ug/g	0.05	0.2	0.2	0.99	7.8	<0.05	<0.05	-	-	-	-	-	-
Ethylbenzene	ug/g	0.05	0.05	0.05	1.9	1.9	<0.05	<0.05	-	-	-	-	-	-
Xylene (o)	ug/g	0.05	-	-	-	-	<0.05	<0.05	-	-	-	-	-	-
Xylene (m & p)	ug/g	0.05	-	-	-	-	<0.05	<0.05	-	-	-	-	-	-
Xylene Total	ug/g	0.05	0.05	0.091	0.9	3	<0.05	<0.05	-	-	-	-	-	-
Petroleum Hydrocarbons (PHCs)														
PHC F1 (C6-C10)	ug/g	7	25	17	25	25	<7	<7	-	-	-	-	-	-
PHC F2 (>C10-C16)	ug/g	4	10	10	10	26	<4	<4	-	-	-	-	-	-
PHC F3 (>C16-C34)	ug/g	8	240	240	300	1,700	<8	<8	-	-	-	-	-	-
PHC F4 (>C34-C50)	ug/g	6	120	2,800	2,800	3,300	<6	<6	-	-	-	-	-	-
F4G-SG	ug/g	50	120	2,800	2,800	3,300	-	-	-	-	-	-	-	-

Notes:
1) 'Table 1 RPI/ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 1 RPI and ICC Full D
2) 'Table 2.1 AgO' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 2.1 VI Full Depth ESQ
3) 'Table 3.1 RPI' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
4) 'Table 3.1 ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 VI Full Depth ESQS
5) RDL refers to 'Reportable Detection Limit'.
6) µS/cm refers tp MicroSiemens per centimetre.
7) µg/g refers to Microgram per gram.
8) A less than symobol (<) next to a soil result indicates that the parameter was below the laboratory RDL.
9) A dash (-) symbol indicates that that parameter was not analyzed.
10) ICC refers to Industrial/Commercial/Community Property Use.
11) RPI refers to Residential/Parkland/Intuitional Property Use.
12) AgO refers to Agricultural and Other Property Use.
13) ESQS refers to Excess Soil Quality Standards.
14) 'RPD' refers to relative percent difference.
15) 'Shallow TP' refers to shallow test pit.

Table 2A - Leachate Results - Modified Synthetic Precipitation Leaching Procedure (mSPLP) Analysis
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

						Location Code	BH22-102	BH22-103	BH22-109	BH22-110	BH22-111	BH22-113	BH22-120	BH22-203	BH22-205
						Field ID	BH22-102_B	BH22-103_1	BH22-109_1	BH22-110_1	BH22-111_1	GR22-106	BH22-120_1	BH22-203_3	BH22-205_3
						Date	07 Jun 2022	07 Jun 2022	06 Jun 2022	06 Jun 2022	06 Jun 2022	06 Jun 2022	06 Jun 2022	08 Dec 2022	08 Dec 2022
						Depth	0.4 - 0.45	0.31 - 0.39	0.62 - 1.01	0.32 - 0.34	0.31 - 0.32	0.4 - 0.45	0.29 - 0.32	2.87 - 3.27	1.7 - 2
						Matrix Description	Shallow TP	Shallow TP	Geoprobe	Shallow TP	Shallow TP	Granular	Shallow TP	Geoprobe	Geoprobe
	Unit	RDL	Table 1 RPI/ICC SV	Table 2.1 AgO SL	Table 3.1 RPI SL	Table 3.1 ICC SL									
Metals															
Antimony	mg/L	0.0005	-	0.006	-	-	0.0006	0.0033	<0.0005	0.0011	0.0008	<0.0005	0.0009	<0.0005	<0.0005
Arsenic	mg/L	0.001	-	-	-	-	0.0033	0.0015	0.0036	0.0025	0.0035	0.0012	0.0038	<0.0010	<0.0010
Barium	mg/L	0.001	-	1	4.6	4.6	0.0523	0.0331	0.253	0.0718	0.105	0.0139	0.136	0.0057	0.0077
Beryllium	mg/L	0.0005	-	0.004	0.011	0.011	<0.0005	<0.0005	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron	mg/L	0.01	-	5	-	-	0.0222	0.0136	0.0233	0.0224	0.0308	0.0203	0.0225	0.0149	0.0227
Cadmium	mg/L	0.0002	-	0.0005	-	0.0005	<0.0002	0.0002	<0.0002	0.0002	0.0002	<0.0002	0.0006	<0.0002	<0.0002
Chromium (Total, III+VI)	mg/L	0.001	-	0.05	0.13	0.13	0.0073	0.0816	0.0028	0.0099	0.0057	0.0018	0.0102	0.0035	0.0015
Cobalt	mg/L	0.0005	-	0.0038	0.01	0.01	0.0011	0.0007	0.0040	0.0010	0.0007	<0.0005	0.0008	<0.0005	<0.0005
Copper	mg/L	0.0005	-	0.014	0.014	0.014	0.0121	0.0260	0.0107	0.0533	0.0274	0.0071	0.0286	0.0006	0.0022
Lead	mg/L	0.0002	-	-	-	-	0.0234	0.225	0.0161	0.0183	0.0098	<0.0002	0.0474	0.0002	0.0002
Molybdenum	mg/L	0.0005	0.023	0.023	-	1.5	0.0016	0.0017	0.0045	0.0033	0.0025	0.0053	0.0024	0.0213	0.0330
Nickel	mg/L	0.001	-	0.078	0.078	0.078	0.0052	0.0065	0.0052	0.0060	0.0049	0.0032	0.0057	0.0016	<0.0010
Selenium	mg/L	0.001	-	0.01	0.01	0.01	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	0.0020	<0.0010	<0.0010	<0.0010
Silver	mg/L	0.0002	0.0003	0.0003	0.0003	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thallium	mg/L	0.0005	0.002	0.002	-	0.08	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Uranium	mg/L	0.0002	-	0.02	0.066	0.066	0.0002	<0.0002	0.0009	0.0003	0.0006	<0.0002	0.0005	<0.0002	0.0004
Vanadium	mg/L	0.0005	-	-	-	-	0.0112	0.0045	0.0178	0.0074	0.0107	0.0058	0.0092	0.0021	0.0044
Zinc	mg/L	0.005	-	0.18	0.18	0.18	0.0597	0.134	0.0165	0.122	0.0464	<0.0050	0.0836	<0.0050	<0.0050

Notes:
1) 'Table 1 RPI/ICC SV' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 1 Leachate Screening Values for RPI/ICC represented by bolding and blue shading.
2) 'Table 2.1 AgO SL' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 2.1 Leachate Screening Levels for Potable GW AgO, represented by yellow shading.
3) 'Table 3.1 RPI' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 Leachate Screening Levels for Non-Potable GW RPI, represented by purple shading.
4) 'Table 3.1 ICC' refers to Ontario Ministry of Environment, Conservation and Parks, 2019, O.Reg. 406/19 Table 3.1 Leachate SL for Non-Potable GW ICC, represented by red shading.
5) RDL refers to 'Reportable Detection Limit'.
6) mg/L refers to Milligrams per litre
7) A less than symobol (<) next to a soil result indicates that the parameter was below the laboratory RDL.
8) ICC refers to Industrial/Commercial/Community Property Use.
9) RPI refers to Residential/Parkland/Intuitional Property Use.
10) AgO refers to Agricultural and Other Property Use.
11) 'Shallow TP' refers to shallow test pit.

Table 2B - Leachate Results - Toxicity Characteristic Leaching Procedure (TCLP) Analysis
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

			Location Code	BH22-103
			Field ID	BH22-103_1
			Date	07 Jun 2022
			Depth	0.31 - 0.39
			Sample Method	Shallow TP
	Unit	RDL	ON MECP O.Reg. 347 Schedule 4 Leachate Quality Criteria	
Calculated Parameters				
Percentage Solids	% by Wt.		-	88.0
General Chemistry				
Fluoride	mg/L	0.05	150	0.24
Cyanide, free	mg/L	0.02	20	<0.02
Ignitability	NA		-	Negative
Nitrate (as N)	mg/L	1	-	<1
Nitrite (as N)	mg/L	1	-	<1
Metals				
Arsenic	mg/L	0.05	2.5	<0.05
Barium	mg/L	0.05	100	0.87
Boron	mg/L	0.05	500	<0.05
Cadmium	mg/L	0.01	0.5	<0.01
Chromium (Total, III+VI)	mg/L	0.05	5	<0.05
Lead	mg/L	0.05	5	0.21
Mercury	mg/L	0.005	0.1	<0.005
Selenium	mg/L	0.05	1	<0.05
Silver	mg/L	0.05	5	<0.05
Uranium	mg/L	0.05	10	<0.05
BTEX				
Benzene	mg/L	0.005	0.5	<0.005
Polycyclic Aromatic Hydrocarbons (PAHs)				
Benzo(a)pyrene	mg/L	0.0001	0.001	<0.0001
Surrogate				
4-Terphenyl-d14	mg/L		-	0.25
Toluene-d8	%		-	0.0000707

Notes:
1) 'Schedule 4 Leachate Quality Criteria' refers to Ontario Ministry of Environment, Conservation, and Parks, Ontario Regulation 347 Schedule 4 Leachate Quality Criteria
2) RDL refers to 'Reportable Detection Limit'.
3) mg/L refers to Milligrams per litre
4) A less than symobol (<) next to a soil result indicates that the parameter was below the laboratory RDL.
5) 'Shallow TP' refers to shallow test pit.

Table 3 - Reuse and Disposal Zone Summary
Howard Avenue Corridor Improvements
Corporation of the City of Windsor

Zone ID	Zone Description	Location IDs Within Zone	Zone Soil Quality Details	Approximate Depth (m)	Soil Reuse and Disposal Options for Zone
Soils exceeding Table 3.1 ICC ESQS					
Zone A	Zone extends along the entire project area within the confines of the roadway with the exception of Zone B and is limited to the sand and gravel material present below the asphalt to the top of the native underlying material.	All boreholes except for hand dug test pits and location IDs listed in Zones B and E1.	- GR22 series samples exceed Table 3.1 ICC ESQ for PHC F4. Note that seelct samples reported elevated Reportable Detection Limits for PHC F2 however, these are not considered to be representative of actual conditions. Refer to Section 4.4.1 of the Soil Characterization Report for details. - BH22 series samples exceed Table 3.1 ICC ESQS for PHC F3 and F4	Below asphalt to top of underlying native material (refer to borehole logs in Appendix C for estimated depths of this material in this zone).	Recommended to be transported to an aggregate recycling yard/facility to be reused as as granular material for a specific engineering purpose and not for use as general fill and/or reused on-site (if possilbe). If note reused for this purposed the granular will be managed as waste.
Zone C	Limited to the boulevard where soils are present (and not underlying asphalt or concrete) along the north boulevard of Division Road and including the west boulevard of Sydney Avenue.	BH22-103, BH22-120, BH22-211, BH22-212, BH22-214	Cadmium, hexavalent chromium, zinc and lead exceeds Table 3.1 ICC ESQS (mostly lead on Sydney Avenue)	Surface to target depth of construction	Requires management as waste
Zone D	Limited to the south boulevard of Division Road where soils are present (and not underlying asphalt or concrete) from south Project Area boundaries on Division Road to the intersection at Howard Avenue/Division Road. Vertically the zone extends from surface to target construction depth.	BH22-110, BH22-111, BH22-213, BH22-215	Lead, Zinc and PHC F2 (elevated RDL) exceeds Table 3.1 ICC ESQS. Elevated RDLs not considered to meet Table 3.1 ICC ESQS (see Section 4.4.1 of the Soil Characterization Report).	Surface to target depth of construction	
Zone E1	Zone consists of surficial soils inside the triangle median on Division Road/Howard Avenue, and vertically extends from the surficial soil to 0.6 mbgs.	BH22-101, BH22-102_B	Lead exceeds Table 3.1 ICC ESQS	Surface to 0.60 mbgs	Requires management as waste
Soils exceeding Table 3.1 RPI ESQS and meeting Table 3.1 ICC ESQS					
Zone B	Zone extends from northern Project Area extents on Sydney Avenue to BH22-106, where granular material is present below the asphalt to the bottom of the underlying granular material (at approximately 0.22 to 0.64 mbgs).	BH22-106 to BH22-108	Barium exceeds the Table 3.1 RPI ESQS	Below the asphalt bottom of the underlying granular material (at approximately 0.22 to 0.64 mbgs).	Potential for reuse at site accepting soils meeting Table 3.1 ICC Site
Zone E2	Lateral extents of Zone E2 include the median present on Howard Avenue and Division Road and extending into the east to the eastern project limits.	BH22-101, BH22-102_B, BH22-204	PHC F2 and Vanadium exceeds Table 3.1 ESQS.	Within the footprint of the median: 0.6 mbgs to the target depth of construction; Within the footprint of the roadway to the east of the median: zone consists of material underlying the sand and gravel material road base to the target depth of construction	Potential for reuse at site accepting soils meeting Table 3.1 ICC Site
Soils meeting Table 3.1 RPI ESQS					
Zone F	Laterally extends throughout the Project area, under the road and underlying Zones A and B and excluding areas of Zones C, D and E.	BH22-102, BH22-104, BH22-105, BH22-106, BH22-107, BH22-108BH22-109, BH22-203, BH22-205, BH22-206, BH22-117, BH22-118, BH22-113, BH22-114, BH22-113, BH22-115, BH22-119, BH22-201, BH22-204	- Arsenic and Lead exceeds Table 2.1 AgO -Molybdenum exceeds Table 1 RPI/ICC - Table 2.1 AgO Leachate Screening Level exceedances of molybdenum (for BH22-203 and BH22-205) Refer to Section 4.5 in SCR for details on this section	Underlying Zones A and B to target construction depth; Present in the boulevard of Howard Avenue from Surface to target construction depth	Soil can be reused in at a Table 1 RPI/ICC site that can accept exceedances of molybdenum or must otherwise be managed at a site that can accept soils meeting Table 3.1 RPI.

Notes

1 To be read in conjunction with Dillon's report "Due Diligence Soil Characterization Report, Howard Avenue Corridor Improvements", dated February 2023, and the Site and Sample Location Plans (Figures 2A-2D).

2 Refer to Table 1 and laboratory certificates of analysis in Appendix A for further details on bulk analysis.

3 Information provided in this report and attachments is not to be used or interpreted for construction in locations outside of the Source Site.

4 Locations of samples exceeding Table 3.1 Industrial/Commercial/Community (ICC) Excess Soil Quality Standards (ESQS) are presented as red shaded areas on the Site and Sample Locations Plans (Figures 2A to 2D).

5 Locations of samples exceeding Table 3.1 Residential/Parkland/Institutional (RPI) ESQS and below Table 3.1 ICC ESQS are presented as purple shaded areas on the Site and Sample Locations Plans (Figures 2A to 2D).

6 Locations of samples exceeding Table 2.1 Agricultural/Other (AgO) ESQS and below Table 1 RPI/ICC ESQS are presented as green shaded areas on the Site and Sample Locations Plans (Figures 2A to 2D).

7 Locations where sand/gravel road base exceeds Table 3.1 ICC ESQS are denoted by red hatching within the shaded areas.

8 Locations where sand/gravel road base exceeds Table 3.1 RPI ESQS are denoted by purple hatching within the shaded areas.

Appendix A

Laboratory Certificate of Analysis

PARACEL LABORATORIES LTD.
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351 Nash Road North, unit 9B
Hamilton, ON L8H 7P4
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Dillon Consulting Ltd (Windsor)

3200 Deziel Drive Suite 608
Windsor, ON N8W 5K8
Attn: Matthew Antaya

Client PO: 20-3864
Project: Howard South Cameron
Custody:

Report Date: 16-Jun-2022
Order Date: 8-Jun-2022

Order #: 2224237

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2224237-01	BH22-101_1
2224237-02	BH22-101_2
2224237-03	BH22-102_1
2224237-04	BH22-102_B
2224237-05	BH22-103_1
2224237-06	BH22-104_1
2224237-07	BH22-104_2
2224237-08	BH22-105_1
2224237-09	BH22-105_2
2224237-10	BH22-106_1
2224237-11	BH22-106_2
2224237-12	BH22-107_1
2224237-13	BH22-107_2
2224237-14	BH22-108_1
2224237-15	BH22-108_2
2224237-16	BH22-109_1
2224237-17	BH22-109_2
2224237-18	BH22-110_1
2224237-19	BH22-111_1
2224237-20	BH22-112_1
2224237-21	BH22-112_2
2224237-22	BH22-113_1
2224237-23	BH22-113_2
2224237-24	BH22-114_1
2224237-25	BH22-114_2
2224237-26	BH22-115_1
2224237-27	BH22-115_2
2224237-28	BH22-116_1
2224237-29	BH22-116_2
2224237-30	BH22-117_1

Approved By:

Dale Robertson, BSc
Laboratory Director

2224237-31	BH22-117_2
2224237-32	BH22-118_1
2224237-33	BH22-118_2
2224237-34	BH22-119_1
2224237-35	BH22-120_1
2224237-36	BH22-DUPA
2224237-37	BH22-DUPB
2224237-38	BH22-DUPC
2224237-39	BH22-DUPD
2224237-40	GR22-101
2224237-41	GR22-102
2224237-42	GR22-103
2224237-43	GR22-104
2224237-44	GR22-105
2224237-45	GR22-106
2224237-46	GR22-107
2224237-47	GR22-DUP
2224237-48	BH22-102_2

Certificate of Analysis

Client: Dillon Consulting Ltd (Windsor)

Client PO: 20-3864

Report Date: 16-Jun-2022

Order Date: 8-Jun-2022

Project Description: Howard South Cameron

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.8 - ICP-MS	14-Jun-22	14-Jun-22
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	10-Jun-22	10-Jun-22
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	10-Jun-22	13-Jun-22
Conductivity	MOE E3138 - probe @25 °C, water ext	14-Jun-22	14-Jun-22
Cyanide, free	MOE E3015 - Auto Colour, water extraction	13-Jun-22	13-Jun-22
Mercury by CVAA	EPA 7471B - CVAA, digestion	13-Jun-22	13-Jun-22
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	14-Jun-22	14-Jun-22
PHC F1	CWS Tier 1 - P&T GC-FID	10-Jun-22	10-Jun-22
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	14-Jun-22	15-Jun-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	10-Jun-22	11-Jun-22
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	13-Jun-22	14-Jun-22
SAR	Calculated	14-Jun-22	14-Jun-22
Solids, %	Gravimetric, calculation	13-Jun-22	13-Jun-22

PARACEL LABORATORIES LTD.

Order #: 2224237

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-101_1	BH22-101_2	BH22-102_1	BH22-102_B
	Sample Date:	07-Jun-22 11:01	07-Jun-22 11:06	07-Jun-22 10:40	07-Jun-22 10:35
	Sample ID:	2224237-01	2224237-02	2224237-03	2224237-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	85.4	81.5	83.0	84.3
General Inorganics					
SAR	0.01 N/A	6.06	3.00	5.46	0.93
Conductivity	5 uS/cm	1100	1140	1080	259
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	7.53	7.37	7.10	7.27
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	12.4	8.1	9.3	9.6
Barium	1.0 ug/g dry	87.1	47.6	95.5	121
Beryllium	0.5 ug/g dry	0.9	0.6	1.0	0.9
Boron	5.0 ug/g dry	11.9	8.1	14.3	12.0
Boron, available	0.5 ug/g dry	0.5	1.0	0.9	0.8
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	1.1
Chromium	5.0 ug/g dry	26.0	14.3	28.6	28.5
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	11.9	5.6	12.1	8.2
Copper	5.0 ug/g dry	18.3	13.4	19.5	62.3
Lead	1.0 ug/g dry	33.3	14.9	13.9	180
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	2.3	1.4	2.4	1.7
Nickel	5.0 ug/g dry	31.6	14.5	27.1	24.6
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	1.1	<1.0
Vanadium	10.0 ug/g dry	94.0	25.8	48.9	36.6
Zinc	20.0 ug/g dry	71.9	47.8	70.9	231
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-101_1	BH22-101_2	BH22-102_1	BH22-102_B
	Sample Date:	07-Jun-22 11:01	07-Jun-22 11:06	07-Jun-22 10:40	07-Jun-22 10:35
	Sample ID:	2224237-01	2224237-02	2224237-03	2224237-04
	MDL/Units	Soil	Soil	Soil	Soil
Toluene-d8	Surrogate	108%	107%	109%	103%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	19	43	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	191 [3]	258	<8	51
F4 PHCs (C34-C50)	6 ug/g dry	40	123 [2]	<6	33
F4G PHCs (gravimetric)	50 ug/g dry	-	245	-	-

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-103_1	BH22-104_1	BH22-104_2	BH22-105_1
	Sample Date:	07-Jun-22 08:10	06-Jun-22 13:03	06-Jun-22 13:08	06-Jun-22 12:42
	Sample ID:	2224237-05	2224237-06	2224237-07	2224237-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	89.0	85.4	87.3	87.2
General Inorganics					
SAR	0.01 N/A	8.22	12.8	2.98	7.30
Conductivity	5 uS/cm	716	2740	828	1480
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	7.69	7.57	7.71	7.46
Metals					
Antimony	1.0 ug/g dry	6.9	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	5.4	8.5	9.5	11.8
Barium	1.0 ug/g dry	144	67.8	80.2	89.3
Beryllium	0.5 ug/g dry	<0.5	0.8	0.7	1.0
Boron	5.0 ug/g dry	10.0	9.9	14.6	13.3
Boron, available	0.5 ug/g dry	<0.5	1.2	<0.5	<0.5
Cadmium	0.5 ug/g dry	2.4	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	111	19.5	24.4	27.8
Chromium (VI)	0.2 ug/g dry	55.6	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	5.8	7.6	12.8	11.6
Copper	5.0 ug/g dry	109	18.3	19.2	21.4
Lead	1.0 ug/g dry	1050	58.9	12.2	14.5
Mercury	0.1 ug/g dry	0.1	0.2	<0.1	<0.1
Molybdenum	1.0 ug/g dry	5.8	1.5	3.7	2.4
Nickel	5.0 ug/g dry	34.9	19.3	29.7	31.1
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	1.0	<1.0	1.2	1.0
Vanadium	10.0 ug/g dry	23.0	31.4	37.2	45.4
Zinc	20.0 ug/g dry	493	63.5	56.6	60.0
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-103_1	BH22-104_1	BH22-104_2	BH22-105_1
	Sample Date:	07-Jun-22 08:10	06-Jun-22 13:03	06-Jun-22 13:08	06-Jun-22 12:42
	Sample ID:	2224237-05	2224237-06	2224237-07	2224237-08
	MDL/Units	Soil	Soil	Soil	Soil
Toluene-d8	Surrogate	108%	115%	108%	111%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<40 [1]	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	150	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	1020 [2]	<6	<6	<6
F4G PHCs (gravimetric)	50 ug/g dry	753	-	-	-

Certificate of Analysis

Client: Dillon Consulting Ltd (Windsor)

Client PO: 20-3864

Report Date: 16-Jun-2022

Order Date: 8-Jun-2022

Project Description: Howard South Cameron

	Client ID:	BH22-105_2	BH22-106_1	BH22-106_2	BH22-107_1
	Sample Date:	06-Jun-22 12:47	06-Jun-22 12:12	06-Jun-22 12:12	06-Jun-22 11:08
	Sample ID:	2224237-09	2224237-10	2224237-11	2224237-12
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	88.5	78.0	89.3	82.8
General Inorganics					
SAR	0.01 N/A	2.98	0.48	0.31	0.59
Conductivity	5 uS/cm	1010	170	183	351
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	7.69	7.45	7.75	7.50
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	9.0	8.2	6.4	7.4
Barium	1.0 ug/g dry	85.3	61.6	59.6	56.6
Beryllium	0.5 ug/g dry	0.7	0.5	<0.5	0.7
Boron	5.0 ug/g dry	14.8	11.2	10.3	13.8
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	23.0	18.5	16.3	21.0
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	11.5	9.0	9.0	10.3
Copper	5.0 ug/g dry	17.9	14.7	13.4	16.2
Lead	1.0 ug/g dry	10.5	8.5	8.6	9.0
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	3.5	2.5	2.5	3.0
Nickel	5.0 ug/g dry	27.9	23.2	20.6	25.8
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	1.0
Vanadium	10.0 ug/g dry	35.8	28.9	24.5	31.4
Zinc	20.0 ug/g dry	53.2	40.4	37.7	60.6
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-105_2	BH22-106_1	BH22-106_2	BH22-107_1
	Sample Date:	06-Jun-22 12:47	06-Jun-22 12:12	06-Jun-22 12:12	06-Jun-22 11:08
	Sample ID:	2224237-09	2224237-10	2224237-11	2224237-12
	MDL/Units	Soil	Soil	Soil	Soil
Toluene-d8	Surrogate	107%	113%	107%	108%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	13	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	8	<6	<6

