THE REGIONAL MUNICIPALITY OF NIAGARA

CONTRACT DOCUMENTS

Contract No. 2019-T-105
(RN19-05)

Reconstruction of Road 98 (Montrose Road)
from Regional Road 49 (McLeod Road)
to Charnwood Avenue
In the City of Niagara Falls

James Bradley
Regional Chair

Catherine Habermebl
Acting Commissioner of Public Works

March, 2019

Contract No. 2019-T-105
(RN19-05)

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_____ _____

Contractor's Signature *Date*

NOTICE

This contract utilizes the Niagara Peninsula Standard Contract Document (Revision 19). This document constitutes the specification for this project and must be utilized in preparing bids for tenders or quotations.

The Niagara Peninsula Standard Contract Document is available on-line at the "Bid Opportunities" section of the Regional Municipality of Niagara website (www.niagararegion.ca).

Contracts issued through tender calls and quotations will reference the Standard Document and the responsibility for obtaining or having access to the Document will rest with the bidder. The Standard Document can be utilized on all projects which clearly indicate reference and use of the Niagara Peninsula Standard Contract Document.

SPECIAL INSTRUCTIONS TO BIDDERS

SPECIAL