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-107_2	BH22-108_1	BH22-108_2	BH22-109_1
	Sample Date:	06-Jun-22 11:12	07-Jun-22 10:42	07-Jun-22 10:48	06-Jun-22 11:44
	Sample ID:	2224237-13	2224237-14	2224237-15	2224237-16
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	87.8	85.3	89.9	83.8
General Inorganics					
SAR	0.01 N/A	0.65	6.61	1.80	7.37
Conductivity	5 uS/cm	347	726	453	1740
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	7.73	7.58	7.71	7.58
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	6.7	8.4	7.4	12.4
Barium	1.0 ug/g dry	58.5	69.7	42.5	106
Beryllium	0.5 ug/g dry	0.6	0.6	0.6	0.9
Boron	5.0 ug/g dry	12.6	7.6	11.6	10.2
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	20.0	17.5	17.6	26.7
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	9.8	8.0	8.2	12.8
Copper	5.0 ug/g dry	15.7	14.1	13.1	21.2
Lead	1.0 ug/g dry	8.7	8.6	8.2	13.4
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	2.9	2.6	2.1	4.8
Nickel	5.0 ug/g dry	24.0	21.0	20.1	32.3
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	29.3	29.1	29.4	44.0
Zinc	20.0 ug/g dry	45.9	43.0	40.5	57.9
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-107_2	BH22-108_1	BH22-108_2	BH22-109_1
	Sample Date:	06-Jun-22 11:12	07-Jun-22 10:42	07-Jun-22 10:48	06-Jun-22 11:44
	Sample ID:	2224237-13	2224237-14	2224237-15	2224237-16
	MDL/Units	Soil	Soil	Soil	Soil
Toluene-d8	Surrogate	110%	108%	106%	112%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-109_2	BH22-110_1	BH22-111_1	BH22-112_1
	Sample Date:	06-Jun-22 11:44	06-Jun-22 08:08	06-Jun-22 08:15	07-Jun-22 11:41
	Sample ID:	2224237-17	2224237-18	2224237-19	2224237-20
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	81.9	91.9	90.8	86.8
General Inorganics					
SAR	0.01 N/A	2.44	4.01	3.32	0.98
Conductivity	5 uS/cm	1260	541	485	303
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	7.65	7.35	7.64	7.51
Metals					
Antimony	1.0 ug/g dry	<1.0	4.3	<1.0	<1.0
Arsenic	1.0 ug/g dry	6.9	5.0	5.2	6.9
Barium	1.0 ug/g dry	58.3	94.1	88.6	65.5
Beryllium	0.5 ug/g dry	0.6	<0.5	0.6	0.6
Boron	5.0 ug/g dry	9.3	10.5	10.0	9.5
Boron, available	0.5 ug/g dry	<0.5	0.7	1.0	<0.5
Cadmium	0.5 ug/g dry	<0.5	0.7	0.6	<0.5
Chromium	5.0 ug/g dry	17.8	95.8	51.1	19.6
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	5.7	5.4	5.0	7.5
Copper	5.0 ug/g dry	13.7	111	65.5	13.0
Lead	1.0 ug/g dry	7.5	85.7	52.1	12.0
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	2.7	7.9	3.8	1.6
Nickel	5.0 ug/g dry	16.2	33.6	22.7	19.4
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	28.4	21.1	25.0	30.4
Zinc	20.0 ug/g dry	43.7	341	191	50.2
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-109_2	BH22-110_1	BH22-111_1	BH22-112_1
	Sample Date:	06-Jun-22 11:44	06-Jun-22 08:08	06-Jun-22 08:15	07-Jun-22 11:41
	Sample ID:	2224237-17	2224237-18	2224237-19	2224237-20
	MDL/Units	Soil	Soil	Soil	Soil
Toluene-d8	Surrogate	111%	106%	103%	107%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<40 [1]	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	10	304	89	<8
F4 PHCs (C34-C50)	6 ug/g dry	19	910 [2]	131 [2]	<6
F4G PHCs (gravimetric)	50 ug/g dry	-	272	77	-

PARACEL LABORATORIES LTD.

Order #: 2224237

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-112_2	BH22-113_1	BH22-113_2	BH22-114_1
	Sample Date:	07-Jun-22 11:41	06-Jun-22 13:11	06-Jun-22 13:16	06-Jun-22 15:54
	Sample ID:	2224237-21	2224237-22	2224237-23	2224237-24
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	87.8	87.6	88.5	85.9
General Inorganics					
SAR	0.01 N/A	0.62	8.37	3.35	6.72
Conductivity	5 uS/cm	275	2870	1490	2390
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	7.96	7.40	7.57	7.64
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	6.7	11.6	6.5	9.9
Barium	1.0 ug/g dry	72.1	67.7	66.0	96.2
Beryllium	0.5 ug/g dry	0.5	0.8	0.6	0.9
Boron	5.0 ug/g dry	10.5	11.4	11.9	12.2
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	16.7	22.1	18.2	26.7
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	9.2	9.8	8.8	13.3
Copper	5.0 ug/g dry	13.4	19.3	14.2	19.1
Lead	1.0 ug/g dry	7.9	10.6	8.3	11.6
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	2.9	2.6	2.9	2.4
Nickel	5.0 ug/g dry	22.6	26.5	22.0	32.5
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	1.1
Vanadium	10.0 ug/g dry	25.6	35.9	27.8	39.4
Zinc	20.0 ug/g dry	40.4	53.2	42.0	61.3
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-112_2	BH22-113_1	BH22-113_2	BH22-114_1
	Sample Date:	07-Jun-22 11:41	06-Jun-22 13:11	06-Jun-22 13:16	06-Jun-22 15:54
	Sample ID:	2224237-21	2224237-22	2224237-23	2224237-24
	MDL/Units	Soil	Soil	Soil	Soil
Toluene-d8	Surrogate	107%	106%	105%	127%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-114_2	BH22-115_1	BH22-115_2	BH22-116_1
	Sample Date:	06-Jun-22 16:07	07-Jun-22 11:29	07-Jun-22 11:32	06-Jun-22 16:44
	Sample ID:	2224237-25	2224237-26	2224237-27	2224237-28
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	88.3	81.3	88.4	87.1
General Inorganics					
SAR	0.01 N/A	11.7	0.30	0.97	27.0
Conductivity	5 uS/cm	1650	133	180	3400
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	7.95	7.41	7.79	7.72
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	8.2	5.8	10.7	10.7
Barium	1.0 ug/g dry	100	79.9	89.0	78.5
Beryllium	0.5 ug/g dry	0.7	0.8	0.8	0.8
Boron	5.0 ug/g dry	11.5	7.8	15.4	12.7
Boron, available	0.5 ug/g dry	<0.5	0.7	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	19.9	22.0	25.3	23.7
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	11.4	7.1	13.0	11.2
Copper	5.0 ug/g dry	16.2	12.2	19.8	19.1
Lead	1.0 ug/g dry	10.6	16.4	11.3	10.9
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	3.4	1.4	3.6	3.7
Nickel	5.0 ug/g dry	26.0	21.8	30.5	27.7
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	1.2	<1.0	1.3	1.1
Vanadium	10.0 ug/g dry	29.8	31.7	38.7	38.9
Zinc	20.0 ug/g dry	47.0	54.5	59.9	56.9
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	107%	113%	106%	112%

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-114_2	BH22-115_1	BH22-115_2	BH22-116_1
	Sample Date:	06-Jun-22 16:07	07-Jun-22 11:29	07-Jun-22 11:32	06-Jun-22 16:44
	Sample ID:	2224237-25	2224237-26	2224237-27	2224237-28
	MDL/Units	Soil	Soil	Soil	Soil
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-116_2	BH22-117_1	BH22-117_2	BH22-118_1
	Sample Date:	06-Jun-22 16:52	07-Jun-22 09:22	07-Jun-22 09:26	07-Jun-22 10:14
	Sample ID:	2224237-29	2224237-30	2224237-31	2224237-32
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	88.7	84.0	88.5	81.8
General Inorganics					
SAR	0.01 N/A	6.03	24.6	7.92	10.1
Conductivity	5 uS/cm	1860	2080	856	1970
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	7.80	7.66	7.77	7.94
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	8.9	9.7	8.0	8.1
Barium	1.0 ug/g dry	81.3	134	93.6	91.1
Beryllium	0.5 ug/g dry	0.6	1.3	0.6	0.9
Boron	5.0 ug/g dry	12.9	8.7	12.1	10.4
Boron, available	0.5 ug/g dry	<0.5	0.6	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	22.1	28.9	20.2	26.1
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	10.1	14.3	11.3	8.8
Copper	5.0 ug/g dry	18.3	20.0	16.5	14.1
Lead	1.0 ug/g dry	9.9	11.9	9.5	11.0
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	3.3	1.9	3.4	2.2
Nickel	5.0 ug/g dry	26.6	31.7	27.6	22.7
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	1.2	1.2	1.0	<1.0
Vanadium	10.0 ug/g dry	33.9	42.5	31.1	42.8
Zinc	20.0 ug/g dry	54.8	60.0	50.7	75.8
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-116_2	BH22-117_1	BH22-117_2	BH22-118_1
	Sample Date:	06-Jun-22 16:52	07-Jun-22 09:22	07-Jun-22 09:26	07-Jun-22 10:14
	Sample ID:	2224237-29	2224237-30	2224237-31	2224237-32
	MDL/Units	Soil	Soil	Soil	Soil
Toluene-d8	Surrogate	105%	110%	108%	111%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	16

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-118_2	BH22-119_1	BH22-120_1	BH22-DUPA
	Sample Date:	07-Jun-22 10:19	07-Jun-22 08:48	06-Jun-22 08:27	06-Jun-22 10:48
	Sample ID:	2224237-33	2224237-34	2224237-35	2224237-36
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	82.3	81.2	88.0	86.3
General Inorganics					
SAR	0.01 N/A	7.12	0.19	5.56	1.33
Conductivity	5 uS/cm	2000	199	542	443
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	7.80	7.31	7.75	7.63
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	16.2	8.1	5.8	8.1
Barium	1.0 ug/g dry	104	104	112	61.0
Beryllium	0.5 ug/g dry	1.1	0.7	0.5	0.6
Boron	5.0 ug/g dry	17.5	9.7	8.9	11.5
Boron, available	0.5 ug/g dry	<0.5	<0.5	0.7	<0.5
Cadmium	0.5 ug/g dry	<0.5	0.5	1.1	<0.5
Chromium	5.0 ug/g dry	33.0	21.2	48.3	18.6
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	14.6	6.5	5.2	10.7
Copper	5.0 ug/g dry	28.2	22.0	47.4	14.0
Lead	1.0 ug/g dry	16.1	92.6	142	10.1
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	4.1	2.0	2.8	2.4
Nickel	5.0 ug/g dry	37.7	18.9	19.9	22.8
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	1.3	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	54.5	29.7	26.4	30.1
Zinc	20.0 ug/g dry	78.3	167	220	41.0
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	108%	118%	110%	112%

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-118_2	BH22-119_1	BH22-120_1	BH22-DUPA
	Sample Date:	07-Jun-22 10:19	07-Jun-22 08:48	06-Jun-22 08:27	06-Jun-22 10:48
	Sample ID:	2224237-33	2224237-34	2224237-35	2224237-36
	MDL/Units	Soil	Soil	Soil	Soil
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	9	56	162	<8
F4 PHCs (C34-C50)	6 ug/g dry	37	78	214 [2]	<6
F4G PHCs (gravimetric)	50 ug/g dry	-	-	125	-

Certificate of Analysis

Client: Dillon Consulting Ltd (Windsor)

Client PO: 20-3864

Report Date: 16-Jun-2022

Order Date: 8-Jun-2022

Project Description: Howard South Cameron

	Client ID:	BH22-DUPB	BH22-DUPC	BH22-DUPD	GR22-101
	Sample Date:	06-Jun-22 12:12	06-Jun-22 13:16	07-Jun-22 08:10	06-Jun-22 10:50
	Sample ID:	2224237-37	2224237-38	2224237-39	2224237-40
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	88.8	88.2	89.4	93.2
General Inorganics					
SAR	0.01 N/A	0.48	3.20	9.59	0.92
Conductivity	5 uS/cm	187	1360	764	1840
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	7.62	7.61	7.66	12.17
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	20.1	<1.0
Arsenic	1.0 ug/g dry	10.9	7.9	7.2	1.4
Barium	1.0 ug/g dry	98.0	68.3	202	433
Beryllium	0.5 ug/g dry	0.8	0.8	<0.5	<0.5
Boron	5.0 ug/g dry	16.1	16.0	11.6	6.8
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	2.8	<0.5
Chromium	5.0 ug/g dry	26.1	24.2	124	12.2
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	1.8	<0.2
Cobalt	1.0 ug/g dry	13.0	9.3	6.8	1.6
Copper	5.0 ug/g dry	20.9	18.0	114	6.0
Lead	1.0 ug/g dry	14.0	10.3	1550	9.8
Mercury	0.1 ug/g dry	<0.1	<0.1	0.1	<0.1
Molybdenum	1.0 ug/g dry	3.9	2.9	7.9	1.5
Nickel	5.0 ug/g dry	32.7	26.5	40.0	8.6
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	1.3	1.0	1.1	1.3
Vanadium	10.0 ug/g dry	39.0	35.3	28.5	12.9
Zinc	20.0 ug/g dry	59.8	53.7	557	37.5
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	107%	110%	101%	99.4%

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-DUPB	BH22-DUPC	BH22-DUPD	GR22-101
	Sample Date:	06-Jun-22 12:12	06-Jun-22 13:16	07-Jun-22 08:10	06-Jun-22 10:50
	Sample ID:	2224237-37	2224237-38	2224237-39	2224237-40
	MDL/Units	Soil	Soil	Soil	Soil
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<40 [1]	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	147	21
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	607 [2]	20
F4G PHCs (gravimetric)	50 ug/g dry	-	-	559	-

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	GR22-102	GR22-103	GR22-104	GR22-105
	Sample Date:	06-Jun-22 11:05	06-Jun-22 11:39	06-Jun-22 12:58	06-Jun-22 12:38
	Sample ID:	2224237-41	2224237-42	2224237-43	2224237-44
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	87.1	97.5	97.2	97.1
General Inorganics					
SAR	0.01 N/A	0.69	9.59	6.26	8.04
Conductivity	5 uS/cm	4170	1320	2160	1660
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	12.14	8.31	7.74	11.56
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	2.4	2.7	3.6	3.1
Barium	1.0 ug/g dry	176	196	153	102
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron	5.0 ug/g dry	7.1	20.2	10.8	5.6
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	14.3	<5.0	6.5	5.1
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	1.7	3.5	2.6	1.9
Copper	5.0 ug/g dry	6.2	18.6	12.9	9.9
Lead	1.0 ug/g dry	8.8	6.6	16.9	26.1
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	1.5	1.6	2.1	1.9
Nickel	5.0 ug/g dry	7.0	8.9	11.5	10.1
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	1.3	1.3	1.1	1.2
Vanadium	10.0 ug/g dry	13.0	14.5	21.8	16.0
Zinc	20.0 ug/g dry	27.1	<20.0	25.5	25.7
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	100%	97.0%	98.4%	99.3%

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	GR22-102	GR22-103	GR22-104	GR22-105
	Sample Date:	06-Jun-22 11:05	06-Jun-22 11:39	06-Jun-22 12:58	06-Jun-22 12:38
	Sample ID:	2224237-41	2224237-42	2224237-43	2224237-44
	MDL/Units	Soil	Soil	Soil	Soil
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<40 [1]	<40 [1]	<40 [1]
F3 PHCs (C16-C34)	8 ug/g dry	25	1330	719	806
F4 PHCs (C34-C50)	6 ug/g dry	26	4810 [2]	4980 [2]	5170 [2]
F4G PHCs (gravimetric)	50 ug/g dry	-	2340	3860	2600

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	GR22-106	GR22-107	GR22-DUP	BH22-102_2
	Sample Date:	06-Jun-22 13:07	07-Jun-22 10:08	06-Jun-22 10:50	07-Jun-22 10:46
	Sample ID:	2224237-45	2224237-46	2224237-47	2224237-48
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	88.8	91.3	92.7	86.9
General Inorganics					
SAR	0.01 N/A	20.9	10.4	0.97	6.19
Conductivity	5 uS/cm	3710	1970	1960	713
Cyanide, free	0.03 ug/g dry	<0.03	<0.03	<0.03	<0.03
pH	0.05 pH Units	11.34	11.30	12.17	8.73
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	5.4	4.5	1.3	7.9
Barium	1.0 ug/g dry	68.6	75.3	392	72.8
Beryllium	0.5 ug/g dry	0.6	<0.5	<0.5	0.6
Boron	5.0 ug/g dry	9.9	9.6	6.0	13.4
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	18.1	13.0	10.9	21.4
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	0.2	<0.2
Cobalt	1.0 ug/g dry	7.2	4.2	1.4	10.4
Copper	5.0 ug/g dry	12.0	12.7	<5.0	16.5
Lead	1.0 ug/g dry	8.0	7.8	3.4	9.3
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	1.1	1.1	1.5	2.5
Nickel	5.0 ug/g dry	14.9	10.8	8.1	25.0
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	1.2	<1.0
Vanadium	10.0 ug/g dry	28.8	21.5	11.9	32.3
Zinc	20.0 ug/g dry	55.0	47.4	33.0	59.6
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	99.4%	97.5%	110%	103%

Certificate of Analysis

Report Date: 16-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	GR22-106	GR22-107	GR22-DUP	BH22-102_2
	Sample Date:	06-Jun-22 13:07	07-Jun-22 10:08	06-Jun-22 10:50	07-Jun-22 10:46
	Sample ID:	2224237-45	2224237-46	2224237-47	2224237-48
	MDL/Units	Soil	Soil	Soil	Soil
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<40 [1]	<40 [1]	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<80 [1]	130	23	<8
F4 PHCs (C34-C50)	6 ug/g dry	203 [2]	1310 [2]	20	<6
F4G PHCs (gravimetric)	50 ug/g dry	439	1140	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
Cyanide, free	ND	0.03	ug/g						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron, available	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.06*		*ug/g*		*95.6*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	6.19	0.01	N/A	6.06			2.2	30	
Conductivity	1100	5	uS/cm	1100			0.4	5	
Cyanide, free	ND	0.03	ug/g	ND			NC	35	
pH	12.11	0.05	pH Units	12.14			0.2	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g	ND			NC	30	
F3 PHCs (C16-C34)	22	8	ug/g	25			15.7	30	
F4 PHCs (C34-C50)	21	6	ug/g	26			22.9	30	
F4G PHCs (gravimetric)	175	50	ug/g	175			0.0	30	
Metals									
Antimony	ND	1.0	ug/g	ND			NC	30	
Arsenic	11.3	1.0	ug/g	12.4			9.3	30	
Barium	79.5	1.0	ug/g	87.1			9.1	30	
Beryllium	0.8	0.5	ug/g	0.9			3.2	30	
Boron, available	0.53	0.5	ug/g	0.50			5.0	35	
Boron	9.5	5.0	ug/g	11.9			21.7	30	
Cadmium	ND	0.5	ug/g	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g	ND			NC	35	
Chromium	23.2	5.0	ug/g	26.0			11.1	30	
Cobalt	11.0	1.0	ug/g	11.9			8.3	30	
Copper	16.8	5.0	ug/g	18.3			8.3	30	
Lead	42.2	1.0	ug/g	33.3			23.6	30	
Mercury	ND	0.1	ug/g	ND			NC	30	
Molybdenum	2.1	1.0	ug/g	2.3			8.6	30	
Nickel	28.7	5.0	ug/g	31.6			9.9	30	
Selenium	ND	1.0	ug/g	ND			NC	30	
Silver	ND	0.3	ug/g	ND			NC	30	
Thallium	ND	1.0	ug/g	ND			NC	30	
Uranium	ND	1.0	ug/g	ND			NC	30	
Vanadium	86.3	10.0	ug/g	94.0			8.6	30	
Zinc	66.3	20.0	ug/g	71.9			8.0	30	
Physical Characteristics									
% Solids	84.5	0.1	% by Wt.	85.4			1.1	25	
Volatiles									
Benzene	ND	0.02	ug/g	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g	ND			NC	50	
Toluene	ND	0.05	ug/g	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g	ND			NC	50	
o-Xylene	ND	0.05	ug/g	ND			NC	50	
Surrogate: Toluene-d8	*4.16*		*ug/g*		*109*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Cyanide, free	0.204	0.03	ug/g	ND	58.0	50-150			
Hydrocarbons									
F1 PHCs (C6-C10)	185	7	ug/g	ND	92.5	80-120			
F2 PHCs (C10-C16)	104	4	ug/g	ND	113	60-140			
F3 PHCs (C16-C34)	231	8	ug/g	25	91.5	60-140			
F4 PHCs (C34-C50)	163	6	ug/g	26	96.3	60-140			
F4G PHCs (gravimetric)	890	50	ug/g	ND	89.0	80-120			
Metals									
Antimony	49.8	1.0	ug/g	ND	99.1	70-130			
Arsenic	55.1	1.0	ug/g	5.0	100	70-130			
Barium	90.8	1.0	ug/g	34.8	112	70-130			
Beryllium	52.5	0.5	ug/g	ND	104	70-130			
Boron, available	4.04	0.5	ug/g	ND	80.8	70-122			
Boron	59.3	5.0	ug/g	ND	109	70-130			
Cadmium	49.7	0.5	ug/g	ND	99.1	70-130			
Chromium (VI)	2.9	0.2	ug/g	ND	47.0	70-130			QM-05
Chromium	62.4	5.0	ug/g	10.4	104	70-130			
Cobalt	55.6	1.0	ug/g	4.8	102	70-130			
Copper	53.7	5.0	ug/g	7.3	92.7	70-130			
Lead	71.5	1.0	ug/g	13.3	116	70-130			
Mercury	1.70	0.1	ug/g	ND	113	70-130			
Molybdenum	53.6	1.0	ug/g	ND	105	70-130			
Nickel	61.7	5.0	ug/g	12.7	98.1	70-130			
Selenium	48.9	1.0	ug/g	ND	97.2	70-130			
Silver	40.2	0.3	ug/g	ND	80.4	70-130			
Thallium	57.1	1.0	ug/g	ND	114	70-130			
Uranium	55.4	1.0	ug/g	ND	110	70-130			
Vanadium	92.1	10.0	ug/g	37.6	109	70-130			
Zinc	72.9	20.0	ug/g	28.7	88.4	70-130			
Volatiles									
Benzene	3.36	0.02	ug/g	ND	84.0	60-130			
Ethylbenzene	4.18	0.05	ug/g	ND	104	60-130			
Toluene	4.57	0.05	ug/g	ND	114	60-130			
m,p-Xylenes	9.06	0.05	ug/g	ND	113	60-130			
o-Xylene	4.70	0.05	ug/g	ND	117	60-130			
Surrogate: Toluene-d8	*3.28*		*ug/g*		*102*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

1 : Elevated detection limits due to the nature of the sample matrix.

2 : GC-FID signal did not return to baseline by C50

3 : Some peak(s) in the GC-FID Chromatogram are not typical of petroleum hydrocarbon distillates. May be the result of high concentrations of non-mineral based compounds not completely removed by the method cleanup. Results may be biased high.

QC Qualifiers :

QM-05 : The spike recovery was outside acceptance limits for the matrix spike due to matrix interference.

QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD. | TRU RES REL

Paracel ID: 2224237

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name: Dillon Consulting Limited	Project Ref: Howard South Cameron	Page 4 of 5
Contact Name: Matthew Antaya	Quote #: 22-522	
Address: 3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #: 20-3864	Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 519-992-7270	E-mail: mantaya@dillon.ca	Date Required:

☐ REG 153/04 ☒ REG 406/19

☒ Table 1 ☒ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ___
For RSC: ☐ Yes ☐ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ___ ☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Required Analysis: Inorganics	Metals	BTEX	PHCs F1 to F4								
1	BH22-117_2	S		3	7-June-22	9:26 am	✔	✔	✔	✔								
2	BH22-118_1	S		3	7-June-22	10:14 am	✔	✔	✔	✔								
3	BH22-118_2	S		3	7-June-22	10:19am	✔	✔	✔	✔								
4	BH22-119_1	S		3	7-June-22	8:48 am	✔	✔	✔	✔								
5	BH22-120_1	S		3	6-June-22	8:27 am	✔	✔	✔	✔								
6	BH22-DUPA	S		3	6-June-22	10:48 am	✔	✔	✔	✔								
7	BH22-DUPB	S		3	6-June-22	12:12 am	✔	✔	✔	✔								
8	BH22-DUPC	S		3	6-June-22	1:16 pm	✔	✔	✔	✔								
9	BH22-DUPD	S		3	7-June-22	8:10 am	✔	✔	✔	✔								
10	GR22-101	S		3	6-June-22	10:50 am	✔	✔	✔	✔								

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: Pick UP

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 8, 2022/ 10.2	Temperature: 7.2 °C	Temperature: 12.1	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

TRI
RE:
RE

Paracel ID: 2224237

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name: Dillon Consulting Limited	Project Ref: Howard South Cameron	Page 5 of 5
Contact Name: Matthew Antaya	Quote #: 22-522	**Turnaround Time**
Address: 3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #: 20-3864	☐ 1 day ☐ 3 day
Telephone: 519-992-7270	E-mail: mantaya@dillon.ca	☐ 2 day ☒ Regular
		Date Required:

☐ REG 153/04 ☒ REG 406/19

☒ Table 1 ☒ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ___
For RSC: ☐ Yes ☐ No

Other Regulation

☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun: ___
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Inorganics	Metals	BTEX	PHCs F1 to F4
1	GR22-102	S		3	6-June-22	11:05 am	✔	✔	✔	✔
2	GR22-103	S		3	6-June-22	11:39 am	✔	✔	✔	✔
3	GR22-104	S		3	6-June-22	12:58 pm	✔	✔	✔	✔
4	GR22-105	S		3	6-June-22	12:38 pm	✔	✔	✔	✔
5	GR22-106	S		3	6-June-22	1:07 pm	✔	✔	✔	✔
6	GR22-107	S		3	7-June-22	10:08 am	✔	✔	✔	✔
7	GR22-DUP	S		3	6-June-22	10:50	✔	✔	✔	✔
8	BH22-102_2	S		3	7-June-22	10:46 am	✔	✔	✔	✔
9										
10										

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: PICK UP

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 8,2022/ 10:30am	Temperature: 7.2 °C	Temperature: 10.8	pH Verified: ☐ By:

PARACEL LABORATORIES LTD. | TR RE RE

Paracel ID: 2224237

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name: Dillon Consulting Limited	Project Ref: Howard South Cameron	Page 1 of 5
Contact Name: Matthew Antaya	Quote #: 22-522	
Address: 3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #: 20-3864	Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 519-992-7270	E-mail: mantaya@dillon.ca	Date Required:

☐ REG 153/04 ☒ REG 406/19

☒ Table 1 ☒ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ___
For RSC: ☐ Yes ☐ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm
Mun: ___
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Inorganics	Metals	BTEX	PHCs F1 to F4								
1	BH22-101_1	S		3	7-June-22	11:01 am	✔	✔	✔	✔								
2	BH22-101_2	S		3	7-June-22	11:06 am	✔	✔	✔	✔								
3	BH22-102_1	S		3	7-June-22	10:40 am	✔	✔	✔	✔								
4	BH22-102_B	S		3	7-June-22	10:35 am	✔	✔	✔	✔								
5	BH22-103_1	S		3	7-June-22	8:10 am	✔	✔	✔	✔								
6	BH22-104_1	S		3	6-June-22	1:03 pm	✔	✔	✔	✔								
7	BH22-104_2	S		3	6-June-22	1:08 pm	✔	✔	✔	✔								
8	BH22-105_1	S		3	6-June-22	12:42 pm	✔	✔	✔	✔								
9	BH22-105_2	S		3	6-June-22	12:47 pm	✔	✔	✔	✔								
10	BH22-106_1	S		3	6-June-22	12:12 pm	✔	✔	✔	✔								

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled incorrectly. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: Pick up

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:28	Date/Time: June 8/22 13:30
Date/Time: June 8 ,2022/ 10:30 am	Temperature: 7.2 °C	Temperature: 10.8	pH Verified: ☐ By:

PARACEL LABORATORIES LTD. | TRU RES REL

Paracel ID: 2224237

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name: Dillon Consulting Limited	Project Ref: Howard South Cameron	Page 2 of 5
Contact Name: Matthew Antaya	Quote #: 22-522	
Address: 3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #: 20-3864	Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 519-992-7270	E-mail: mantaya@dillon.ca	Date Required:

☐ REG 153/04 ☒ REG 406/19

☒ Table 1 ☒ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ___
For RSC: ☐ Yes ☐ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm
Mun: ___
☐ Other:

Matrix Type: **S** (Soil/Sed.) **GW** (Ground Water) **SW** (Surface Water) **SS** (Storm/Sanitary Sewer) **P** (Paint) **A** (Air) **O** (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analysis: Inorganics	Metals	BTEX	PHCs F1 to F4
1	BH22-106_2	S		3	6-June-22	12:12 pm	✔	✔	✔	✔
2	BH22-107_1	S		3	6-June-22	11:08 am	✔	✔	✔	✔
3	BH22-107_2	S		3	6-June-22	11:12 am	✔	✔	✔	✔
4	BH22-108_1	S		3	7-June-22	10:42 am	✔	✔	✔	✔
5	BH22-108_2	S		3	7-June-22	10:48 am	✔	✔	✔	✔
6	BH22-109_1	S		3	6-June-22	11:44 am	✔	✔	✔	✔
7	BH22-109_2	S		3	6-June-22	11:44 am	✔	✔	✔	✔
8	BH22-110_1	S		3	6-June-22	8:08 am	✔	✔	✔	✔
9	BH22-111_1	S		3	6-June-22	8:15 am	✔	✔	✔	✔
10	BH22-112_1	S		3	7-June-22	11:41 am	✔	✔	✔	✔

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: Pick up

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 8, 2022/ 16:30	Temperature: 7.2 °C	Temperature: 10.8	pH Verified: ☐ By:

PARACEL LABORATORIES LTD. | TRU RES REL

Paracel ID: 2224237

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name: Dillon Consulting Limited	Project Ref: Howard South Cameron	Page 3 of 5	
Contact Name: Matthew Antaya	Quote #: 22-522		
Address: 3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #: 20-3864	Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular	
Telephone: 519-992-7270	E-mail: mantaya@dillon.ca	Date Required:	

☐ REG 153/04 ☒ REG 406/19

☒ Table 1 ☒ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ___
For RSC: ☐ Yes ☐ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Required Analysis: Inorganics	Metals	BTEX	PHCs F1 to F4								
1	BH22-112_2	S		3	7-June-22	11:41 am	✔	✔	✔	✔								
2	BH22-113_1	S		3	6-June-22	1:11 pm	✔	✔	✔	✔								
3	BH22-113_2	S		3	6-June-22	1:16 pm	✔	✔	✔	✔								
4	BH22-114_1	S		3	6-June-22	3:54 pm	✔	✔	✔	✔								
5	BH22-114_2	S		3	6-June-22	4:07 pm	✔	✔	✔	✔								
6	BH22-115_1	S		3	7-June-22	11:29 am	✔	✔	✔	✔								
7	BH22-115_2	S		3	7-June-22	11:32 am	✔	✔	✔	✔								
8	BH22-116_1	S		3	6-June-22	4:44 pm	✔	✔	✔	✔								
9	BH22-116_2	S		3	6-June-22	4:52 pm	✔	✔	✔	✔								
10	BH22-117_1	S		3	7-June-22	9:22 am	✔	✔	✔	✔								

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: Pick UP

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 8,2022/ 10:30am	Temperature: 7.2 °C	Temperature: 0.8	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

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351 Nash Road North, unit 9B
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1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Dillon Consulting Ltd (Windsor)

3200 Deziel Drive Suite 608
Windsor, ON N8W 5K8
Attn: Matthew Antaya

Client PO: 20-3864
Project: Howard South Cameron
Custody:

Report Date: 23-Jun-2022
Order Date: 8-Jun-2022

Order #: 2226005

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2226005-01	BH22-102_B
2226005-02	BH22-103_1
2226005-03	BH22-109_1
2226005-04	BH22-110_1
2226005-05	BH22-111_1
2226005-06	BH22-120_1
2226005-07	GR22-106

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Client: Dillon Consulting Ltd (Windsor)

Client PO: 20-3864

Report Date: 23-Jun-2022

Order Date: 8-Jun-2022

Project Description: Howard South Cameron

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 406: Metals, leachate	mSPLP EPA 6020 - Digestion - ICP-MS	23-Jun-22	23-Jun-22

Certificate of Analysis

Report Date: 23-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-102_B	BH22-103_1	BH22-109_1	BH22-110_1
	Sample Date:	07-Jun-22 10:35	07-Jun-22 08:10	06-Jun-22 11:44	06-Jun-22 08:08
	Sample ID:	2226005-01	2226005-02	2226005-03	2226005-04
	MDL/Units	Soil	Soil	Soil	Soil
mSPLP Leachate Metals					
Antimony	0.5 ug/L	0.6	3.3	<0.5	1.1
Arsenic	1.0 ug/L	3.3	1.5	3.6	2.5
Barium	1.0 ug/L	52.3	33.1	253	71.8
Beryllium	0.5 ug/L	<0.5	<0.5	0.9	<0.5
Boron	10.0 ug/L	22.2	13.6	23.3	22.4
Cadmium	0.2 ug/L	<0.2	0.2	<0.2	0.2
Chromium	1.0 ug/L	7.3	81.6	2.8	9.9
Cobalt	0.5 ug/L	1.1	0.7	4.0	1.0
Copper	0.5 ug/L	12.1	26.0	10.7	53.3
Lead	0.2 ug/L	23.4	225	16.1	18.3
Molybdenum	0.5 ug/L	1.6	1.7	4.5	3.3
Nickel	1.0 ug/L	5.2	6.5	5.2	6.0
Selenium	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Silver	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Thallium	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Uranium	0.2 ug/L	0.2	<0.2	0.9	0.3
Vanadium	0.5 ug/L	11.2	4.5	17.8	7.4
Zinc	5.0 ug/L	59.7	134	16.5	122

Certificate of Analysis

Report Date: 23-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-111_1	BH22-120_1	GR22-106	-
	Sample Date:	06-Jun-22 08:15	06-Jun-22 08:27	06-Jun-22 13:07	-
	Sample ID:	2226005-05	2226005-06	2226005-07	-
	MDL/Units	Soil	Soil	Soil	-
mSPLP Leachate Metals					
Antimony	0.5 ug/L	0.8	0.9	<0.5	-
Arsenic	1.0 ug/L	3.5	3.8	1.2	-
Barium	1.0 ug/L	105	136	13.9	-
Beryllium	0.5 ug/L	<0.5	<0.5	<0.5	-
Boron	10.0 ug/L	30.8	22.5	20.3	-
Cadmium	0.2 ug/L	0.2	0.6	<0.2	-
Chromium	1.0 ug/L	5.7	10.2	1.8	-
Cobalt	0.5 ug/L	0.7	0.8	<0.5	-
Copper	0.5 ug/L	27.4	28.6	7.1	-
Lead	0.2 ug/L	9.8	47.4	<0.2	-
Molybdenum	0.5 ug/L	2.5	2.4	5.3	-
Nickel	1.0 ug/L	4.9	5.7	3.2	-
Selenium	1.0 ug/L	1.2	<1.0	2.0	-
Silver	0.2 ug/L	<0.2	<0.2	<0.2	-
Thallium	0.5 ug/L	<0.5	<0.5	<0.5	-
Uranium	0.2 ug/L	0.6	0.5	<0.2	-
Vanadium	0.5 ug/L	10.7	9.2	5.8	-
Zinc	5.0 ug/L	46.4	83.6	<5.0	-

Certificate of Analysis

Report Date: 23-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
mSPLP Leachate Metals									
Antimony	ND	0.5	ug/L						
Arsenic	ND	1.0	ug/L						
Barium	ND	1.0	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10.0	ug/L						
Cadmium	ND	0.2	ug/L						
Chromium	ND	1.0	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.2	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1.0	ug/L						
Selenium	ND	1.0	ug/L						
Silver	ND	0.2	ug/L						
Thallium	ND	0.5	ug/L						
Uranium	ND	0.2	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5.0	ug/L						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
mSPLP Leachate Metals									
Antimony	0.83	0.5	ug/L	0.63			27.1	50	
Arsenic	3.31	1.0	ug/L	3.34			1.2	50	
Barium	60.4	1.0	ug/L	52.3			14.4	50	
Beryllium	ND	0.5	ug/L	ND			NC	50	
Boron	31.4	10.0	ug/L	22.2			34.4	50	
Cadmium	ND	0.2	ug/L	ND			NC	50	
Chromium	9.40	1.0	ug/L	7.29			25.3	50	
Cobalt	0.95	0.5	ug/L	1.09			13.2	50	
Copper	11.7	0.5	ug/L	12.1			2.9	50	
Lead	23.1	0.2	ug/L	23.4			1.3	50	
Molybdenum	1.54	0.5	ug/L	1.56			1.3	50	
Nickel	4.58	1.0	ug/L	5.19			12.5	50	
Selenium	ND	1.0	ug/L	ND			NC	50	
Silver	ND	0.2	ug/L	ND			NC	50	
Thallium	ND	0.5	ug/L	ND			NC	50	
Uranium	0.28	0.2	ug/L	0.20			33.7	50	
Vanadium	17.2	0.5	ug/L	11.2			41.9	50	
Zinc	53.7	5.0	ug/L	59.7			10.6	50	

Certificate of Analysis

Client: Dillon Consulting Ltd (Windsor)

Client PO: 20-3864

Report Date: 23-Jun-2022

Order Date: 8-Jun-2022

Project Description: Howard South Cameron

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
mSPLP Leachate Metals									
Antimony	41.2	0.5	ug/L	0.63	81.1	70-130			
Arsenic	52.5	1.0	ug/L	3.34	98.4	70-130			
Barium	93.6	1.0	ug/L	52.3	82.6	70-130			
Beryllium	47.5	0.5	ug/L	ND	94.5	70-130			
Boron	73.3	10.0	ug/L	22.2	102	70-130			
Cadmium	45.6	0.2	ug/L	ND	90.9	70-130			
Chromium	54.8	1.0	ug/L	7.29	95.0	70-130			
Cobalt	48.2	0.5	ug/L	1.09	94.2	70-130			
Copper	56.0	0.5	ug/L	12.1	87.9	70-130			
Lead	66.0	0.2	ug/L	23.4	85.1	70-130			
Molybdenum	49.6	0.5	ug/L	1.56	96.0	70-130			
Nickel	51.2	1.0	ug/L	5.19	92.1	70-130			
Selenium	48.3	1.0	ug/L	ND	95.5	70-130			
Silver	44.1	0.2	ug/L	ND	88.2	70-130			
Thallium	43.9	0.5	ug/L	ND	87.7	70-130			
Uranium	46.8	0.2	ug/L	0.20	93.1	70-130			
Vanadium	58.6	0.5	ug/L	11.2	94.8	70-130			
Zinc	96.7	5.0	ug/L	59.7	73.9	70-130			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

PARACEL LABORATORIES LTD | TR RE RE

Paracel ID: 2226005

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name: Dillon Consulting Limited	Project Ref: Howard South Cameron	Page 1 of 5
Contact Name: Matthew Antaya	Quote #: 22-522	
Address: 3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #: 20-3864	Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 519-992-7270	E-mail: mantaya@dillon.ca	Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ Other:

☒ Table 1 ☒ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table

For RSC: ☐ Yes ☐ No

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Required Analysis: Inorganics	Metals	BTEX	PHCs F1 to F4
1	BH22-101_1	S		3	7-June-22	11:01 am	✔	✔	✔	✔
2	BH22-101_2	S		3	7-June-22	11:06 am	✔	✔	✔	✔
3	BH22-102_1	S		3	7-June-22	10:40 am	✔	✔	✔	✔
4	BH22-102_B	S		3	7-June-22	10:35 am	✔	✔	✔	✔
5	BH22-103_1	S		3	7-June-22	8:10 am	✔	✔	✔	✔
6	BH22-104_1	S		3	6-June-22	1:03 pm	✔	✔	✔	✔
7	BH22-104_2	S		3	6-June-22	1:08 pm	✔	✔	✔	✔
8	BH22-105_1	S		3	6-June-22	12:42 pm	✔	✔	✔	✔
9	BH22-105_2	S		3	6-June-22	12:47 pm	✔	✔	✔	✔
10	BH22-106_1	S		3	6-June-22	12:12 pm	✔	✔	✔	✔

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled incorrectly. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: Pick up

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:28	Date/Time: June 8/22 13:30
Date/Time: June 2 ,2022 10:30 am	Temperature: 7.2 °C	Temperature: 10.8	pH Verified: ☐ By:

Chain of Custody (Blank).xlsx

Revision 4.0

PARACEL LABORATORIES LTD. | TR RE RE

Paracel ID: 2226005

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name: Dillon Consulting Limited	Project Ref: Howard South Cameron	Page 2 of 5
Contact Name: Matthew Antaya	Quote #: 22-522	
Address: 3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #: 20-3864	Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 519-992-7270	E-mail: mantaya@dillon.ca	Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ Other:

☒ Table 1 ☒ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table

For RSC: ☐ Yes ☐ No

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analysis: Inorganics	Metals	BTEX	PHCs F1 to F4
1	BH22-106_2	S		3	6-June-22	12:12 pm	✔	✔	✔	✔
2	BH22-107_1	S		3	6-June-22	11:08 am	✔	✔	✔	✔
3	BH22-107_2	S		3	6-June-22	11:12 am	✔	✔	✔	✔
4	BH22-108_1	S		3	7-June-22	10:42 am	✔	✔	✔	✔
5	BH22-108_2	S		3	7-June-22	10:48 am	✔	✔	✔	✔
6	BH22-109_1	S		3	6-June-22	11:44 am	✔	✔	✔	✔
7	BH22-109_2	S		3	6-June-22	11:44 am	✔	✔	✔	✔
8	BH22-110_1	S		3	6-June-22	8:08 am	✔	✔	✔	✔
9	BH22-111_1	S		3	6-June-22	8:15 am	✔	✔	✔	✔
10	BH22-112_1	S		3	7-June-22	11:41 am	✔	✔	✔	✔

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: Pick up

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 8, 2022/ 16:50	Temperature: 7.2 °C	Temperature: 10.8	pH Verified: ☐ By:

Chain of Custody (Blank).xlsx

Revision 4.0

Paracel ID: 2226005

PARACEL | T R R

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name: Dillon Consulting Limited	Project Ref: Howard South Cameron	Page 3 of 5
Contact Name: Matthew Antaya	Quote #: 22-522	
Address: 3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #: 20-3864	Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 519-992-7270	E-mail: mantaya@dillon.ca	Date Required:

☐ REG 153/04 ☒ REG 406/19

☒ Table 1 ☒ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table
For RSC: ☐ Yes ☐ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Required Analysis: Inorganics	Metals	BTEX	PHCs F1 to F4
1	BH22-112_2	S		3	7-June-22	11:41 am	✔	✔	✔	✔
2	BH22-113_1	S		3	6-June-22	1:11 pm	✔	✔	✔	✔
3	BH22-113_2	S		3	6-June-22	1:16 pm	✔	✔	✔	✔
4	BH22-114_1	S		3	6-June-22	3:54 pm	✔	✔	✔	✔
5	BH22-114_2	S		3	6-June-22	4:07 pm	✔	✔	✔	✔
6	BH22-115_1	S		3	7-June-22	11:29 am	✔	✔	✔	✔
7	BH22-115_2	S		3	7-June-22	11:32 am	✔	✔	✔	✔
8	BH22-116_1	S		3	6-June-22	4:44 pm	✔	✔	✔	✔
9	BH22-116_2	S		3	6-June-22	4:52 pm	✔	✔	✔	✔
10	BH22-117_1	S		3	7-June-22	9:22 am	✔	✔	✔	✔

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Method of Delivery: Pick up
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:25	Verified By: K. Jakobsen
Date/Time: June 8,2022/ 10:30am	Temperature: 7.2 °C	Temperature: 0.8	Date/Time: June 8/22 13:30
			pH Verified: ☐ By:

Chain of Custody (Blank).xlsx

Revision 4.0

PARACEL LABORATORIES LTD.

Paracel ID: 2226005

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name: Dillon Consulting Limited	Project Ref: Howard South Cameron
Contact Name: Matthew Antaya	Quote #: 22-522
Address: 3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #: 20-3864
Telephone: 519-992-7270	E-mail: mantaya@dillon.ca

Page 4 of 5

Turnaround Time

☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular

Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation

☒ Table 1 ☒ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table

For RSC: ☐ Yes ☐ No

☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm

Mun:

☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analysis: Inorganics	Metals	BTEX	PHCs F1 to F4
1	BH22-117_2	S		3	7-June-22	9:26 am	✔	✔	✔	✔
2	BH22-118_1	S		3	7-June-22	10:14 am	✔	✔	✔	✔
3	BH22-118_2	S		3	7-June-22	10:19am	✔	✔	✔	✔
4	BH22-119_1	S		3	7-June-22	8:48 am	✔	✔	✔	✔
5	BH22-120_1	S		3	6-June-22	8:27 am	✔	✔	✔	✔
6	BH22-DUPA	S		3	6-June-22	10:48 am	✔	✔	✔	✔
7	BH22-DUPB	S		3	6-June-22	12:12 am	✔	✔	✔	✔
8	BH22-DUPC	S		3	6-June-22	1:16 pm	✔	✔	✔	✔
9	BH22-DUPD	S		3	7-June-22	8:10 am	✔	✔	✔	✔
10	GR22-101	S		3	6-June-22	10:50 am	✔	✔	✔	✔

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: Pick UP

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 8, 2022 10:24	Temperature: 7.2 °C	Temperature: 12°	pH Verified: ☐ By:

Chain of Custody (Blank).xlsx

Revision 4.0

Paracel ID: 2226005

PARACEL LABORATORIES LTD.

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name: Dillon Consulting Limited	Project Ref: Howard South Cameron	Page 5 of 5
Contact Name: Matthew Antaya	Quote #: 22-522	
Address: 3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #: 20-3864	Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 519-992-7270	E-mail: mantaya@dillon.ca	Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ Other:

☒ Table 1 ☒ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table

For RSC: ☐ Yes ☐ No

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Required Analysis: Inorganics	Metals	BTEX	PHCs F1 to F4
1	GR22-102	S		3	6-June-22	11:05 am	✓	✓	✓	✓
2	GR22-103	S		3	6-June-22	11:39 am	✓	✓	✓	✓
3	GR22-104	S		3	6-June-22	12:58 pm	✓	✓	✓	✓
4	GR22-105	S		3	6-June-22	12:38 pm	✓	✓	✓	✓
5	GR22-106	S		3	6-June-22	1:07 pm	✓	✓	✓	✓
6	GR22-107	S		3	7-June-22	10:08 am	✓	✓	✓	✓
7	GR22-DUP	S		3	6-June-22	10:50	✓	✓	✓	✓
8	BH22-102_2	S		3	7-June-22	10:46 am	✓	✓	✓	✓
9										
10										

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: PICK UP

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:20	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 8,2022 10:30	Temperature: 7.2 °C	Temperature: 10.8	pH Verified: ☐ By:

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Revision 4.0

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www.paracellabs.com

Certificate of Analysis

Dillon Consulting Ltd (Windsor)

3200 Deziel Drive Suite 608
Windsor, ON N8W 5K8
Attn: Matthew Antaya

Client PO: 20-3864
Project: Howard South Cameron
Custody:

Report Date: 29-Jun-2022
Order Date: 8-Jun-2022

Order #: 2226006

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2226006-01	BH22-103_1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 29-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Ignitability	based on EPA 1030	22-Jun-22	22-Jun-22
Metals, ICP-MS	TCLP EPA 6020 - Digestion - ICP-MS	22-Jun-22	22-Jun-22
REG 558 - Benzene	TCLP ZHE EPA 624 - P&T GC-MS	22-Jun-22	22-Jun-22
REG 558 - Cyanide	TCLP MOE E3015- Auto Colour	22-Jun-22	22-Jun-22
REG 558 - Fluoride	TCLP EPA 340.2 - ISE	22-Jun-22	22-Jun-22
REG 558 - Mercury by CVAA	TCLP EPA 7470A, CVAA	22-Jun-22	23-Jun-22
REG 558 - NO3/NO2	TCLP EPA 300.1 - IC	23-Jun-22	23-Jun-22
REG 558 - PAHs	TCLP EPA 625 - GC-MS	27-Jun-22	28-Jun-22
Solids, %	Gravimetric, calculation	22-Jun-22	22-Jun-22

Certificate of Analysis

Report Date: 29-Jun-2022

Client: Dillon Consulting Ltd (Windsor)

Order Date: 8-Jun-2022

Client PO: 20-3864

Project Description: Howard South Cameron

	Client ID:	BH22-103_1	-	-	-
	Sample Date:	07-Jun-22 08:10	-	-	-
	Sample ID:	2226006-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	88.0	-	-	-
Ignitability	N/A	Negative [1]	-	-	-
EPA 1311 - TCLP Leachate Inorganics					
Fluoride	0.05 mg/L	0.24	-	-	-
Nitrate as N	1 mg/L	<1	-	-	-
Nitrite as N	1 mg/L	<1	-	-	-
Cyanide, free	0.02 mg/L	<0.02	-	-	-
EPA 1311 - TCLP Leachate Metals					
Arsenic	0.05 mg/L	<0.05	-	-	-
Barium	0.05 mg/L	0.87	-	-	-
Boron	0.05 mg/L	<0.05	-	-	-
Cadmium	0.01 mg/L	<0.01	-	-	-
Chromium	0.05 mg/L	<0.05	-	-	-
Lead	0.05 mg/L	0.21	-	-	-
Mercury	0.005 mg/L	<0.005	-	-	-
Selenium	0.05 mg/L	<0.05	-	-	-
Silver	0.05 mg/L	<0.05	-	-	-
Uranium	0.05 mg/L	<0.05	-	-	-
EPA 1311 - TCLP Leachate Volatiles					
Benzene	0.005 mg/L	<0.005	-	-	-
Toluene-d8	Surrogate	103%	-	-	-
EPA 1311 - TCLP Leachate Organics					
Benzo [a] pyrene	0.0001 mg/L	<0.0001	-	-	-
Terphenyl-d14	Surrogate	125%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Inorganics									
Fluoride	ND	0.05	mg/L						
Nitrate as N	ND	1	mg/L						
Nitrite as N	ND	1	mg/L						
Cyanide, free	ND	0.02	mg/L						
EPA 1311 - TCLP Leachate Metals									
Arsenic	ND	0.05	mg/L						
Barium	ND	0.05	mg/L						
Boron	ND	0.05	mg/L						
Cadmium	ND	0.01	mg/L						
Chromium	ND	0.05	mg/L						
Lead	ND	0.05	mg/L						
Mercury	ND	0.005	mg/L						
Selenium	ND	0.05	mg/L						
Silver	ND	0.05	mg/L						
Uranium	ND	0.05	mg/L						
EPA 1311 - TCLP Leachate Organics									
Benzo [a] pyrene	ND	0.0001	mg/L						
Surrogate: Terphenyl-d14	*0.22*		*mg/L*		*111*	*37-156*			
EPA 1311 - TCLP Leachate Volatiles									
Benzene	ND	0.005	mg/L						
Surrogate: Toluene-d8	*0.785*		*mg/L*		*114*	*76-118*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Inorganics									
Fluoride	0.09	0.05	mg/L	0.09			0.1	20	
Nitrate as N	ND	1	mg/L	ND			NC	20	
Nitrite as N	ND	1	mg/L	ND			NC	20	
Cyanide, free	ND	0.02	mg/L	ND			NC	20	
EPA 1311 - TCLP Leachate Metals									
Arsenic	ND	0.05	mg/L	ND			NC	29	
Barium	0.955	0.05	mg/L	0.985			3.1	34	
Boron	0.072	0.05	mg/L	0.069			3.7	33	
Cadmium	ND	0.01	mg/L	ND			NC	33	
Chromium	ND	0.05	mg/L	ND			NC	32	
Lead	ND	0.05	mg/L	ND			NC	32	
Mercury	ND	0.005	mg/L	ND			NC	30	
Selenium	ND	0.05	mg/L	ND			NC	28	
Silver	ND	0.05	mg/L	ND			NC	28	
Uranium	ND	0.05	mg/L	ND			NC	27	
EPA 1311 - TCLP Leachate Organics									
Benzo [a] pyrene	ND	0.0001	mg/L	ND			NC	50	
Surrogate: Terphenyl-d14	*0.24*		*mg/L*		*122*	*37-156*			
EPA 1311 - TCLP Leachate Volatiles									
Benzene	ND	0.005	mg/L	ND			NC	25	
Surrogate: Toluene-d8	*0.768*		*mg/L*		*112*	*76-118*			
Physical Characteristics									
% Solids	76.0	0.1	% by Wt.	75.6			0.5	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
EPA 1311 - TCLP Leachate Inorganics									
Fluoride	0.64	0.05	mg/L	0.09	109	70-130			
Nitrate as N	10	1	mg/L	ND	95.6	70-130			
Nitrite as N	9	1	mg/L	ND	93.6	80-120			
Cyanide, free	0.046	0.02	mg/L	ND	92.8	52-148			
EPA 1311 - TCLP Leachate Metals									
Arsenic	55.2	0.05	mg/L	0.084	110	83-119			
Barium	156	0.05	mg/L	98.5	115	80-120			
Boron	60.4	0.05	mg/L	6.90	107	71-128			
Cadmium	50.3	0.01	mg/L	0.089	101	78-119			
Chromium	61.8	0.05	mg/L	0.180	123	80-124			
Lead	56.3	0.05	mg/L	0.069	112	77-126			
Mercury	0.0398	0.005	mg/L	ND	133	70-130			QM-07
Selenium	50.1	0.05	mg/L	0.169	99.8	75-125			
Silver	50.0	0.05	mg/L	ND	100	70-128			
Uranium	62.2	0.05	mg/L	0.086	124	70-131			
EPA 1311 - TCLP Leachate Organics									
Benzo [a] pyrene	0.0462	0.0001	mg/L	ND	92.4	39-123			
Surrogate: Terphenyl-d14	*0.22*		*mg/L*		*108*	*37-156*			
EPA 1311 - TCLP Leachate Volatiles									
Benzene	0.355	0.005	mg/L	ND	103	55-141			
Surrogate: Toluene-d8	*0.638*		*mg/L*		*92.7*	*76-118*			

Qualifier Notes:

Sample Qualifiers :

1 : Holding time had been exceeded upon receipt of the sample at the laboratory or prior to the analysis being requested.

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

PARACEL LABORATORIES LTD. | T R R

Paracel ID: 2226006

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name:	Dillon Consulting Limited	Project Ref:	Howard South Cameron
Contact Name:	Matthew Antaya	Quote #:	22-522
Address:	3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #:	20-3864
Telephone:	519-992-7270	E-mail:	mantaya@dillon.ca

Page 1 of 5

Turnaround Time

☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular

Date Required: _____

☐ REG 153/04 ☒ REG 406/19

☒ Table 1 ☒ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table ____

For RSC: ☐ Yes ☐ No

Other Regulation

☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm

Mun: _____

☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Inorganics	Metals	BTEX	PHCs F1 to F4								
1	BH22-101_1	S		3	7-June-22	11:01 am	✔	✔	✔	✔								
2	BH22-101_2	S		3	7-June-22	11:06 am	✔	✔	✔	✔								
3	BH22-102_1	S		3	7-June-22	10:40 am	✔	✔	✔	✔								
4	BH22-102_B	S		3	7-June-22	10:35 am	✔	✔	✔	✔								
5	BH22-103_1	S		3	7-June-22	8:10 am	✔	✔	✔	✔								
6	BH22-104_1	S		3	6-June-22	1:03 pm	✔	✔	✔	✔								
7	BH22-104_2	S		3	6-June-22	1:08 pm	✔	✔	✔	✔								
8	BH22-105_1	S		3	6-June-22	12:42 pm	✔	✔	✔	✔								
9	BH22-105_2	S		3	6-June-22	12:47 pm	✔	✔	✔	✔								
10	BH22-106_1	S		3	6-June-22	12:12 pm	✔	✔	✔	✔								

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled incorrectly. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: Pick up

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 2 2022/ 10:30 am	Temperature: 7.2 °C	Temperature: 10.8	pH Verified: ☐ By:

Chain of Custody (Blank).xlsx

Revision 4.0

Paracel ID: 2226006

PARACEL LABORATORIES LTD. | TRI RE RE

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name:	Dillon Consulting Limited	Project Ref:	Howard South Cameron
Contact Name:	Matthew Antaya	Quote #:	22-522
Address:	3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #:	20-3864
Telephone:	519-992-7270	E-mail:	mantaya@dillon.ca

Page 2 of 5

Turnaround Time

☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular

Date Required:

☐ REG 153/04 ☒ REG 406/19

☒ Table 1 ☒ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table

For RSC: ☐ Yes ☐ No

Other Regulation

☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm

Mun:

☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Inorganics	Metals	BTEX	PHCs F1 to F4								
1	BH22-106_2	S		3	6-June-22	12:12 pm	✔	✔	✔	✔								
2	BH22-107_1	S		3	6-June-22	11:08 am	✔	✔	✔	✔								
3	BH22-107_2	S		3	6-June-22	11:12 am	✔	✔	✔	✔								
4	BH22-108_1	S		3	7-June-22	10:42 am	✔	✔	✔	✔								
5	BH22-108_2	S		3	7-June-22	10:48 am	✔	✔	✔	✔								
6	BH22-109_1	S		3	6-June-22	11:44 am	✔	✔	✔	✔								
7	BH22-109_2	S		3	6-June-22	11:44 am	✔	✔	✔	✔								
8	BH22-110_1	S		3	6-June-22	8:08 am	✔	✔	✔	✔								
9	BH22-111_1	S		3	6-June-22	8:15 am	✔	✔	✔	✔								
10	BH22-112_1	S		3	7-June-22	11:41 am	✔	✔	✔	✔								

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: Pick up

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 8,2022/ 16:30	Temperature: 7.2 °C	Temperature: 10.8	pH Verified: ☐ By:

Chain of Custody (Blank).xlsx

Revision 4.0

PARACEL LABORATORIES LTD. | TRR

Paracel ID: 2226006

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name: Dillon Consulting Limited	Project Ref: Howard South Cameron		Page 3 of 5
Contact Name: Matthew Antaya	Quote #: 22-522		
Address: 3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #: 20-3864		Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 519-992-7270	E-mail: mantaya@dillon.ca		Date Required:

☐ REG 153/04 ☒ REG 406/19

☒ Table 1 ☒ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table

For RSC: ☐ Yes ☐ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Required Analysis: Inorganics	Metals	BTEX	PHCs F1 to F4								
1	BH22-112_2	S		3	7-June-22	11:41 am	✔	✔	✔	✔								
2	BH22-113_1	S		3	6-June-22	1:11 pm	✔	✔	✔	✔								
3	BH22-113_2	S		3	6-June-22	1:16 pm	✔	✔	✔	✔								
4	BH22-114_1	S		3	6-June-22	3:54 pm	✔	✔	✔	✔								
5	BH22-114_2	S		3	6-June-22	4:07 pm	✔	✔	✔	✔								
6	BH22-115_1	S		3	7-June-22	11:29 am	✔	✔	✔	✔								
7	BH22-115_2	S		3	7-June-22	11:32 am	✔	✔	✔	✔								
8	BH22-116_1	S		3	6-June-22	4:44 pm	✔	✔	✔	✔								
9	BH22-116_2	S		3	6-June-22	4:52 pm	✔	✔	✔	✔								
10	BH22-117_1	S		3	7-June-22	9:22 am	✔	✔	✔	✔								

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: Pick UP

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 8,2022/ 10:40am	Temperature: 7.2 °C	Temperature: 0.5	pH Verified: ☐ By:

PARACEL LABORATORIES LTD. | TRU RES REL

Paracel ID: 2226006

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name:	Dillon Consulting Limited	Project Ref:	Howard South Cameron
Contact Name:	Matthew Antaya	Quote #:	22-522
Address:	3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #:	20-3864
Telephone:	519-992-7270	E-mail:	mantaya@dillon.ca

Page 4 of 5

Turnaround Time

☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular

Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation

☒ Table 1 ☒ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table ___

For RSC: ☐ Yes ☐ No

☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm

Mun: ___

☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Inorganics	Metals	BTEX	PHCs F1 to F4								
1	BH22-117_2	S		3	7-June-22	9:26 am	✔	✔	✔	✔								
2	BH22-118_1	S		3	7-June-22	10:14 am	✔	✔	✔	✔								
3	BH22-118_2	S		3	7-June-22	10:19am	✔	✔	✔	✔								
4	BH22-119_1	S		3	7-June-22	8:48 am	✔	✔	✔	✔								
5	BH22-120_1	S		3	6-June-22	8:27 am	✔	✔	✔	✔								
6	BH22-DUPA	S		3	6-June-22	10:48 am	✔	✔	✔	✔								
7	BH22-DUPB	S		3	6-June-22	12:12 am	✔	✔	✔	✔								
8	BH22-DUPC	S		3	6-June-22	1:16 pm	✔	✔	✔	✔								
9	BH22-DUPD	S		3	7-June-22	8:10 am	✔	✔	✔	✔								
10	GR22-101	S		3	6-June-22	10:50 am	✔	✔	✔	✔								

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: Pick UP

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:30	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 8, 2022/ 10.2	Temperature: 7.2 °C	Temperature: 10.2	pH Verified: ☐ By:

Chain of Custody (Blank).xlsx

Revision 4.0

Paracel ID: 2226006

PARACEL LABORATORIES LTD. | T R R

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2224237	

Client Name:	Dillon Consulting Limited	Project Ref:	Howard South Cameron
Contact Name:	Matthew Antaya	Quote #:	22-522
Address:	3200 Deziel Drive, Suite 608, Windsor, ON, N8W 5K8	PO #:	20-3864
Telephone:	519-992-7270	E-mail:	mantaya@dillon.ca

Page 5 of 5

Turnaround Time

☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular

Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation

☒ Table 1 ☒ Res/Park ☐ Med/Fine ☐ REG 558 ☐ PWQO

☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ CCME ☐ MISA

☐ Table 3 ☐ Agri/Other ☐ SU - Sani ☐ SU - Storm

☐ Table ___ Mun:

For RSC: ☐ Yes ☐ No ☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analysis: Inorganics	Metals	BTEX	PHCs F1 to F4
1	GR22-102	S		3	6-June-22	11:05 am	✓	✓	✓	✓
2	GR22-103	S		3	6-June-22	11:39 am	✓	✓	✓	✓
3	GR22-104	S		3	6-June-22	12:58 pm	✓	✓	✓	✓
4	GR22-105	S		3	6-June-22	12:38 pm	✓	✓	✓	✓
5	GR22-106	S		3	6-June-22	1:07 pm	✓	✓	✓	✓
6	GR22-107	S		3	7-June-22	10:08 am	✓	✓	✓	✓
7	GR22-DUP	S		3	6-June-22	10:50	✓	✓	✓	✓
8	BH22-102_2	S		3	7-June-22	10:46 am	✓	✓	✓	✓
9										
10										

Comments:
- Please hold remaining sample volume post-analysis for potential mSPLP analysis.
- BH Ids on soil jars pre-labelled wrong. All samples are suppose to be "BH22-1XX" instead of "BH21-1XX".

Method of Delivery: PICK UP

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew Antaya	Date/Time: June 8/22 10:20	Date/Time: June 9/22 13:25	Date/Time: June 8/22 13:30
Date/Time: June 8,2022/ 10:30	Temperature: 7.2 °C	Temperature: 10.8	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.
TRUSTED. RESPONSIVE. RELIABLE.

351 Nash Road North, unit 9B
Hamilton, ON L8H 7P4
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Dillon Consulting Ltd (Windsor)
3200 Deziel Drive Suite 608
Windsor, ON N8W 5K8
Attn: Matthew Antaya

Client PO: 20-3864
Project: Howard Additional Drilling
Custody: 68957, 68958, 68959, 68960

Report Date: 6-Feb-2023
Order Date: 9-Dec-2022

Revised Report

Order #: 2250530

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID	Paracel ID	Client ID
2250530-01	BH22-201_1	2250530-17	BH22-206_2
2250530-02	BH22-201_2	2250530-18	BH22-206_3
2250530-03	BH22-201_3	2250530-19	BH22-208_1
2250530-04	BH22-202_1	2250530-20	BH22-208_2
2250530-05	BH22-202_2	2250530-21	BH22-208_3
2250530-06	BH22-202_3	2250530-22	BH22-209_1
2250530-07	BH22-203_1	2250530-23	BH22-209_2
2250530-08	BH22-203_2	2250530-24	BH22-209_3
2250530-09	BH22-203_3	2250530-25	BH22-210
2250530-10	BH22-204_1	2250530-26	BH22-211
2250530-11	BH22-204_2	2250530-27	BH22-212
2250530-12	BH22-204_3	2250530-28	BH22-213
2250530-13	BH22-205_1	2250530-29	BH22-214
2250530-14	BH22-205_2	2250530-30	BH22-215
2250530-15	BH22-205_3	2250530-31	BH22-216
2250530-16	BH22-206_1	2250530-32	BH22-DUP1

Approved By:

Milan Ralitsch, PhD

Senior Technical Manager

Certificate of Analysis

Report Date: 06-Feb-2023

Client: **Dillon Consulting Ltd (Windsor)**

Order Date: 9-Dec-2022

Client PO: 20-3864

Project Description: Howard Additional Drilling

Paracel ID	Client ID
2250530-33	BH22-DUP2

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.8 - ICP-MS	14-Dec-22	15-Dec-22
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	13-Dec-22	15-Dec-22
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	14-Dec-22	15-Dec-22
Conductivity	MOE E3138 - probe @25 °C, water ext	15-Dec-22	15-Dec-22
Cyanide, free	MOE E3015 - Auto Colour, water extraction	14-Dec-22	14-Dec-22
Mercury by CVAA	EPA 7471B - CVAA, digestion	15-Dec-22	15-Dec-22
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	13-Dec-22	14-Dec-22
PHC F1	CWS Tier 1 - P&T GC-FID	13-Dec-22	15-Dec-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	13-Dec-22	15-Dec-22
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	15-Dec-22	15-Dec-22
REG 153: PHC F4(g)	CWS Tier 1 - Extraction Gravimetric	3-Feb-23	3-Feb-23
SAR	Calculated	15-Dec-22	16-Dec-22
Solids, %	CWS Tier 1 - Gravimetric	12-Dec-22	13-Dec-22

Summary of Criteria Exceedances

(If this page is blank then there are no exceedances)

Only those criteria that a sample exceeds will be highlighted in red

Regulatory Comparison:

Paracel Laboratories has provided regulatory guidelines on this report for informational purposes only and makes no representations or warranties that the data is accurate or reflects the current regulatory values. The user is advised to consult with the appropriate official regulations to evaluate compliance. Sample results that are highlighted have exceeded the selected regulatory limit. Calculated uncertainty estimations have not been applied for determining regulatory exceedances.

Sample	Analyte	MDL / Units	Result	-	-

	Client ID:	BH22-201_1	BH22-201_2	BH22-201_3	BH22-202_1	-	-
	Sample Date:	08-Dec-22 11:15	08-Dec-22 11:27	08-Dec-22 11:20	08-Dec-22 10:54		
	Sample ID:	2250530-01	2250530-02	2250530-03	2250530-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	96.2	83.4	88.4	95.0	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 ug/g	<7	<7	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g	<4	<4	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g	723	<8	<8	1090	-	-
F4 PHCs (C34-C50)	6 ug/g	3260	<6	<6	4070	-	-
F4G-sg PHCs (gravimetric)	50 ug/g	7320 [1]	-	-	8360 [1]	-	-

	Client ID:	BH22-202_2	BH22-202_3	BH22-203_1	BH22-203_2	-	-
	Sample Date:	08-Dec-22 10:56	08-Dec-22 11:03	08-Dec-22 12:10	08-Dec-22 12:14		
	Sample ID:	2250530-05	2250530-06	2250530-07	2250530-08		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	84.3	86.8	96.6	83.9	-	-
General Inorganics							
SAR	0.01 N/A	-	-	1.46	9.04	-	-
Conductivity	5 uS/cm	-	-	583	1120	-	-
Cyanide, free	0.03 ug/g	-	-	<0.03	<0.03	-	-
pH	0.05 pH Units	-	-	8.22	7.85	-	-
Metals							
Antimony	1 ug/g	-	-	<1.0	<1.0	-	-
Arsenic	1 ug/g	-	-	3.2	11.4	-	-
Barium	1 ug/g	-	-	67.5	101	-	-
Beryllium	0.5 ug/g	-	-	<0.5	0.7	-	-
Boron, available	0.5 ug/g	-	-	<0.5	<0.5	-	-
Boron	5 ug/g	-	-	<5.0	5.6	-	-
Cadmium	0.5 ug/g	-	-	<0.5	<0.5	-	-
Chromium	5 ug/g	-	-	5.2	25.5	-	-
Chromium (VI)	0.2 ug/g	-	-	<0.2	<0.2	-	-
Cobalt	1 ug/g	-	-	2.1	11.3	-	-
Copper	5 ug/g	-	-	7.4	22.3	-	-
Lead	1 ug/g	-	-	3.7	16.9	-	-
Mercury	0.1 ug/g	-	-	<0.1	<0.1	-	-
Molybdenum	1 ug/g	-	-	3.1	3.0	-	-
Nickel	5 ug/g	-	-	6.7	27.7	-	-
Selenium	1 ug/g	-	-	2.0	1.3	-	-
Silver	0.3 ug/g	-	-	0.4	0.6	-	-
Thallium	1 ug/g	-	-	<1.0	<1.0	-	-

	Client ID:	BH22-202_2	BH22-202_3	BH22-203_1	BH22-203_2	-	-
	Sample Date:	08-Dec-22 10:56	08-Dec-22 11:03	08-Dec-22 12:10	08-Dec-22 12:14		
	Sample ID:	2250530-05	2250530-06	2250530-07	2250530-08		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Uranium	1 ug/g	-	-	1.2	<1.0	-	-
Vanadium	10 ug/g	-	-	12.0	39.5	-	-
Zinc	20 ug/g	-	-	<20.0	64.9	-	-
Volatiles							
Benzene	0.02 ug/g	-	-	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g	-	-	<0.05	<0.05	-	-
Toluene	0.05 ug/g	-	-	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g	-	-	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g	-	-	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g	-	-	<0.05	<0.05	-	-
Toluene-d8	Surrogate	-	-	107%	106%	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 ug/g	<7	<7	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g	<4	<4	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g	<8	<8	2530	16	-	-
F4 PHCs (C34-C50)	6 ug/g	<6	<6	7900	<6	-	-
F4G-sg PHCs (gravimetric)	50 ug/g	-	-	14900 [1]	-	-	-

	Client ID:	BH22-203_3	BH22-204_1	BH22-204_2	BH22-204_3	-	-
	Sample Date:	08-Dec-22 12:17	08-Dec-22 10:30	08-Dec-22 10:30	08-Dec-22 10:37		
	Sample ID:	2250530-09	2250530-10	2250530-11	2250530-12		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	87.5	94.7	86.3	87.7	-	-
General Inorganics							
SAR	0.01 N/A	1.62	-	-	3.85	-	-
Conductivity	5 uS/cm	454	-	-	718	-	-
Cyanide, free	0.03 ug/g	<0.03	-	-	<0.03	-	-
pH	0.05 pH Units	7.91	-	-	7.91	-	-
Metals							
Antimony	1 ug/g	<1.0	-	-	<1.0	-	-
Arsenic	1 ug/g	8.8	-	-	8.3	-	-
Barium	1 ug/g	67.8	-	-	68.7	-	-
Beryllium	0.5 ug/g	0.6	-	-	0.6	-	-
Boron, available	0.5 ug/g	0.6	-	-	<0.5	-	-
Boron	5 ug/g	8.5	-	-	12.0	-	-
Cadmium	0.5 ug/g	<0.5	-	-	<0.5	-	-
Chromium	5 ug/g	22.9	-	-	20.8	-	-
Chromium (VI)	0.2 ug/g	<0.2	-	-	<0.2	-	-
Cobalt	1 ug/g	9.7	-	-	9.9	-	-
Copper	5 ug/g	17.5	-	-	16.2	-	-
Lead	1 ug/g	9.0	-	-	9.9	-	-
Mercury	0.1 ug/g	<0.1	-	-	<0.1	-	-
Molybdenum	1 ug/g	2.6	-	-	3.1	-	-
Nickel	5 ug/g	24.3	-	-	25.6	-	-
Selenium	1 ug/g	<1.0	-	-	<1.0	-	-
Silver	0.3 ug/g	0.5	-	-	2.3	-	-
Thallium	1 ug/g	<1.0	-	-	<1.0	-	-

Certificate of Analysis

Report Date: 06-Feb-2023

Client: **Dillon Consulting Ltd (Windsor)**

Order Date: 9-Dec-2022

Client PO: 20-3864

Project Description: Howard Additional Drilling

	Client ID:	BH22-203_3	BH22-204_1	BH22-204_2	BH22-204_3	-	-
	Sample Date:	08-Dec-22 12:17	08-Dec-22 10:30	08-Dec-22 10:30	08-Dec-22 10:37		
	Sample ID:	2250530-09	2250530-10	2250530-11	2250530-12		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Uranium	1 ug/g	1.0	-	-	<1.0	-	-
Vanadium	10 ug/g	33.2	-	-	30.0	-	-
Zinc	20 ug/g	51.8	-	-	48.3	-	-
Volatiles							
Benzene	0.02 ug/g	<0.02	-	-	<0.02	-	-
Ethylbenzene	0.05 ug/g	<0.05	-	-	<0.05	-	-
Toluene	0.05 ug/g	<0.05	-	-	<0.05	-	-
m,p-Xylenes	0.05 ug/g	<0.05	-	-	<0.05	-	-
o-Xylene	0.05 ug/g	<0.05	-	-	<0.05	-	-
Xylenes, total	0.05 ug/g	<0.05	-	-	<0.05	-	-
Toluene-d8	Surrogate	106%	-	-	104%	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 ug/g	<7	<7	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g	<4	<4	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g	<8	428	<8	<8	-	-
F4 PHCs (C34-C50)	6 ug/g	<6	1310	<6	<6	-	-
F4G-sg PHCs (gravimetric)	50 ug/g	-	2890 [1]	-	-	-	-

	Client ID:	BH22-205_1	BH22-205_2	BH22-205_3	BH22-206_1	-	-
	Sample Date:	08-Dec-22 12:27	08-Dec-22 12:49	08-Dec-22 12:54	08-Dec-22 09:43		
	Sample ID:	2250530-13	2250530-14	2250530-15	2250530-16		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	96.9	82.8	86.6	92.9	-	-
General Inorganics							
SAR	0.01 N/A	1.94	10.6	6.59	-	-	-
Conductivity	5 uS/cm	1880	1080	710	-	-	-
Cyanide, free	0.03 ug/g	<0.03	<0.03	<0.03	-	-	-
pH	0.05 pH Units	8.12	8.54	8.12	-	-	-
Metals							
Antimony	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-
Arsenic	1 ug/g	1.3	10.4	8.1	3.8	-	-
Barium	1 ug/g	7.0	99.4	74.6	168	-	-
Beryllium	0.5 ug/g	<0.5	0.9	0.7	<0.5	-	-
Boron, available	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Boron	5 ug/g	<5.0	6.5	7.6	<5.0	-	-
Cadmium	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Chromium	5 ug/g	<5.0	30.1	22.5	8.1	-	-
Chromium (VI)	0.2 ug/g	<0.2	<0.2	<0.2	<0.2	-	-
Cobalt	1 ug/g	1.2	12.5	8.8	2.8	-	-
Copper	5 ug/g	<5.0	20.6	17.5	8.1	-	-
Lead	1 ug/g	3.0	11.9	8.5	7.9	-	-
Mercury	0.1 ug/g	<0.1	<0.1	<0.1	<0.1	-	-
Molybdenum	1 ug/g	1.3	3.0	3.3	1.9	-	-
Nickel	5 ug/g	<5.0	32.1	23.4	8.5	-	-
Selenium	1 ug/g	<1.0	1.6	<1.0	<1.0	-	-
Silver	0.3 ug/g	<0.3	0.4	0.4	<0.3	-	-
Thallium	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-

	Client ID:	BH22-205_1	BH22-205_2	BH22-205_3	BH22-206_1	-	-
	Sample Date:	08-Dec-22 12:27	08-Dec-22 12:49	08-Dec-22 12:54	08-Dec-22 09:43		
	Sample ID:	2250530-13	2250530-14	2250530-15	2250530-16		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Uranium	1 ug/g	<1.0	<1.0	1.6	1.7	-	-
Vanadium	10 ug/g	<10.0	45.4	33.9	16.0	-	-
Zinc	20 ug/g	<20.0	69.5	51.3	21.8	-	-
Volatiles							
Benzene	0.02 ug/g	<0.02	<0.02	<0.02	-	-	-
Ethylbenzene	0.05 ug/g	<0.05	<0.05	<0.05	-	-	-
Toluene	0.05 ug/g	0.11	<0.05	<0.05	-	-	-
m,p-Xylenes	0.05 ug/g	<0.05	<0.05	<0.05	-	-	-
o-Xylene	0.05 ug/g	<0.05	<0.05	<0.05	-	-	-
Xylenes, total	0.05 ug/g	<0.05	<0.05	<0.05	-	-	-
Toluene-d8	Surrogate	105%	107%	107%	-	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 ug/g	<7	<7	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g	<4	<4	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g	1310	<8	<8	246	-	-
F4 PHCs (C34-C50)	6 ug/g	5030	<6	<6	1040	-	-
F4G-sg PHCs (gravimetric)	50 ug/g	7940 [1]	-	-	2130 [1]	-	-

	Client ID:	BH22-206_2	BH22-206_3	BH22-208_1	BH22-208_2	-	-
	Sample Date:	08-Dec-22 09:46	08-Dec-22 09:49	08-Dec-22 14:48	08-Dec-22 14:51		
	Sample ID:	2250530-17	2250530-18	2250530-19	2250530-20		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	86.6	82.6	93.9	88.4	-	-
General Inorganics							
SAR	0.01 N/A	-	-	5.31	11.2	-	-
Conductivity	5 uS/cm	-	-	3030	2440	-	-
Cyanide, free	0.03 ug/g	-	-	<0.03	<0.03	-	-
pH	0.05 pH Units	-	-	8.16	7.96	-	-
Metals							
Antimony	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-
Arsenic	1 ug/g	14.7	13.2	1.5	9.1	-	-
Barium	1 ug/g	33.1	76.3	189	73.0	-	-
Beryllium	0.5 ug/g	<0.5	0.7	<0.5	0.6	-	-
Boron, available	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Boron	5 ug/g	<5.0	<5.0	<5.0	<5.0	-	-
Cadmium	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Chromium	5 ug/g	18.1	26.8	<5.0	22.3	-	-
Chromium (VI)	0.2 ug/g	<0.2	<0.2	<0.2	<0.2	-	-
Cobalt	1 ug/g	8.4	13.5	1.5	8.8	-	-
Copper	5 ug/g	25.0	24.0	<5.0	16.6	-	-
Lead	1 ug/g	13.9	10.8	3.0	10.0	-	-
Mercury	0.1 ug/g	<0.1	<0.1	<0.1	<0.1	-	-
Molybdenum	1 ug/g	4.5	2.6	<1.0	2.3	-	-
Nickel	5 ug/g	25.5	35.4	<5.0	22.8	-	-
Selenium	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-
Silver	0.3 ug/g	<0.3	<0.3	<0.3	<0.3	-	-
Thallium	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-

	Client ID:	BH22-206_2	BH22-206_3	BH22-208_1	BH22-208_2	-	-
	Sample Date:	08-Dec-22 09:46	08-Dec-22 09:49	08-Dec-22 14:48	08-Dec-22 14:51		
	Sample ID:	2250530-17	2250530-18	2250530-19	2250530-20		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Uranium	1 ug/g	2.4	<1.0	2.0	1.1	-	-
Vanadium	10 ug/g	40.4	38.9	<10.0	36.5	-	-
Zinc	20 ug/g	59.0	64.7	<20.0	49.7	-	-
Volatiles							
Benzene	0.02 ug/g	-	-	<0.02	-	-	-
Ethylbenzene	0.05 ug/g	-	-	<0.05	-	-	-
Toluene	0.05 ug/g	-	-	<0.05	-	-	-
m,p-Xylenes	0.05 ug/g	-	-	<0.05	-	-	-
o-Xylene	0.05 ug/g	-	-	<0.05	-	-	-
Xylenes, total	0.05 ug/g	-	-	<0.05	-	-	-
Toluene-d8	Surrogate	-	-	105%	-	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 ug/g	-	-	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g	-	-	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g	-	-	95	<8	-	-
F4 PHCs (C34-C50)	6 ug/g	-	-	1230	<6	-	-
F4G-sg PHCs (gravimetric)	50 ug/g	-	-	3300 [1]	-	-	-

Certificate of Analysis

Report Date: 06-Feb-2023

Client: **Dillon Consulting Ltd (Windsor)**

Order Date: 9-Dec-2022

Client PO: **20-3864**

Project Description: Howard Additional Drilling

	Client ID:	BH22-208_3	BH22-209_1	BH22-209_2	BH22-209_3	-	-
	Sample Date:	08-Dec-22 14:56	08-Dec-22 14:26	08-Dec-22 14:29	08-Dec-22 14:35		
	Sample ID:	2250530-21	2250530-22	2250530-23	2250530-24		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	88.5	95.5	84.8	81.5	-	-
General Inorganics							
SAR	0.01 N/A	2.13	5.80	13.1	2.74	-	-
Conductivity	5 uS/cm	924	1360	1740	1030	-	-
Cyanide, free	0.03 ug/g	<0.03	<0.03	<0.03	<0.03	-	-
pH	0.05 pH Units	7.99	8.13	7.89	7.83	-	-
Metals							
Antimony	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-
Arsenic	1 ug/g	9.1	1.9	9.5	9.8	-	-
Barium	1 ug/g	109	118	98.5	76.9	-	-
Beryllium	0.5 ug/g	0.6	<0.5	0.7	0.7	-	-
Boron	5 ug/g	7.0	<5.0	<5.0	<5.0	-	-
Boron, available	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Cadmium	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Chromium (VI)	0.2 ug/g	<0.2	<0.2	<0.2	<0.2	-	-
Chromium	5 ug/g	22.3	<5.0	25.0	28.4	-	-
Cobalt	1 ug/g	12.1	2.3	11.7	12.6	-	-
Copper	5 ug/g	16.9	16.0	17.0	19.9	-	-
Lead	1 ug/g	9.0	3.9	10.5	11.9	-	-
Mercury	0.1 ug/g	<0.1	<0.1	<0.1	<0.1	-	-
Molybdenum	1 ug/g	3.5	1.1	2.2	2.8	-	-
Nickel	5 ug/g	26.2	6.4	28.1	29.6	-	-
Selenium	1 ug/g	<1.0	<1.0	<1.0	1.1	-	-
Silver	0.3 ug/g	<0.3	<0.3	<0.3	<0.3	-	-
Thallium	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-

	Client ID:	BH22-208_3	BH22-209_1	BH22-209_2	BH22-209_3	-	-
	Sample Date:	08-Dec-22 14:56	08-Dec-22 14:26	08-Dec-22 14:29	08-Dec-22 14:35		
	Sample ID:	2250530-21	2250530-22	2250530-23	2250530-24		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Uranium	1 ug/g	1.3	1.8	<1.0	<1.0	-	-
Vanadium	10 ug/g	33.5	10.4	39.2	39.2	-	-
Zinc	20 ug/g	51.7	<20.0	52.1	63.7	-	-
Volatiles							
Benzene	0.02 ug/g	-	<0.02	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g	-	<0.05	<0.05	<0.05	-	-
Toluene	0.05 ug/g	-	<0.05	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g	-	<0.05	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g	-	<0.05	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g	-	<0.05	<0.05	<0.05	-	-
Toluene-d8	Surrogate	-	106%	105%	103%	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 ug/g	<7	<7	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g	<4	<4	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g	<8	311	<8	<8	-	-
F4 PHCs (C34-C50)	6 ug/g	<6	4140	<6	<6	-	-
F4G-sg PHCs (gravimetric)	50 ug/g	-	9990 [1]	-	-	-	-

	Client ID:	BH22-210	BH22-211	BH22-212	BH22-213	-	-
	Sample Date:	08-Dec-22 15:45	09-Dec-22 12:35	09-Dec-22 12:25	09-Dec-22 12:45		
	Sample ID:	2250530-25	2250530-26	2250530-27	2250530-28		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	96.2	88.3	88.8	93.2	-	-
General Inorganics							
SAR	0.01 N/A	4.35	-	-	-	-	-
Conductivity	5 uS/cm	3400	-	-	-	-	-
Cyanide, free	0.03 ug/g	<0.03	-	-	-	-	-
pH	0.05 pH Units	11.93	-	-	-	-	-
Metals							
Antimony	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-
Arsenic	1 ug/g	3.2	6.5	7.2	6.8	-	-
Barium	1 ug/g	35.9	89.0	63.5	147	-	-
Beryllium	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Boron	5 ug/g	<5.0	<5.0	<5.0	<5.0	-	-
Boron, available	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Cadmium	0.5 ug/g	<0.5	0.5	<0.5	1.4	-	-
Chromium (VI)	0.2 ug/g	<0.2	<0.2	<0.2	<0.2	-	-
Chromium	5 ug/g	22.9	35.2	15.3	62.0	-	-
Cobalt	1 ug/g	7.2	6.6	6.5	5.0	-	-
Copper	5 ug/g	8.6	46.1	22.7	107	-	-
Lead	1 ug/g	4.5	80.5	34.4	1070	-	-
Mercury	0.1 ug/g	<0.1	<0.1	<0.1	<0.1	-	-
Molybdenum	1 ug/g	1.6	2.5	2.3	5.2	-	-
Nickel	5 ug/g	10.6	20.3	14.6	28.4	-	-
Selenium	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-
Silver	0.3 ug/g	<0.3	<0.3	<0.3	<0.3	-	-
Thallium	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-

Certificate of Analysis

Report Date: 06-Feb-2023

Client: **Dillon Consulting Ltd (Windsor)**

Order Date: 9-Dec-2022

Client PO: 20-3864

Project Description: Howard Additional Drilling

	Client ID:	BH22-210	BH22-211	BH22-212	BH22-213	-	-
	Sample Date:	08-Dec-22 15:45	09-Dec-22 12:35	09-Dec-22 12:25	09-Dec-22 12:45		
	Sample ID:	2250530-25	2250530-26	2250530-27	2250530-28		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Uranium	1 ug/g	<1.0	<1.0	1.1	1.2	-	-
Vanadium	10 ug/g	16.5	28.5	25.4	21.1	-	-
Zinc	20 ug/g	96.3	139	51.7	397	-	-
Volatiles							
Benzene	0.02 ug/g	<0.02	-	-	-	-	-
Ethylbenzene	0.05 ug/g	<0.05	-	-	-	-	-
Toluene	0.05 ug/g	<0.05	-	-	-	-	-
m,p-Xylenes	0.05 ug/g	<0.05	-	-	-	-	-
o-Xylene	0.05 ug/g	<0.05	-	-	-	-	-
Xylenes, total	0.05 ug/g	<0.05	-	-	-	-	-
Toluene-d8	Surrogate	106%	-	-	-	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 ug/g	<7	-	-	-	-	-
F2 PHCs (C10-C16)	4 ug/g	<4	-	-	-	-	-
F3 PHCs (C16-C34)	8 ug/g	360	-	-	-	-	-
F4 PHCs (C34-C50)	6 ug/g	3890	-	-	-	-	-
F4G-sg PHCs (gravimetric)	50 ug/g	8960 [1]	-	-	-	-	-

	Client ID:	BH22-214	BH22-215	BH22-216	BH22-DUP1	-	-
	Sample Date:	09-Dec-22 12:05	09-Dec-22 11:47	09-Dec-22 11:18	08-Dec-22 10:37		
	Sample ID:	2250530-29	2250530-30	2250530-31	2250530-32		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	93.2	85.4	87.7	87.8	-	-
General Inorganics							
SAR	0.01 N/A	-	-	-	4.84	-	-
Conductivity	5 uS/cm	-	-	-	789	-	-
Cyanide, free	0.03 ug/g	-	-	-	<0.03	-	-
pH	0.05 pH Units	-	-	-	8.94	-	-
Metals							
Antimony	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-
Arsenic	1 ug/g	7.0	9.2	8.3	7.9	-	-
Barium	1 ug/g	127	125	97.3	58.3	-	-
Beryllium	0.5 ug/g	0.6	0.6	0.7	0.5	-	-
Boron, available	0.5 ug/g	0.5	<0.5	<0.5	<0.5	-	-
Boron	5 ug/g	8.5	<5.0	<5.0	<5.0	-	-
Cadmium	0.5 ug/g	0.7	1.6	0.7	<0.5	-	-
Chromium (VI)	0.2 ug/g	<0.2	<0.2	<0.2	<0.2	-	-
Chromium	5 ug/g	39.7	28.9	25.4	19.8	-	-
Cobalt	1 ug/g	6.6	6.5	7.2	9.0	-	-
Copper	5 ug/g	48.9	122	43.2	15.1	-	-
Lead	1 ug/g	223	482	108	8.8	-	-
Mercury	0.1 ug/g	<0.1	0.1	<0.1	<0.1	-	-
Molybdenum	1 ug/g	3.7	3.0	1.9	2.3	-	-
Nickel	5 ug/g	22.8	26.5	21.2	21.4	-	-
Selenium	1 ug/g	1.6	1.6	1.3	<1.0	-	-
Silver	0.3 ug/g	<0.3	<0.3	<0.3	<0.3	-	-
Thallium	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-

Certificate of Analysis

Report Date: 06-Feb-2023

Client: **Dillon Consulting Ltd (Windsor)**

Order Date: 9-Dec-2022

Client PO: 20-3864

Project Description: Howard Additional Drilling

	Client ID:	BH22-214	BH22-215	BH22-216	BH22-DUP1	-	-
	Sample Date:	09-Dec-22 12:05	09-Dec-22 11:47	09-Dec-22 11:18	08-Dec-22 10:37		
	Sample ID:	2250530-29	2250530-30	2250530-31	2250530-32		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Uranium	1 ug/g	<1.0	<1.0	<1.0	<1.0	-	-
Vanadium	10 ug/g	28.3	26.7	30.0	30.1	-	-
Zinc	20 ug/g	223	378	191	44.2	-	-
Volatiles							
Benzene	0.02 ug/g	-	-	-	<0.02	-	-
Ethylbenzene	0.05 ug/g	-	-	-	<0.05	-	-
Toluene	0.05 ug/g	-	-	-	<0.05	-	-
m,p-Xylenes	0.05 ug/g	-	-	-	<0.05	-	-
o-Xylene	0.05 ug/g	-	-	-	<0.05	-	-
Xylenes, total	0.05 ug/g	-	-	-	<0.05	-	-
Toluene-d8	Surrogate	-	-	-	105%	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 ug/g	-	-	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g	-	-	-	<4	-	-
F3 PHCs (C16-C34)	8 ug/g	-	-	-	<8	-	-
F4 PHCs (C34-C50)	6 ug/g	-	-	-	<6	-	-

	Client ID:	BH22-DUP2				-	-
	Sample Date:	08-Dec-22 11:15					
	Sample ID:	2250530-33					
	Matrix:	Soil					
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	96.1	-	-	-	-	-
General Inorganics							
SAR	0.01 N/A	4.10	-	-	-	-	-
Conductivity	5 uS/cm	950	-	-	-	-	-
Cyanide, free	0.03 ug/g	<0.03	-	-	-	-	-
pH	0.05 pH Units	8.59	-	-	-	-	-
Metals							
Antimony	1 ug/g	<1.0	-	-	-	-	-
Arsenic	1 ug/g	1.4	-	-	-	-	-
Barium	1 ug/g	47.2	-	-	-	-	-
Beryllium	0.5 ug/g	<0.5	-	-	-	-	-
Boron	5 ug/g	<5.0	-	-	-	-	-
Boron, available	0.5 ug/g	<0.5	-	-	-	-	-
Cadmium	0.5 ug/g	<0.5	-	-	-	-	-
Chromium	5 ug/g	<5.0	-	-	-	-	-
Chromium (VI)	0.2 ug/g	<0.2	-	-	-	-	-
Cobalt	1 ug/g	1.2	-	-	-	-	-
Copper	5 ug/g	<5.0	-	-	-	-	-
Lead	1 ug/g	4.9	-	-	-	-	-
Mercury	0.1 ug/g	<0.1	-	-	-	-	-
Molybdenum	1 ug/g	<1.0	-	-	-	-	-
Nickel	5 ug/g	<5.0	-	-	-	-	-
Selenium	1 ug/g	<1.0	-	-	-	-	-
Silver	0.3 ug/g	<0.3	-	-	-	-	-
Thallium	1 ug/g	<1.0	-	-	-	-	-

	Client ID:	BH22-DUP2				-	-
	Sample Date:	08-Dec-22 11:15					
	Sample ID:	2250530-33					
	Matrix:	Soil					
	MDL/Units						
Metals							
Uranium	1 ug/g	<1.0	-	-	-	-	-
Vanadium	10 ug/g	<10.0	-	-	-	-	-
Zinc	20 ug/g	<20.0	-	-	-	-	-
Volatiles							
Benzene	0.02 ug/g	<0.02	-	-	-	-	-
Ethylbenzene	0.05 ug/g	<0.05	-	-	-	-	-
Toluene	0.05 ug/g	<0.05	-	-	-	-	-
m,p-Xylenes	0.05 ug/g	<0.05	-	-	-	-	-
o-Xylene	0.05 ug/g	<0.05	-	-	-	-	-
Xylenes, total	0.05 ug/g	<0.05	-	-	-	-	-
Toluene-d8	Surrogate	102%	-	-	-	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 ug/g	<7	-	-	-	-	-
F2 PHCs (C10-C16)	4 ug/g	<4	-	-	-	-	-
F3 PHCs (C16-C34)	8 ug/g	838	-	-	-	-	-
F4 PHCs (C34-C50)	6 ug/g	5360	-	-	-	-	-
F4G-sg PHCs (gravimetric)	50 ug/g	9180 [1]	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics								
SAR	ND	0.01	N/A					
Conductivity	ND	5	uS/cm					
Cyanide, free	ND	0.03	ug/g					
Hydrocarbons								
F1 PHCs (C6-C10)	ND	7	ug/g					
F2 PHCs (C10-C16)	ND	4	ug/g					
F3 PHCs (C16-C34)	ND	8	ug/g					
F4 PHCs (C34-C50)	ND	6	ug/g					
F4G-sg PHCs (gravimetric)	ND	50	ug/g					
Metals								
Antimony	ND	1.0	ug/g					
Arsenic	ND	1.0	ug/g					
Barium	ND	1.0	ug/g					
Beryllium	ND	0.5	ug/g					
Boron, available	ND	0.5	ug/g					
Boron	ND	5.0	ug/g					
Cadmium	ND	0.5	ug/g					
Chromium (VI)	ND	0.2	ug/g					
Chromium	ND	5.0	ug/g					
Cobalt	ND	1.0	ug/g					
Copper	ND	5.0	ug/g					
Lead	ND	1.0	ug/g					
Mercury	ND	0.1	ug/g					
Molybdenum	ND	1.0	ug/g					
Nickel	ND	5.0	ug/g					
Selenium	ND	1.0	ug/g					
Silver	ND	0.3	ug/g					
Thallium	ND	1.0	ug/g					
Uranium	ND	1.0	ug/g					
Vanadium	ND	10.0	ug/g					
Zinc	ND	20.0	ug/g					
Volatiles								

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	ND	0.02	ug/g					
Ethylbenzene	ND	0.05	ug/g					
Toluene	ND	0.05	ug/g					
m,p-Xylenes	ND	0.05	ug/g					
o-Xylene	ND	0.05	ug/g					
Xylenes, total	ND	0.05	ug/g					
Surrogate: Toluene-d8	*8.38*		*ug/g*	*105*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	1.58	0.01	N/A	1.46			7.9	30	
Conductivity	587	5	uS/cm	583			0.6	5	
Cyanide, free	ND	0.03	ug/g	ND			NC	35	
pH	8.35	0.05	pH Units	8.22			1.6	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g	ND			NC	30	
F4G-sg PHCs (gravimetric)	7090	50	ug/g	7320			3.2	30	
Metals									
Antimony	ND	1.0	ug/g	ND			NC	30	
Arsenic	3.6	1.0	ug/g	3.2			10.3	30	
Barium	60.7	1.0	ug/g	67.5			10.6	30	
Beryllium	ND	0.5	ug/g	ND			NC	30	
Boron, available	0.76	0.5	ug/g	ND			NC	35	
Boron	11.1	5.0	ug/g	ND			NC	30	
Cadmium	ND	0.5	ug/g	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g	ND			NC	35	
Chromium	5.4	5.0	ug/g	5.2			3.7	30	
Cobalt	2.0	1.0	ug/g	2.1			4.1	30	
Copper	ND	5.0	ug/g	7.4			NC	30	
Lead	3.5	1.0	ug/g	3.7			5.5	30	
Mercury	ND	0.1	ug/g	ND			NC	30	
Molybdenum	2.5	1.0	ug/g	3.1			23.4	30	
Nickel	ND	5.0	ug/g	6.7			NC	30	
Selenium	1.6	1.0	ug/g	2.0			22.5	30	
Silver	ND	0.3	ug/g	0.4			NC	30	
Thallium	2.3	1.0	ug/g	ND			NC	30	
Uranium	1.6	1.0	ug/g	1.2			26.2	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Vanadium	ND	10.0	ug/g	12.0			NC	30	
Zinc	ND	20.0	ug/g	ND			NC	30	
Physical Characteristics									
% Solids	82.7	0.1	% by Wt.	83.5			1.0	25	
Volatiles									
Benzene	ND	0.02	ug/g	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g	ND			NC	50	
Toluene	ND	0.05	ug/g	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g	ND			NC	50	
o-Xylene	ND	0.05	ug/g	ND			NC	50	
Surrogate: Toluene-d8	*7.94*		*ug/g*		*106*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Cyanide, free	0.264	0.03	ug/g	ND	84.4	70-130			
Hydrocarbons									
F1 PHCs (C6-C10)	60	7	ug/g	ND	84.1	80-120			
F2 PHCs (C10-C16)	82	4	ug/g	ND	93.3	60-140			
F3 PHCs (C16-C34)	167	8	ug/g	ND	85.2	60-140			
F4 PHCs (C34-C50)	142	6	ug/g	ND	100	60-140			
F4G-sg PHCs (gravimetric)	1080	50	ug/g	ND	108	80-120			
Metals									
Antimony	115	1.0	ug/g	ND	92.2	70-130			
Arsenic	124	1.0	ug/g	3.2	96.6	70-130			
Barium	172	1.0	ug/g	67.5	83.7	70-130			
Beryllium	99.0	0.5	ug/g	ND	79.2	70-130			
Boron, available	3.66	0.5	ug/g	ND	73.3	70-122			
Boron	122	5.0	ug/g	ND	97.5	70-130			
Cadmium	116	0.5	ug/g	ND	92.7	70-130			
Chromium (VI)	4.1	0.2	ug/g	ND	78.0	70-130			
Chromium	126	5.0	ug/g	5.2	96.5	70-130			
Cobalt	118	1.0	ug/g	2.1	92.7	70-130			
Copper	118	5.0	ug/g	7.4	88.2	70-130			
Lead	104	1.0	ug/g	3.7	80.2	70-130			
Mercury	1.43	0.1	ug/g	ND	95.0	70-130			
Molybdenum	129	1.0	ug/g	3.1	101	70-130			
Nickel	122	5.0	ug/g	6.7	92.5	70-130			
Selenium	123	1.0	ug/g	2.0	96.5	70-130			
Silver	126	0.3	ug/g	0.4	101	70-130			
Thallium	103	1.0	ug/g	ND	82.7	70-130			
Uranium	122	1.0	ug/g	1.2	96.2	70-130			
Vanadium	129	10.0	ug/g	12.0	93.9	70-130			
Zinc	122	20.0	ug/g	ND	97.5	70-130			
Volatiles									

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	4.08	0.02	ug/g	ND	101	60-130			
Ethylbenzene	4.09	0.05	ug/g	ND	102	60-130			
Toluene	4.06	0.05	ug/g	ND	101	60-130			
m,p-Xylenes	8.03	0.05	ug/g	ND	100	60-130			
o-Xylene	4.15	0.05	ug/g	ND	103	60-130			
Surrogate: Toluene-d8	*7.89*		*ug/g*		*98.6*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

1: This analysis was conducted after the accepted holding time had been exceeded.

Sample Data Revisions:

None

Work Order Revisions / Comments:

Revision - 1: This report was revised to include F4 gravametric data that was not included in the original report

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

Soil results are reported on a dry weight basis unlesss otherwise noted.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.

- F1 range corrected for BTEX.

- F2 to F3 ranges corrected for appropriate PAHs where available.

- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.

- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD

Paracel ID: 2250530

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2250530	№ 68957

Client Name: Dillon Consulting Ltd.	Project Ref: Howard Additional Drilling	Page 1 of 4
Contact Name: Matthew Antunes	Quote #: 22-737	Turnaround Time
Address: 3200 Dezel Drive suite 608, Windsor, ON N8W 5K5	PO #: 20-3864	☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 519-992-7270	E-mail: Montanya@dillon.ca disabelle@dillon.ca	Date Required:

Regulation	Other Regulation	Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)
☐ REG 153/04 ☒ REG 406/19	☐ REG 558 ☐ PWQO	
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ CCME ☐ MISA	
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ SU - Sani ☐ SU - Storm	
☐ Table 3 ☐ Agri/Other	Mun:	
☐ Table	☐ Other:	
For RSC: ☐ Yes ☐ No		

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs (F1 to F4)	M/I BTEX										Hold for M/I BTEX
1	BH22-201_1	S		2	8-Dec-22	11:15am	X											X
2	BH22-201_2					11:27am	X											X
3	BH22-201_3					11:20am	X											X
4	BH22-202_1					10:54am	X											X
5	BH22-202_2					10:56am	X											X
6	BH22-202_3					11:03am	X											X
7	BH22-203_1					12:10Pm	X	X	X									
8	BH22-203_2					12:14Pm	X	X	X									
9	BH22-203_3					12:17Pm	X	X	X									
10	BH22-204_1					10:30am	X											X

Comments: Hold remainder of samples for mSPLP and/or TCLP analysis

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab: Alindra	Method of Delivery: Walk in
Relinquished By (Print): Matthew C	Date/Time: Dec. 9/22 13:30	Date/Time: 12/10/22 11:50	Verified By: K. Jakobsen
Date/Time: 9-Dec-22 11:15 Pm	Temperature: 6.2 °C	Temperature: 3.5 °C	Date/Time: Dec. 9/22 15:00
			pH Verified: ☐ By:

PARACEL LABORATORIES LTD

Paracel ID: 2250530

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2250530	№ 68958

Client Name: Dillon Consulting Ltd.
Contact Name: Matthew Antonyn
Address: 3200 Deziel Dr, Suite 608, Windsor, ON N8W 5K8
Telephone: 519-992-7270

Project Ref: Howard additional Sampling
Quote #: 22-737
PO #: 20-3864
E-mail: mantonyn@dillon.ca, dlisabelle@dillon.ca

Page 2 of 4

Turnaround Time
☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ Other:

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ___
For RSC: ☐ Yes ☐ No

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analysis: PHCs (CH-F4)	Metals	BTEX	Inorganics						Hold for BTEX	Hold for PHCs	Hold for Metals, BTEX
1	BH22-204_2	S		2	8-Dec-22	10:30am	X											X
2	BH22-204_3					10:37am	X	X	X	X								~~X~~
3	BH22-205_1					12:27pm	X	X	X	X								
4	BH22-205_2					12:49pm	X	X	X	X								
5	BH22-205_3					12:54pm	X	X	X	X								
6	BH22-206_1					9:43am	X	X										
7	BH22-206_2					9:46am		X									X	
8	BH22-206_3					9:49am		X									X	
9	BH22-208_1					2:48PM	X	X	X	X								
10	BH22-208_2					2:51PM	X	X		X						X		

Comments: See pg 1 comments

Method of Delivery: Walk in

Relinquished By (Sign):	Received by Driver/Depot: K. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew. A	Date/Time: Dec. 9/22 13:30	Date/Time:	Date/Time: Dec. 9/22 15:00
Date/Time: 9-Dec-22 1:15pm	Temperature: 6.2 °C	Temperature: °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD

Paracel ID: 2250530

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2250530	№ 68959

Client Name: Dillon Consulting Ltd.
Contact Name: Matthew Antonyan
Address: 3200 Deziel Dr, Suite 608, Windsor, ON, N8W 5K5
Telephone:

Project Ref: Howard Additional Drilling
Quote #: 22-737
PO #: 20-3864
E-mail: mantonyan@dillon.ca
dlabelle@dillon.ca

Turnaround Time
☐ 1 day ☐ 3 day
☐ 2 day ☒ Regular
Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table
For RSC: ☐ Yes ☐ No
☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun:
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHC (F1-F4)	Metals	Inorganics	BTEX								Hold for BTEX
1	BH22-~~208~~ 208-3	S		2	8-Dec 22	2:56PM	X	X	X									X
2	BH22-209-1					2:26PM	X	X	X	X								
3	BH22-209-2					2:29PM	X	X	X	X								
4	BH22-209-3					2:35PM	X	X	X	X								
5	BH22-210					3:45PM	X	X	X	X								
6	BH22-211				9-Dec-22	12:35PM		X										
7	BH22-212					12:25PM		X										
8	BH22-213					12:45PM		X										
9	BH22-214					12:05PM		X										
10	BH22-215					11:47am		X										

Comments: See pg 1 comments

Method of Delivery: Walk in

Relinquished By (Sign):	Received by Driver/Depot: F. Jakobsen	Received at Lab:	Verified By: K. Jakobsen
Relinquished By (Print): Matthew A.	Date/Time: Dec. 9/22 13:30	Date/Time:	Date/Time: Dec. 9/22 15:00
Date/Time: 9Dec-22	Temperature: 6.2 °C	Temperature: °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD

Paracel ID: 2250530

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2250530	№ 68960

Client Name: Dillon Consulting Ltd.
Contact Name: Matthew Antonyan
Address: 3200 Deziel Drive Suite 608, Windsor, ON N8W 5K5.
Telephone: 519-992-7270

Project Ref: Howard Additional Drilling
Quote #: 22-757
PO #: 20-3864
E-mail: mantonyan@dillon.ca
d.isabelle@dillon.ca

Page 4 of 4

Turnaround Time
☐ 1 day ☐ 3 day
☐ 2 day ☒ Regular
Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table
For RSC: ☐ Yes ☐ No

Mun:
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Metals	PHCs (F1-F4)	Inorganics	BTEX
1	BH22-216	S		2	9-Dec-22	11:18am	X			
2	BH22-DUP1	↓		↓	8-Dec-22	10:37am	X	X	X	X
3	BH22-DUP2	↓		↓	8-Dec-22	11:15am	X	X	X	X
4										
5										
6										
7										
8										
9										
10										

Comments: See psl Comments

Method of Delivery: walk in

Relinquished By (Sign): [signature]
Relinquished By (Print): Matthew Antonyan
Date/Time: 9-Dec-22 11:15 PM

Received By Driver/Depot: K. Jakobsen
Date/Time: Dec. 9/22 13:30
Temperature: 0.2 °C

Received at Lab:
Date/Time:
Temperature: °C

Verified By: K. Jakobsen
Date/Time: Dec. 9/22 15:00
pH Verified: ☐ By:

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1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Dillon Consulting Ltd (Windsor)
3200 Deziel Drive Suite 608
Windsor, ON N8W 5K8
Attn: Matthew Antaya

Client PO: 20-3864
Project: Howard Additional Drilling
Custody: 68957, 68958, 68959 & 68960

Report Date: 28-Dec-2022
Order Date: 9-Dec-2022

Order #: 2252034

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2252034-01	BH22-203_3
2252034-02	BH22-205_3

Approved By:

Alex Enfield, MSc
Lab Manager

Certificate of Analysis

Report Date: 28-Dec-2022

Client: **Dillon Consulting Ltd (Windsor)**

Order Date: 9-Dec-2022

Client PO: 20-3864

Project Description: Howard Additional Drilling

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 406: Leachate - Metals by ICP-MS	mSPLP EPA 6020 - Digestion - ICP-MS	21-Dec-22	21-Dec-22
Solids, %	CWS Tier 1 - Gravimetric	21-Dec-22	28-Dec-22

Certificate of Analysis

Report Date: 28-Dec-2022

Client: **Dillon Consulting Ltd (Windsor)**

Order Date: 9-Dec-2022

Client PO: **20-3864**

Project Description: Howard Additional Drilling

Summary of Criteria Exceedances

(If this page is blank then there are no exceedances)

Only those criteria that a sample exceeds will be highlighted in red

Regulatory Comparison:

Paracel Laboratories has provided regulatory guidelines on this report for informational purposes only and makes no representations or warranties that the data is accurate or reflects the current regulatory values. The user is advised to consult with the appropriate official regulations to evaluate compliance. Sample results that are highlighted have exceeded the selected regulatory limit. Calculated uncertainty estimations have not been applied for determining regulatory exceedances.

Sample	Analyte	MDL / Units	Result	-	-

Certificate of Analysis

Report Date: 28-Dec-2022

Client: **Dillon Consulting Ltd (Windsor)**

Order Date: 9-Dec-2022

Client PO: 20-3864

Project Description: Howard Additional Drilling

	Client ID:	BH22-203_3	BH22-205_3	-	-	-	-
	Sample Date:	08-Dec-22 12:17	08-Dec-22 12:54	-	-		
	Sample ID:	2252034-01	2252034-02	-	-		
	Matrix:	Soil	Soil	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	89.2	83.4	-	-	-	-
mSPLP Leachate Metals							
Antimony	0.5 ug/L	<0.5	<0.5	-	-	-	-
Arsenic	1 ug/L	<1.0	<1.0	-	-	-	-
Barium	1 ug/L	5.7	7.7	-	-	-	-
Beryllium	0.5 ug/L	<0.5	<0.5	-	-	-	-
Boron	10 ug/L	14.9	22.7	-	-	-	-
Cadmium	0.2 ug/L	<0.2	<0.2	-	-	-	-
Chromium	1 ug/L	3.5	1.5	-	-	-	-
Cobalt	0.5 ug/L	<0.5	<0.5	-	-	-	-
Copper	0.5 ug/L	0.6	2.2	-	-	-	-
Lead	0.2 ug/L	0.2	0.2	-	-	-	-
Molybdenum	0.5 ug/L	21.3	33.0	-	-	-	-
Nickel	1 ug/L	1.6	<1.0	-	-	-	-
Selenium	1 ug/L	<1.0	<1.0	-	-	-	-
Silver	0.2 ug/L	<0.2	<0.2	-	-	-	-
Thallium	0.5 ug/L	<0.5	<0.5	-	-	-	-
Uranium	0.2 ug/L	<0.2	0.4	-	-	-	-
Vanadium	0.5 ug/L	2.1	4.4	-	-	-	-
Zinc	5 ug/L	<5.0	<5.0	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
mSPLP Leachate Metals								
Antimony	ND	0.5	ug/L					
Arsenic	ND	1.0	ug/L					
Barium	ND	1.0	ug/L					
Beryllium	ND	0.5	ug/L					
Boron	ND	10.0	ug/L					
Cadmium	ND	0.2	ug/L					
Chromium	ND	1.0	ug/L					
Cobalt	ND	0.5	ug/L					
Copper	ND	0.5	ug/L					
Lead	ND	0.2	ug/L					
Molybdenum	ND	0.5	ug/L					
Nickel	ND	1.0	ug/L					
Selenium	ND	1.0	ug/L					
Silver	ND	0.2	ug/L					
Thallium	ND	0.5	ug/L					
Uranium	ND	0.2	ug/L					
Vanadium	ND	0.5	ug/L					
Zinc	ND	5.0	ug/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
mSPLP Leachate Metals									
Antimony	ND	0.5	ug/L	ND			NC	50	
Arsenic	ND	1.0	ug/L	ND			NC	50	
Barium	2.30	1.0	ug/L	2.19			4.9	50	
Beryllium	ND	0.5	ug/L	ND			NC	50	
Boron	ND	10.0	ug/L	ND			NC	50	
Cadmium	ND	0.2	ug/L	ND			NC	50	
Chromium	ND	1.0	ug/L	ND			NC	50	
Cobalt	ND	0.5	ug/L	ND			NC	50	
Copper	5.03	0.5	ug/L	ND			NC	50	
Lead	0.31	0.2	ug/L	ND			NC	50	
Molybdenum	1.07	0.5	ug/L	ND			NC	50	
Nickel	ND	1.0	ug/L	ND			NC	50	
Selenium	ND	1.0	ug/L	ND			NC	50	
Silver	0.20	0.2	ug/L	ND			NC	50	
Thallium	ND	0.5	ug/L	ND			NC	50	
Uranium	ND	0.2	ug/L	ND			NC	50	
Vanadium	1.03	0.5	ug/L	0.98			4.8	50	
Zinc	ND	5.0	ug/L	ND			NC	50	
Physical Characteristics									
% Solids	91.4	0.1	% by Wt.	92.6			1.3	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
mSPLP Leachate Metals									
Antimony	52.6	0.5	ug/L	ND	105	70-130			
Arsenic	52.8	1.0	ug/L	ND	106	70-130			
Barium	55.4	1.0	ug/L	2.19	106	70-130			
Beryllium	48.9	0.5	ug/L	ND	97.8	70-130			
Boron	58.3	10.0	ug/L	ND	117	70-130			
Cadmium	50.4	0.2	ug/L	ND	101	70-130			
Chromium	52.9	1.0	ug/L	ND	106	70-130			
Cobalt	52.5	0.5	ug/L	ND	105	70-130			
Copper	57.0	0.5	ug/L	ND	114	70-130			
Lead	54.9	0.2	ug/L	ND	110	70-130			
Molybdenum	55.5	0.5	ug/L	ND	111	70-130			
Nickel	52.5	1.0	ug/L	ND	105	70-130			
Selenium	51.0	1.0	ug/L	ND	102	70-130			
Silver	54.7	0.2	ug/L	ND	109	70-130			
Thallium	55.5	0.5	ug/L	ND	111	70-130			
Uranium	52.3	0.2	ug/L	ND	105	70-130			
Vanadium	53.7	0.5	ug/L	0.98	105	70-130			
Zinc	51.8	5.0	ug/L	ND	104	70-130			

Qualifier Notes:

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

Soil results are reported on a dry weight basis unlesss otherwise noted.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

Paracel ID: 2252034

PARACE LABORATORIES L

Paracel Order Number (Lab Use Only): 2250530

Chain Of Custody (Lab Use Only): № 68957

Page 1 of 4

Client Name:	Dillon Consulting Ltd.
Contact Name:	Matthew Antunes
Address:	3200 Deziel Drive suite 608, Windsor, ON N8W 5K5
Telephone:	519-992-7270
Project Ref:	Howard Additional Drilling
Quote #:	22-737
PO #:	20-3864
E-mail:	mantunes@dillon.ca; disabelle@dillon.ca

Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular — Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ Other:

☐ Table 1 ☐ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table — For RSC: ☐ Yes ☐ No

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Required Analysis: PHCs (F1 to F4)	M/I BTEX	Hg for M/I & BTEX
1	BH22-201_1	S		2	8-Dec-22	11:15am	X		X
2	BH22-201_2					11:27am	X		X
3	BH22-201_3					11:20am	X		X
4	BH22-202_1					10:54am	X		X
5	BH22-202_2					10:56am	X		X
6	BH22-202_3					11:03am	X		X
7	BH22-203_1					12:10pm	X	X X	
8	BH22-203_2					12:14pm	X	X X	
9	BH22-203_3					12:17pm	X	X X	
10	BH22-204_1					10:30am	X		X

Comments: Hold remainder of samples for MSPLP and/or TCLP analysis

Relinquished By (Sign):	Received By Driver/Depot: K. Jakobsen	Received at Lab: A. Lindsay	Method of Delivery: Walk in
Relinquished By (Print): Matthew A	Date/Time: Dec. 9/22 13:30	Date/Time: 12/10/22 11:50	Verified By: K. Jakobsen
Date/Time: 9-Dec-22 11:15 PM	Temperature: 6.2 °C	Temperature: 3.5 °C	Date/Time: Dec. 9/22 15:00
			pH Verified: ☐ By:

Chain of Custody (Blank).xlsx

Revision 4.0

Paracel ID: 2252034

PARACEL LABORATORIES

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2250530	№ 68958

Client Name: Dillon Consulting Ltd.
Contact Name: Matthew Antonyn
Address: 3200 Deziel Dr, Suite 606, Windsor, ON N8W 5K8
Telephone: 519-992-7270

Project Ref: Howard additional Sampling
Quote #: 22-737
PO #: 20-3804
E-mail: mantonyn@dillon.ca, dlisabelle@dillon.ca

Page 2 of 4

Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ Other:

☐ Table 1 ☐ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table
For RSC: ☐ Yes ☐ No

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs (F1-F4)	~~Metals~~	BTEX	Inorganics							Hold for BTEX	Hold for PHCs	Hold for M/I, BTEX
1	BH22-204_2	S		2	8-Dec-22	10:30am	X												X
2	BH22-204_3					10:37am	X	X	X	X									X
3	BH22-205_1					12:27pm	X	X	X	X									
4	BH22-205_2					12:49pm	X	X	X	X									
5	BH22-205_3					12:54pm	X	X	X	X									
6	BH22-206_1					9:43am	X	X											
7	BH22-206_2					9:46am		X											
8	BH22-206_3					9:49am		X										X	
9	BH22-208_1					2:48PM	X	X	X	X								X	
10	BH22-208_2					2:51PM	X	X		X							X		

Comments: See pg 1 comments

Method of Delivery: Walk in

Relinquished By (Sign): [signature]
Relinquished By (Print): Matthew. A
Date/Time: 9-Dec-22 1:15pm

Received by Driver/Depot: K. Jakobsen
Date/Time: Dec. 9/22 13:30
Temperature: 6.2 °C

Received at Lab:
Date/Time:
Temperature: °C

Verified By: K. Jakobsen
Date/Time: Dec. 9/22 15:00
pH Verified: ☐ By:

Chain of Custody (Blank).xlsx
Revision 4.0

Paracel ID: 2252034

PARACE LABORATORIES L

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2250530	№ 68959

Client Name: Dillon Consulting Ltd.
Contact Name: Matthew Antonyan
Address: 3200 Deziel Dr, Suite 608, Windsor, ON, N8W 5K5
Telephone:

Project Ref: Howard Additional Drilling
Quote #: 22-737
PO #: 20-3864
E-mail: mantonyan@dillon.ca
dsabelle@dillon.ca

Page 3 of 4

Turnaround Time
☐ 1 day ☐ 3 day
☐ 2 day ☒ Regular
Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ Other:

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table
For RSC: ☐ Yes ☐ No

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHC (F1-F4)	Metals	Inorganics	BTEX	Hold for BTEX
1	BH22-208-3	S		2	8-Dec 22	2:56PM	X	X	X		X
2	BH22-209-1					2:26PM	X	X	X	X	
3	BH22-209-2					2:29PM	X	X	X	X	
4	BH22-209-3					2:35PM	X	X	X	X	
5	BH22-210					3:45PM	X	X	X	X	
6	BH22-211				9-Dec-22	12:35PM		X			
7	BH22-212					12:25PM		X			
8	BH22-213					12:45PM		X			
9	BH22-214					12:05PM		X			
10	BH22-215					11:47AM		X			

Comments: See pg 1 comments

Method of Delivery: walk in

Relinquished By (Sign): MA
Relinquished By (Print): Matthew A
Date/Time: 9Dec-22

Received at Driver/Depot: K. Jakobsen
Date/Time: Dec. 9/22 13:30
Temperature: 6.2 °C

Received at Lab:
Date/Time:
Temperature: °C

Verified By: K. Jakobsen
Date/Time: Dec. 9/22 15:00
pH Verified: ☐ By:

Chain of Custody (Blank).xlsx
Revision 3.0

PARAC LABORATORIES

Paracel ID: 2252034

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2250530	№ 68960

Client Name: Dillon Consulting Ltd.
Contact Name: Matthew Antonyan
Address: 3200 Deziel Drive Suite 608, Windsor, ONT N8W 5K5
Telephone: 519-992-7270

Project Ref: Howard Additional Drilling
Quote #: 22-757
PO #: 20-3864
E-mail: mantonyan@dillon.ca, dsabelle@dillon.ca

Page 1 of 1

Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Date Required:

☐ REG 153/04 ☒ REG 406/19

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm ☐ Mun: ☐ Other:

☐ Table 1 ☐ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table
For RSC: ☐ Yes ☐ No

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analysis: Metals	PHCs (F1-F4)	Inorganics	BTEX
1	BH22-216	S		2	9-Dec-22	11:18am	X			
2	BH22-DUP1	↓		↓	8-Dec-22	10:37am	X	X	X	X
3	BH22-DUP2				8-Dec-22	11:15am	X	X	X	X
4										
5										
6										
7										
8										
9										
10										

Comments: See PSI Comments

Method of Delivery: walk in

Relinquished By (Sign): [signature]
Relinquished By (Print): Matthew A
Date/Time: 9-Dec-22 / 1:15 PM

Received by Driver/Depot: K. Jukobsen
Date/Time: Dec. 9/22 13:30
Temperature: 0.2 °C

Received at Lab:
Date/Time:
Temperature: °C

Verified By: K. Jukobsen
Date/Time: Dec. 9/22 15:00
pH Verified: ☐ By:

Chain of Custody (Blank).xlsx
Revision 4.0

Appendix B

Laboratory Correspondence

DILLON CONSULTING

Antaya, Matthew <mantaya@dillon.ca>

2224237 PHC Raised DLs

7 messages

Patrick Bellamy <PBellamy@paracellabs.com> Fri, Sep 2, 2022 at 10:43 AM
To: "Antaya, Matthew" <mantaya@dillon.ca>

Hi Matthew,

I have spoken to our lab manager and he explained the reasoning behind the raised DLs for PHCs.

In this case the Detection limits were raised due to dilution. When the analyst visual inspected the extracts prior to running, they appeared to be impacted. The analyst made the decision to dilute as failure to do so may cause off scale results and damage to the instrument. The analyst accepted the data based on that there were PHC hits above the raised detection limits. Unfortunately with high amounts of F4 PHC in the sample in question it was not possible to quantify with confidence below the raised detection limit for some fractions.

Let me know if this covers what you need for your report. If there is any extra info required do not hesitate to reach out.

Have a great day,

Patrick Bellamy

Account Manager

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Windsor, Ontario, N9A 6J3

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c: (519) 562-7230

t: 1-800-749-1947

PBellamy@paracellabs.com

www.paracellabs.com

2022 Price Adjustment

Paracel Laboratories Ltd. Holiday Hours

New Ontario Regulation 406/19

Paracel's Asbestos PLM Accreditations now covered by CALA!

COVID 19 Update

Paracel continues to take strong measures to ensure the health, safety and well-being of our employees and clients. While our reception areas may be closed, we are open for contactless sample drop off and bottle order pickups. Our service group remains available by phone and email to assist you.

Take care and stay healthy.

Antaya, Matthew <mantaya@dillon.ca> Fri, Sep 2, 2022 at 10:45 AM
To: Denise Isabelle <disabelle@dillon.ca>

See email from patrick. Let me know if you want me to revise our follow plan because of this
[Quoted text hidden]
--

Matthew Antaya
Dillon Consulting Limited
3200 Deziel Drive, Suite 608
Windsor, Ontario, N8W 5K8
T - 519.948.4243 ext. 3203
F - 519.948.5054
mantaya@dillon.ca
www.dillon.ca

Denise Isabelle <disabelle@dillon.ca> Fri, Sep 2, 2022 at 2:22 PM
To: "Antaya, Matthew" <mantaya@dillon.ca>

Hi Matt -
Just taking a look at this answer - is Patrick saying that they accepted the elevated RDLs based on the PHC exceedances we found at other samples or did we have actual measurable PHC fractions in the same sample as the elevated RDL for PHC F2?
What PHC F4 exceedances is he talking about? Did we have PHC F4 as a real concentration at a sample location that had an RDL issue? Is that true for all the RDL issues we had for this project?

Are these locations where we sampled under asphalt? Is it possible that we had elevated F4 present because of that, which unfortunately resulted in the lab elevating the RDL for the others?

Denise Isabelle
Associate
Dillon Consulting Limited
12 James St. N Suite 401
Hamilton, Ontario, L8R 2J9
T - 905.901.2912 ext. 3420
F - 905.901.2918
M - 905.407.2388
DIsabelle@dillon.ca
www.dillon.ca

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Antaya, Matthew <mantaya@dillon.ca> Fri, Sep 2, 2022 at 2:42 PM
To: Denise Isabelle <disabelle@dillon.ca>, Patrick Bellamy <PBellamy@paracellabs.com>

Hello Denise,

I have included Patrick in the email to provide clarification. It is my understanding these findings were attributed to both the 'BH22-' (topsoil and clay) series IDs and the 'GR22-' series IDs (granular). Based on our conversation, it sounds like all samples with raised RDLS were PHC hits that needed to be diluted.

I looked at the results regarding your F4 question. The Bh22 samples that exceeded non-detect for F2 did not exceed F4 for any samples, whereas most granular samples (with the exception of two) that had raised F2 RDLs had high F4 concentrations. So it could be impacts from asphalt for sure, as for the F4 affecting the F2 RDLs, I will leave that question for Patrick to answer.

Thank you,

Matthew Antaya
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Patrick Bellamy <PBellamy@paracellabs.com> Fri, Sep 2, 2022 at 3:20 PM
To: "Antaya, Matthew" <mantaya@dillon.ca>, Denise Isabelle <disabelle@dillon.ca>

Hi Denise,

For BH22-110_1 – the sample required dilution due to the High levels of PHCs within. In particular Fraction 4. With the high levels of F4 we had to dilute for the whole F2-F4 portions of the testing as all fractions are run from the same extract on the same analytical run. This decision was based on the qualities of the extract for this sample and was not affected by the qualities of any other sample.

The same dilution approach was taken with the granular samples with high reading for F4.

I included a picture with this just to show the PHC F4 Lab hit that I was describing

BH22-110_1 06-Jun-22 08:08 2224237-18
Soil
106%
<7
<40 [1]
304
910 [2]
272

Let me know if this answers your question. If not let me know and I will do my best to provide you with more information.

Have a great day!

Patrick Bellamy

Account Manager

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1780 North Talbot rd, unit 2

Windsor, Ontario, N9A 6J3

p: (519) 988-7689

c: (519) 562-7230

t: 1-800-749-1947

PBellamy@paracellabs.com

www.paracellabs.com

2022 Price Adjustment

Paracel Laboratories Ltd. Holiday Hours

New Ontario Regulation 406/19

Paracel's Asbestos PLM Accreditations now covered by CALA!

COVID 19 Update

Paracel continues to take strong measures to ensure the health, safety and well-being of our employees and clients. While our reception areas may be closed, we are open for contactless sample drop off and bottle order pickups. Our service group remains available by phone and email to assist you.

Take care and stay healthy.

From: Antaya, Matthew [mailto:mantaya@dillon.ca]
Sent: Friday, September 2, 2022 2:42 PM
To: Denise Isabelle <disabelle@dillon.ca>; Patrick Bellamy <PBellamy@paracellabs.com>
Subject: Re: 2224237 PHC Raised DLs

[Quoted text hidden]

Antaya, Matthew <mantaya@dillon.ca> Thu, Jan 26, 2023 at 10:51 AM
To: Patrick Bellamy <PBellamy@paracellabs.com>
Cc: Denise Isabelle <disabelle@dillon.ca>

Good Morning Patrick,

Just wanted to revisit this discussion we had back in September. Based on what was discussed above, the elevated RDLs for PHC F2 in report no. 2224237 were based on high concentrations of PHC F4 which required sample dilution, specifically with the granular samples that were collected. However, in our additional sampling completed at the site in December (report no. 2250530), the granular samples showed similar or higher concentrations of PHC F4, with the RDLs of PHC F2 not elevated.

I have attached both CofAs for your reference. Please advise.

Thank you,

Matthew Antaya
[Quoted text hidden]

2 attachments

2250530 FINAL 16 Dec 22 0931.PDF
861K

2224237 FINAL 16 Jun 22 0840.PDF
1037K

Patrick Bellamy <PBellamy@paracellabs.com> Thu, Jan 26, 2023 at 11:48 AM
To: "Antaya, Matthew" <mantaya@dillon.ca>
Cc: Denise Isabelle <disabelle@dillon.ca>

Hi Matthew,

I forwarded your question to our Lab director Dale and he explained*:*

The decision to dilute a PHC extract is made by the analyst running the sample. It is subjective, and the analyst considers the qualities of the extract including colour and viscosity, and any other information they might have regarding the sample when deciding if a dilution is necessary. As this is a subjective assessment, different analyst may come to a different decision based on their past experiences. The intent of diluting an extract prior to analysis by GC-FID is to avoid overloading the instrument which could result in false positives for subsequent samples and unnecessary instrument down time for maintenance and cleaning. We generally do not re-run diluted extracts at a higher concentration to avoid potential instrument issues.

Let me know if have any questions and I will do my best to get you answers ASAP.

Best regards,

Patrick Bellamy

Account Manager

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1780 North Talbot rd, unit 2

Windsor, Ontario, N9A 6J3

p: (519) 988-7689

c: (519) 562-7230

t: 1-800-749-1947

PBellamy@paracellabs.com

www.paracellabs.com

Bulk Asbestos Sample Submission Details

Paracel Laboratories Ltd. 2023 Fee increase

New Ontario Regulation 406/19

[Quoted text hidden]

Appendix C

Borehole Logs

Borehole ID: BH22-101

DILLON CONSULTING

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 7, 2022 Date Completed: June 7, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	TOPSOIL								*Patched using Coldpatch Asphalt*	
	GRAVEL Granular Material			0.22						
1	**SILTY CLAY** Brown with grey mottling into dark grey (at 0.9 mbgs), DPL, stiff, some gravel			0.55	BH22-101_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	70			
2	**SILTY CLAY** Blueish-grey to black (at 0.42 mbgs) to brown with grey mottling (at 0.75 mgs), soft to firm with depth, trace gravel			1.52	BH22-101_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	100		*Backfilled to surface with bentonite*	
3	End of borehole at 3.04 m bgs (10 ft)			3.04						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Organics; Sandy Gravel; Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-102

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 7, 2022 Date Completed: June 7, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	ASPHALT								*Patched using Coldpatch Asphalt*	
	CLAY Dark grey with brown mottling to brown with grey mottling (at 1.52 mbgs), firm, APL, trace gravel Soil is black at 0.34 to 0.63 mbgs			0.34	BH22-102_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	71			
1									*Backfilled to surface with bentonite*	
					BH22-102_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0				
2							100			
3	End of borehole at 3.04 m bgs (10 ft)			3.04						
	Notes: 1) **APL** = At plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons									
4										

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Asphalt, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-104

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 6, 2022 Date Completed: June 6, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	GRAVEL Granular Material				GR22-104 (SAR, EC, Cyanide, Metals, BTEX, PHCs)	0/0			*Patched using Coldpatch Asphalt*	
	SAND Dark brown, homogeneous, loose, damp			0.57						
	CLAY Dark grey, stiff, DPL, some gravel			0.67	BH22-104_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	5/0	64			
1										
	CLAY Brown, trace grey mottling, stiff, some gravel, black smearing on side of core			1.65	BH22-104_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	85/0			*Backfilled to surface with bentonite*	
2							100			
3	End of borehole at 3.17 m bgs (10.4 ft)			3.17						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples (GR22) were collected prior to continuous samples via direct push									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Gravel, Sand, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-105

DILLON CONSULTING

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 6, 2022 Date Completed: June 6, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	GRAVEL Granular Material				GR22-105 (SAR, EC, Cyanide, Metals, BTEX, PHCs)	10/0			*Patched using Coldpatch Asphalt*	
	SAND Dark brown, homogeneous, loose, damp			0.5						
1	**CLAY** Brown, with grey mottling, stiff, DPL, trace gravel, black smearing on side			0.67	BH22-105_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	5/0	59			
	No mottling at 1.65 mbgs				BH22-105_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	5/0			*Backfilled to surface with bentonite*	
2							100			
3	End of borehole at 3.17 m bgs (10.4 ft)			3.17						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples (GR22) were collected prior to continuous samples via direct push									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Gravel, Sand, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-106

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 6, 2022 Date Completed: June 6, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	TOPSOIL								*Patched using Coldpatch Asphalt*	
	SILTY CLAY Brown, trace grey mottling, soft to stiff with depth, DPL, trace gravel			0.23	BH22-106_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	66			
1										
	SILT Grey, very soft, saturated			1.52					*Backfilled to surface with bentonite*	
	SILTY CLAY Brown, trace grey mottling, stiff, DPL, trace gravel			1.67	BH22-106_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	100			
2										
3	End of borehole at 3.04 m bgs (10 ft)			3.04						
4										

Notes:
1) **DPL** = Drier than plastic limit.
2) **m bgs** = meters below ground surface
3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons

LITHOLOGY SYMBOLS: Organics, Clay, Silt

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-107

DILLON CONSULTING

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 6, 2022 Date Completed: June 6, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	CONCRETE								*Patched using Coldpatch Asphalt*	
	GRAVEL Granular Material			0.11	GR22-102 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0				
	SILTY CLAY Greyish-blue, brown mottling, soft, APL, trace gravel			0.22	BH22-107_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	20/0				
1							61			
	SILTY CLAY Brown, stiff, DPL, trace gravel			1.74					*Backfilled to surface with bentonite*	
2					BH22-107_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	100			
3	End of borehole at 3.26 m bgs (10.7 ft)			3.26						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **APL** = At plastic limit. 3) **m bgs** = meters below ground surface 4) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 5) Concrete/asphalt was augured to Granular material. Granular samples (GR22) were collected prior to continuous samples via direct push.									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Concrete; Gravel; Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-108

DILLON CONSULTING

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 6, 2022 Date Completed: June 6, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	GRAVEL Granular Material				GR22-101 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0			*Patched using Coldpatch Asphalt*	
	SILTY CLAY Brown, some grey mottling, firm, trace gravel, APL			0.52	BH22-108_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	5/0	67		*Backfilled to surface with bentonite*	
1										
2					BH22-108_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	100			
3										
	End of borehole at 3.44 m bgs (11.3 ft)			3.44						
4	**Notes:** 1) **APL** = At plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples (GR22) were collected prior to continuous samples via direct push.									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Gravel, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-109

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 6, 2022 Date Completed: June 6, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	ASPHALT								*Patched using Coldpatch Asphalt*	
	GRAVEL Granular Material			0.2	GR22-103 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0				
	SAND Dark Brown, damp, loose, some gravel			0.45						
1	**SILTY CLAY** Grey, with brown mottling, stiff, DPL, trace gravel			0.61	BH22-109_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	53		*Backfilled to surface with bentonite*	
2					BH22-109_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	5/0	100			
3	End of borehole at 3.24 m bgs (10.6 ft)			3.24						
4	**Notes:** 1) **APL** = At plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 4) Concrete/ashphalt was augured to Granular material. Granular samples (GR22) were collected prior to continuous samples via direct push.									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Asphalt, Gravel, Sand, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-112

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 7, 2022 Date Completed: June 7, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	TOPSOIL								*Patched using Coldpatch Asphalt*	
	SILTY CLAY Brown, with orange and grey mottling, DPL, stiff, trace gravel			0.2	BH22-112_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	100			
1										
	No mottling at 1.52 mbgs				BH22-112_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	100		*Backfilled to surface with bentonite*	
2										
3	End of borehole at 3.04 m bgs (10 ft)			3.04						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Organics, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-113

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 6, 2022 Date Completed: June 6, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	ASPHALT								*Patched using Coldpatch Asphalt*	
	GRAVEL Granular Material			0.25	GR22-106 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0				
1	**SILTY CLAY** Grey, with brown mottling, stiff, DPL, trace gravel			0.45	BH22-113_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	59		*Backfilled to surface with bentonite*	
2	**SILTY CLAY** Brown, stiff, DPL, some gravel			1.97	BH22-113_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	100			
3	End of borehole at 3.49 m bgs (11.5 ft)			3.49						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples (GR22) were collected prior to continuous samples via direct push.									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Asphalt, Gravel, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-114

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 6, 2022 Date Completed: June 6, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	GRAVEL Granular Material								*Patched using Coldpatch Asphalt*	
	SILTY CLAY Dark grey, brown mottling, firm, DPL, trace gravel			0.5	BH22-114_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	60		*Backfilled to surface with bentonite*	
1										
	SILTY CLAY Brown, very stiff, DPL			1.89	BH22-114_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	100			
2										
3										
	End of borehole at 3.41 m bgs (11.2 ft)			3.41						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples (GR22) were collected prior to continuous samples via direct push.									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Gravel, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-115

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 7, 2022 Date Completed: June 7, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	TOPSOIL								*Patched using Coldpatch Asphalt*	
	SILTY CLAY Brown, orange mottling, DPL, stiff, trace gravel			0.3	BH22-115_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	90			
1										
	trace grey mottling at 1.52 mbgs								*Backfilled to surface with bentonite*	
					BH22-115_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0				
2							100			
3	End of borehole at 3.04 m bgs (10 ft)			3.04						
	Notes: 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons									
4										

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Organics, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-116

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 6, 2022 Date Completed: June 6, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	ASPHALT								*Patched using Coldpatch Asphalt*	
	SILTY CLAY Brown, grey mottling (trace at 1.97 mbgs), stiff, DPL, trace gravel			0.45	BH22-116_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	50			
1										
2					BH22-116_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0	100		*Backfilled to surface with bentonite*	
3										
	End of borehole at 3.49 m bgs (11.5 ft)			3.49						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Asphalt, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-117

DILLON CONSULTING

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 7, 2022 Date Completed: June 7, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	TOPSOIL			0.02					*Patched using Coldpatch Asphalt*	
	GRAVEL Black, medium to coarse, damp, loose			0.12	BH22-117_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0				
	SILTY CLAY Brown, with orange mottling, black spotting (at 0.12 to 0.4 mbgs), DPL, trace gravel, stiff						74			
1										
	Trace grey mottling at 1.52 mbgs				BH22-117_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	25/0			*Backfilled to surface with bentonite*	
2							100			
3	End of borehole at 3.04 m bgs (10 ft)			3.04						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Organics, Gravel, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-118

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: June 7, 2022 Date Completed: June 7, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	ASPHALT								*Patched using Coldpatch Asphalt*	
	GRAVEL Granular Material			0.2	GR22-107 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	0/0				
	SILTY CLAY Dark grey, with brown mottling, trace gravel, stiff, DPL, concrete dusting on sides of core, clay is black from 0.4 to 0.6 mbgs			0.4	BH22-118_1 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	20/0				
1							43		*Backfilled to surface with bentonite*	
2	**SILTY CLAY** Brown, with grey and orange mottling (up to 2.2 mbgs), DPL, stiff, trace gravel			1.92	BH22-119_2 (SAR, EC, Cyanide, Metals,BTEX,PHCs)	35/0				
3							100			
4	End of borehole at 3.44 m bgs (11.3 ft)			3.44						

Notes:
1) **DPL** = Drier than plastic limit.
2) **m bgs** = meters below ground surface
3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons
4) Concrete/asphalt was augured to Granular material. Granular samples (GR22) were collected prior to continuous samples via direct push.

LITHOLOGY SYMBOLS: Asphalt, Gravel, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

Borehole ID: BH22-201

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: Dec 8, 2022 Date Completed: Dec 8, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	ASPHALT								*Patched using Coldpatch Asphalt*	
	GRAVEL Granular Material			0.15	BH22-201_1 (PHCs)	0/0				
	SAND Reddish-brown, loose, dry			0.4						
	SILTY CLAY Grey to black, some organics and gravel, firm, DPL			0.5	BH22-201_2 (PHCs)	0/0	46			
1										
	SILTY CLAY Brown, stiff, DPL, trace gravel			1.52					*Backfilled to surface with bentonite*	
2							100			
					BH22-201_3 (PHCs)	0/0				
3	End of borehole at 3.04 m bgs (10.0 ft)			3.04						
	Notes: 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples were collected prior to continuous samples via direct push. 5) Lithology information for the 0 m to 1.52 m interval was based on a second borehole redrilled adjacent to the original borehole due to poor recovery.									
4										

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Asphalt, Gravel, Sand, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-202

DILLON CONSULTING

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: Dec 8, 2022 Date Completed: Dec 8, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	GRAVEL Granular Material								*Patched using Coldpatch Asphalt*	
					BH22-202_1 (PHCs)	0/0				
	SAND Brown, homogeneous, moist, loose			0.38						
	SILTY CLAY Brown, grey and orange mottling (trace great mottling at 1.8 m bgs), DPL, stiff			0.58	BH22-202_2 (PHCs)	0/0				
1							58			
2									*Backfilled to surface with bentonite*	
					BH22-201_3 (PHCs)	0/0	78			
3										
	End of borehole at 3.32 m bgs (10.9 ft)			3.32						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples were collected prior to continuous samples via direct push.continuous samples via direct push.									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Gravel, Sand, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-203

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: Dec 8, 2022 Date Completed: Dec 8, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	GRAVEL Granular Material				BH22-203_1 (Metals, EC, SAR, cyanide, BTEX, PHCs)	0/0			*Patched using Coldpatch Asphalt*	
	SILTY CLAY Dark grey, stiff, some gravel, DPL			0.39	BH22-203_2 (Metals, EC, SAR, cyanide, inorganics, BTEX, PHCs)	0/0				
	Light grey at 0.77 m bgs									
1							72			
									Backfilled to surface with bentonite	
	Greenish grey, and soft to stiff (with increasing depth) at 1.79 m bgs									
2	Orange and grey at 2.07 mbgs									
	Brown with trace grey mottling at 2.57 m bgs						100			
3					BH22-203_3 (Metals, EC, SAR, cyanide, inorganics, BTEX, PHCs)	0/0				
	End of borehole at 3.31 m bgs (10.9 ft)			3.31						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples were collected prior to continuous samples via direct push.									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Gravel, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-204

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: Dec 8, 2022 Date Completed: Dec 8, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	ASPHALT								*Patched using Coldpatch Asphalt*	
	GRAVEL Granular Material			0.24	BH22-204_1 (PHCs)	0/0				
	SAND Brown, loose, poorly sorted			0.4	BH22-204_2 (PHCs)	0/0				
1	**SILTY CLAY** Brown, grey and orange mottling, DPL, stiff, trace gravel			0.65			66			
	SILTY CLAY Grey, WTPL, soft, trace light brown mottling, trace gravel			1.52	BH22-204_3 (Metals, EC, SAR, cyanide, inorganics, BTEX, PHCs)	0/0			*Backfilled to surface with bentonite*	
2	**SILTY CLAY** Brown, very stiff, DPL, trace gravel			1.9			71			
3	End of borehole at 3.04 m bgs (10.0 ft)			3.04						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **WTPL** = Wetter than plastic limit. 3) **m bgs** = meters below ground surface 4) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples were collected prior to continuous samples via direct push. 6) Lithology information for the 0 m to 1.52 m interval was based on a second borehole drilled adjacent to the original borehole due to poor recovery.									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Asphalt, Gravel, Sand, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-205

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: Dec 8, 2022 Date Completed: Dec 8, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	GRAVEL Granular Material				BH22-205_1 (Metals, EC, SAR, cyanide, inorganics, BTEX, PHCs)	0/0			*Patched using Coldpatch Asphalt*	
	CONCRETE			0.3						
1	**SILTY CLAY** Black to grey (at 0.87 m bgs), firm, DPL, concrete dusting on core, trace gravel			0.67	BH22-205_2 (Metals, EC, SAR, cyanide, inorganics, BTEX, PHCs)	0/0	40		*Backfilled to surface with bentonite*	
2					BH22-205_3 (Metals, EC, SAR, cyanide, inorganics, BTEX, PHCs)	0/0				
	SILTY CLAY Grey/orange, stiff, DPL, trace gravel Brown with orange and grey mottling at 2.67 m bgs			2.19						
3	Brown with trace grey mottling at 3.07 m bgs						77			
	End of borehole at 3.71 m bgs (12.2 ft)			3.71						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples were collected prior to continuous samples via direct push. 5) Refusal at 0.3 to 0.67 m bgs, first run advanced at 0.67 m bgs.									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Gravel; Concrete; Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-206

DILLON CONSULTING

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: Dec 8, 2022 Date Completed: Dec 8, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	GRAVEL Granular Material								*Patched using Coldpatch Asphalt*	
					BH22-206_1 (Metals, PHCs)	0/0				
	SAND Brown, saturated, coarse to fine grained, poorly sorted, loose			0.4	BH22-206_2 (Metals)	0/0				
1	**SILTY CLAY** Brown, orange and grey mottling, APL, wet on sides of core, trace gravel			0.78	BH22-206_3 (Metals)	0/0	54		*Backfilled to surface with bentonite*	
	End of borehole at 1.77m bgs (5.8 ft)			1.77						
2	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **APL** = At plastic limit. 3) **m bgs** = meters below ground surface 4) **PHC** = Petroleum Hydrocarbons 5) Concrete/asphalt was augured to Granular material. Granular samples were collected prior to continuous samples via direct push.									
3										

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Gravel, Sand, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-208

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: Dec 8, 2022 Date Completed: Dec 8, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	GRAVEL Granular Material								*Patched using Coldpatch Asphalt*	
					BH22-208_1 (Metals, EC, SAR, cyanide, BTEX, PHCs)	0/0				
	SAND Brown, homogeneous, loose, dry			0.52						
	SILTY CLAY Brown, orange and grey mottling (mottling stops at 1.84 m bgs), stiff to very stiff (at 1.84 m bgs), DPL, trace gravel			0.69	BH22-208_2 (Metals, EC, SAR, cyanide, inorganics, PHCs)	0/0				
1							61			
2					BH22-203_3 (Metals, EC, SAR, cyanide, inorganics, PHCs)	0/0				
							100		*Backfilled to surface with bentonite*	
3										
	End of borehole at 3.36 m bgs (11.0 ft)			3.36						
4	**Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples were collected prior to continuous samples via direct push.									

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Gravel, Sand, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Borehole ID: BH22-209

DILLON CONSULTING

Client: City of Windsor
Project No.: 20-3864
Drilling Co.: Landshark Drilling
Observer: M.Antaya

Project: Howard-South Cameron Intersection
Location : Windsor, ON
Drilling Method: Direct Push (Geoprobe 7822DT)
Date Started: Dec 8, 2022 Date Completed: Dec 8, 2022

Depth Scale (m)	Stratigraphic Description	Letter Symbol	Stratigraphy	Depth (m)	Sample: Soil Sample ID (analysis)	Sample: Vapour OVM/PID*	Sample: Rec %	Sample: Blows/6"	Borehole Completion Detail	Elev. (m asl)
	GRAVEL Granular Material				BH22-209_1 (Metals, EC, SAR, cyanide, BTEX, PHCs)	0/0			*Patched using Coldpatch Asphalt*	
1	**SILTY CLAY** Brown, grey and orange mottling, DPL, stiff			0.72	BH22-209_2 (Metals, EC, SAR, cyanide, BTEX, PHCs)	0/0	67		*Backfilled to surface with bentonite*	
2	**SILTY CLAY** Grey, orange mottling into brown (at 2.10 m bgs), DPL, very stiff, trace gravel			1.82	BH22-209_3 (Metals, EC, SAR, cyanide, BTEX, PHCs)	0/0	81			
3										
4	End of borehole at 3.34 m bgs (11.0 ft) **Notes:** 1) **DPL** = Drier than plastic limit. 2) **m bgs** = meters below ground surface 3) **SAR** = Sodium Adsorption Ratio;**EC** = Electrical Conductivity;**BTEX** = Benzene, Toluene, Ethylbenzene, Xylene;**PHC** = Petroleum Hydrocarbons 4) Concrete/asphalt was augured to Granular material. Granular samples were collected prior to continuous samples via direct push.			3.34						

DILLON MW MOD 20-3864 - HOWARD SOUTH CAM.GPJ 23-1-25

LITHOLOGY SYMBOLS: Gravel, Clay

Casing: n/a
Grade Elevation (m asl) :
Reference Point Elevation (m asl) : n/a

Appendix D

Sample Location Survey Data

Survey Data			
Location ID	Easting (m)	Northing (m)	Elevation (mASL)
BH22-101	334722.32	4681991.59	187.35
BH22-102	334759.33	4681917.45	186.87
BH22-102_B	334742.71	4681956.00	187.47
BH22-103	334810.87	4681913.91	186.78
BH22-104	334856.28	4681851.23	187.19
BH22-105	334891.46	4681817.52	187.32
BH22-106	334955.86	4681784.69	187.59
BH22-107	334983.55	4681806.90	187.16
BH22-108	335019.50	4681852.33	186.78
BH22-109	334999.93	4681729.32	187.67
BH22-110	334957.59	4681739.58	187.70
BH22-111	334931.46	4681759.99	187.86
BH22-112	334915.02	4681700.35	187.27
BH22-113	334897.54	4681582.14	187.26
BH22-114	334875.09	4681632.21	187.11
BH22-115	334871.74	4681687.34	187.20
BH22-116	334839.28	4681713.01	187.12
BH22-117	334776.48	4681801.96	187.02
BH22-118	334729.19	4681845.48	186.72
BH22-119	334830.95	4681753.46	187.11
BH22-120	334971.31	4681796.91	187.46
BH22-201	334681.08	4682115.55	186.07
BH22-202	334712.01	4682052.52	186.28
BH22-203	334708.87	4682006.79	187.08
BH22-204	334737.02	4682011.85	186.45
BH22-205	334734.49	4681950.87	187.15
BH22-206	334808.54	4681911.63	186.87
BH22-208	335064.53	4681677.79	187.90
BH22-209	335115.22	4681638.79	187.97
BH22-211	334786.40	4681946.13	186.82
BH22-212	334825.54	4681894.61	186.78
BH22-213	334795.98	4681890.56	187.60
BH22-214	334942.65	4681779.37	187.56
BH22-215	335050.90	4681667.98	187.68

Notes:
1)Boreholes were surveyed using a Trimble GPS R10 with an accuracy of +/- 0.020 m.
2)Elevations were surveyed using City of Windsor Benchmarks.

Settlement Monitoring Requirements

Settlement Monitoring Scheme Requirements:

1. Summary of Proposed Settlement Monitoring:
    a. Geographical Location
    b. Number of Settlement Monitoring Probes
    c. Type of Probe & Installation Method
    d. Expected Amount of Settlement (mm)
    e. Frequency of Monitoring
    f. Duration of Monitoring
2. Site Plan:
    a. Site Plan
    b. Identify Probe Locations and Offset Distances to Nearest Rails
    c. Elevation of Top-of-Probes
3. Probe Detail Drawing:
    a. Show section through Railway Track Road Bed
    b. Existing Ground Line
    c. Depth of Bore
    d. Distance to Bottom-of-Probe to Top of Casing Pipe
4. Log of Survey Results
    a. Station
    b. Date and Elevation of Initial Readings
    c. Date and Elevation of Subsequent Readings
    d. Differences in Elevation

Settlement Monitoring Duration:

Pre Construction:

- Survey 1 week prior to construction
    - Survey a minimum of 2 times daily for baseline measure

During Construction:

- Survey a minimum of 2 times daily for duration of project

Post Construction:

- Survey twice daily for 2 Weeks after project completion
- After these 2 weeks if there is little to no settlement then continue surveying once a month for 3 months.

Settlement Monitoring

Please note that all buried casings (10") and greater within the CN Right-of-way, require a review by the Railway of a complete Geotechnical Investigation that includes comments and recommendations with respect to the construction methodology to be employed for the utility installation.

In addition, a form of settlement monitoring is required, and for this purpose, we suggest a Geotechnical Engineer be retained and that the Engineer submit a proposal for an in-ground settlement monitors. The proposal must provide for the reading of in-ground settlement monitoring points[(1)] and surface settlement monitoring points[(2)] elevations prior to, during, and following the utility installation and must be sent to CN for review.

(1) ***Inground***

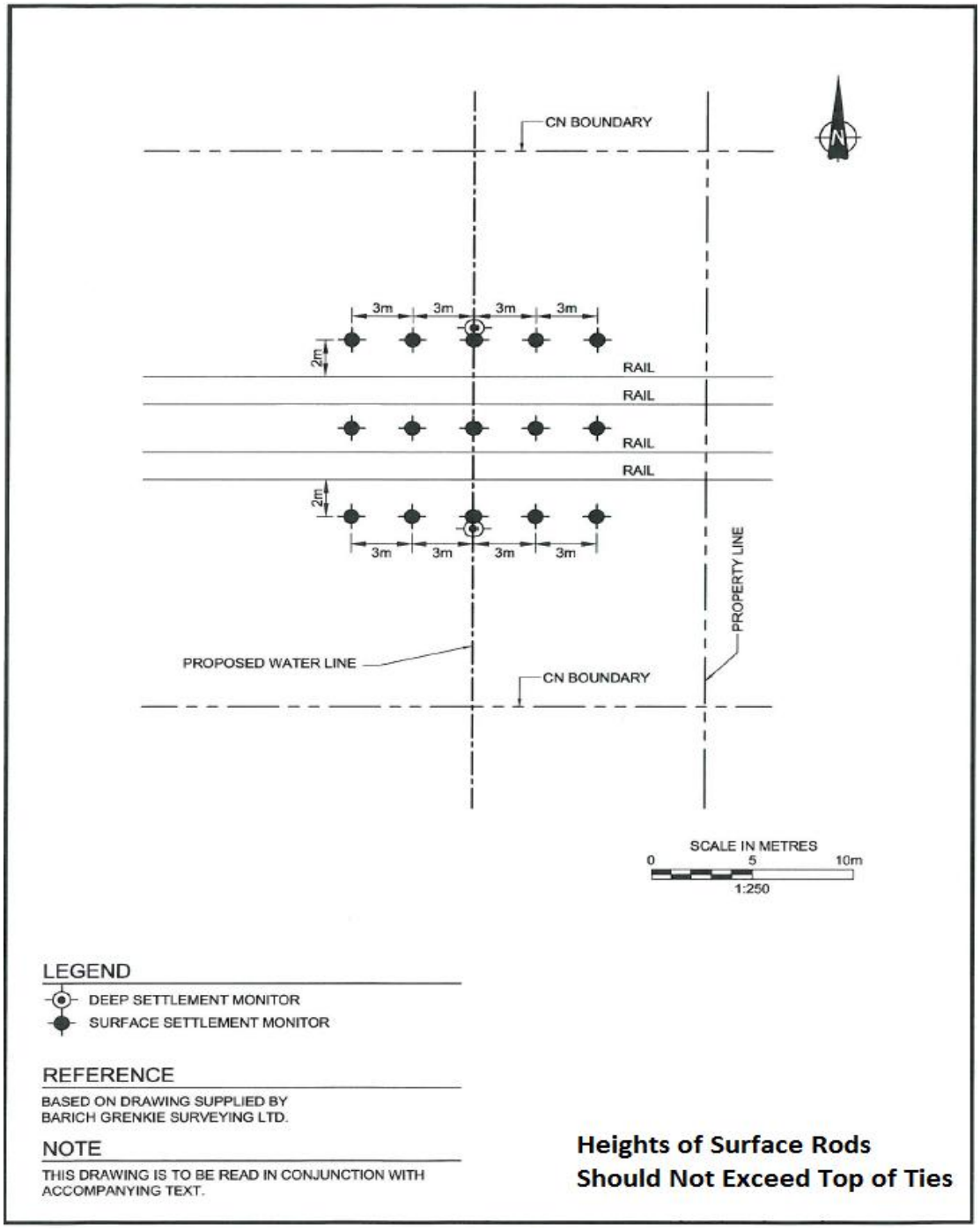
(i) *Cased Settlement monitoring points* should be placed along the alignment of the proposed utility installation for the entire length and placed parallel with the track(s) at distances that reflect the soils investigation and recommendations of the Geotechnical Engineer. These rods shall be cased and protected from the movement of vertical and horizontal forces, giving a much more accurate measurement of settlement above the pipe. The number of more accurate measurement of settlement above the pipe. The number of monitoring points will increase as the soils investigation predicts a more significant settlement. We recommend that the depths of the monitoring points be placed at least 600mm to 1200mm above the obvert of the installation. The monitoring schedule of these points will be established by the Geotechnical Engineer and reviewed by the Railway. Changes to the monitoring schedule may very, when elevation levels indicate critical settlement and/or it is apparent that considerable settlement is occurring.

(ii) *Not Cased Settlement monitoring points* are typically used where the ballast is elevated or the water table is high and the soils report indicates a risk of subsurface failure. These points will provide adequate measurements if a horizontal shift (slippage) should occur, rendering the stability of the track unsafe or hazardous for train movements. These points shall be placed as indicated by a Geotechnical Engineer and monitoring schedule will follow the same recommendations as directed above, it should be noted that the rods be placed in the ground with no casings allowing the movements to be recorded actually.

(2) ***Surface***

i) *Surface monitoring points* should be placed on the in areas near excavations and/or areas of concern. Plates with rods on the surface will be acceptable and should be well marked/visible. T**he elevation of the rods should not exceed the top of tie.**

Monitoring Points Sketch



Application Checklist - Utilities 10" or Greater

The Applicant's shall:

- □ Drawings shall be stamped and signed by an Engineer licensed in the Province where the work is being performed. CN reserves the right to prohibit a certain construction methodology, at its own discretion; however, CN shall not assume any responsibility for the suitability of the accepted method. Open cut methodology shall only be considered where other installation techniques are deemed impractical and where rail traffic volumes are low. Installations using water jet methods shall not be permitted.

- □ Complete Subsurface Investigation
  - i. Boreholes are required at each end of the crossing and at each entry/exit pit with a maximum spacing between boreholes of 50 m.
  - ii. The boreholes shall be drilled to a depth of 5 m below the proposed crossing depth or to 5 m below the maximum feasible crossing depth if the proposed crossing depth has not yet been determined.
  - iii. Soils samples shall be obtained at 0.75 m intervals to a depth of 4.6 m and also within the proposed tunnel horizon (i.e., from at least 2 m or one pipe/casing diameter above the proposed tunnel obvert to at least 2 m or one pipe/casing diameter below the proposed tunnel invert). At other depths, soil samples may be obtained at 1.5 m intervals; No Boreholes will be completed between ties or tracks in double track territory.
  - iv. If bedrock is encountered at the proposed location, the bedrock will be cored to establish the competency and engineering characteristics of the bedrock. The bedrock shall be cored to at least 1 m below the invert of the proposed crossing.
  - v. Soil classification testing (i.e., water content determination, Atterberg Limits testing and grain size distributions) shall be carried out on soil samples obtained from all major soil strata and on soil samples obtained from every layer that the proposed tunnel would intersect.
  - vi. The stabilized groundwater elevation must be established by installation of piezometer/monitoring well(s); at least one piezometer/monitoring well must be maintained in operation and checked prior to construction to confirm the groundwater elevation.

- □ Submit a Geotechnical Report prepared by a Geotechnical Engineer with experience in trenchless technology. The Report shall include (i) comments and recommendations with respect to construction methodology, (ii) an estimate of the expected extent and magnitude of ground movement over time, (iii) measures to be undertaken to preserve the safety of rail operations and the structural integrity of the track structure, and (iv) a detailed proposal for ground surface and subsurface monitoring.
  - i. Factual subsurface information with all field and laboratory test data.
  - ii. A description of the site and soil stratigraphy including results of soil classification testing.
  - iii. A plan of the proposed crossing with borehole/testing/installation locations.
  - iv. A summary of groundwater conditions encountered during the investigation including the observed groundwater levels within the boreholes and the presence of any perched water levels at the borehole locations.
  - v. Anticipated settlements as well as an assessment of the anticipated settlement through configurations.
  - vi. A detailed monitoring plan to monitor any ground surface and subsurface movements during construction shall be provided. The Review and Alert (work stoppage) levels shall be provided.
  - vii. Submit a contingency plan and notification procedure to be implemented in the event of excessive/unexpected settlement or heave, and unforeseen changes in subsurface conditions, i.e. cobbles and boulders, ravelling /flowing ground.

- □ Submit a Detailed Work Plan
    i. Details of the proposed methodology - the installation operations, methods of maintaining and adjusting line and grade, drilled/bored diameter, drill hole stabilization procedures, temporary dewatering measures and any mitigation procedures if sinkholes/settlement above the pipe occurs or excessive movement of the settlement monitors is observed.
    ii. The design of the crossing - length, diameter and thickness of the casing, elevations of the crossing invert at both ends, excavation shoring details and methods of dealing with cobbles/boulders and obstructions.
    iii. Provide additional details for specific installation methodologies as follows:
        i. Jack and Bore: size and location of the auger head relative to the casing, estimated jacking thrust required, method of monitoring casing elevation, thrust block design calculations, record keeping system to document casing advance and jacking pressures, bulkheading, and grouting procedures.
    iv. Pipe Ramming: length, diameter and thickness of the casing, details of the reinforcing ring used at the leading edge of the pipe
    v. Hand Mining: method of temporary bulkheading
    vi. Micro-tunnelling: type of machine
    vii. HDD; slurry pressure and mitigation measures for frac out if applicable
    viii. TBM: type of machine, methods of primary ground support, grouting between the casing, ribs and lagging (primary support) and the surrounding soil/rock

- □ Settlement Monitoring Scheme Requirements:
    i. Summary of Proposed Settlement Monitoring
        i. Geographical Location
        ii. Number of Settlement Monitoring Probes
        iii. Type of Probe & installation Method
        iv. Expected Amount of Settlement (mm)
        v. Frequency of Monitoring
        vi. Duration of Monitoring
    ii. Site Plan:
        i. Site Plan
        ii. Identify Probe Locations and Offset Distances to Nearest Rails
        iii. Elevation of Top-of-Probes
    iii. Probe Detail Drawing:
        i. Show section through Railway Track Road Bed
        ii. Existing Ground Line
        iii. Depth of Bore
        iv. Distance to Bottom-of-Probe to Top of Casing Pipe
    iv. Submit a dewatering plan.

- □ Monitoring During Construction
    i. Monitoring by a qualified geotechnical personnel and report to CN on a daily basis.
    ii. Installation in accordance with the Contractor's detailed work plan.
    iii. Over-excavation does not occur, and the liner / casing is installed tight to the excavation.
    iv. Report theoretical vs. actual volumes of spoils removed on per meter and total bases.
    v. The excavation is fully supported until the liner / pipe installation is complete.
    vi. The bulkhead is installed at the end of every work shift or during any prolonged stoppage of work.
    vii. Voids are fully grouted to refusal immediately after the completion of liner / pipe installation. Report theoretical vs. actual volumes of grout pumped.

- □ Reporting to CN during/post Construction
    i. Progress of the contractor and pipe installation and what work was completed on that day,

ii. A summary of the daily ground surface and subsurface movements showing a comparison to a baseline reading taken before the start of construction, settlements of greater than 10 mm shall be reported to CN immediately.
iii. Any other geotechnical issues that may be of concern to CN.
iv. Log of settlement survey results showing
    i. Station
    ii. Date and Elevation of Initial Readings
    iii. Date and Elevation of Subsequent Readings
    iv. Difference in Elevation
v. Submit ground surface and subsurface monitoring reports to CN on a **daily basis**, showing a comparison to baseline readings taken prior to the commencement of construction. Settlement of 5mm is to be reported to CN immediately, and a settlement of 10 mm or greater the work is stopped until a resolution is achieved.

□ Provide, in writing, the name and phone number of the Applicant's qualified site inspector who will be on the job site on a full time basis for the duration of construction.

□ If there are fibre optic cables buried within the ROW, the Contractor shall submit details on the type of equipment to be used for pile driving, and estimate the vibrations that will be induced at ground level during operation.

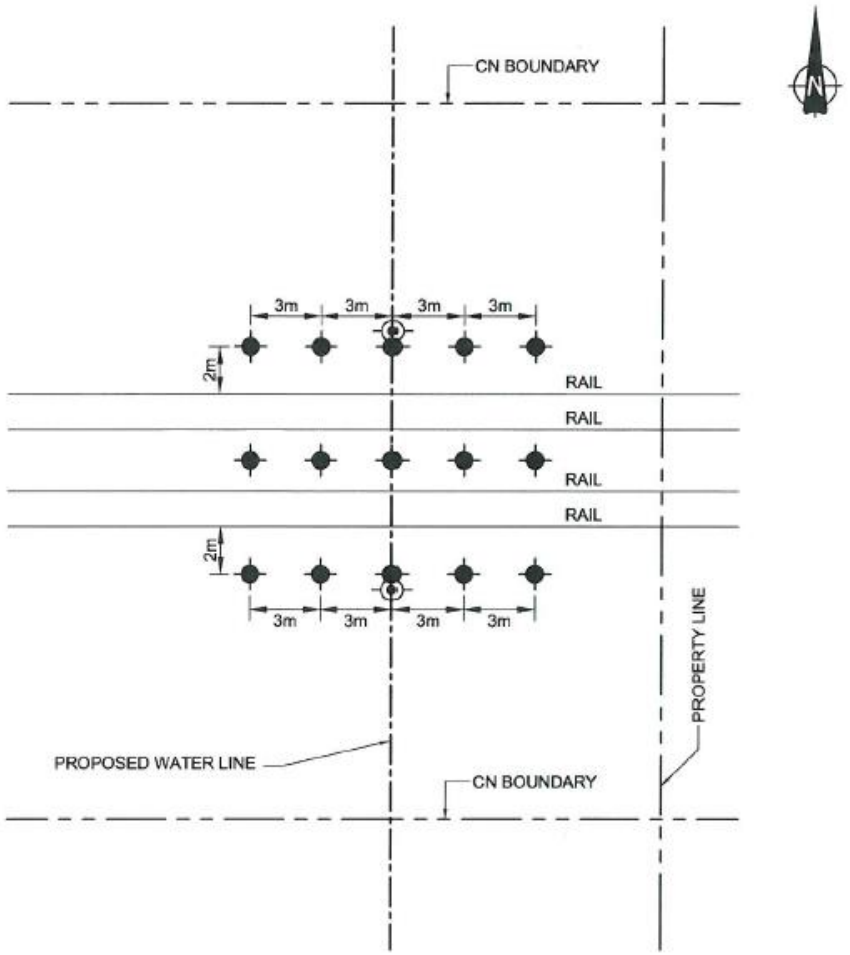
□ The Contractor may be required to monitor vibrations levels during pile driving operations, for which the Contractor shall submit a procedure and the type of monitoring equipment to be used.
i. Induced vibrations shall be limited to a maximum peak particle velocity (PPV) of less than 100mm/sec (measured in 3 mutually perpendicular directions taken at tie level / ground surface). And induced amplitude of movement shall be less than 0.2mm
ii. Vibrations undertaken within 50 metres of Bell Canada (360 Networks) fibre optic cables, induced vibrations shall be limited to a maximum of PPV of less than 50mm/sec

□ The nearest point, at which excavation can be undertaken, is as follows: Starting ten (10) feet from the gauge side (inside) of the nearest rail, measured perpendicular to the rail, calculate a slope to the bottom of the proposed pipe at a 1.5:1 slope. If a 1.5:1 slope cannot be maintained or more restrictive conditions occur, approved shoring will be required.

□ During construction, the Applicant shall maintain positive drainage of Railway property. After construction is completed, the Railway's right-of-way shall be restored to its original condition and to the satisfaction of the Railway. Any fencing removed to facilitate construction shall be restored.

*** No construction or access to CN ROW will commence until a Agreement has been entered into between CN and the Utility Owner ***

Monitoring Points Sketch



LEGEND

DEEP SETTLEMENT MONITOR

SURFACE SETTLEMENT MONITOR

REFERENCE

NOTE

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

Heights of Surface Rods Should Not Exceed Top of Ties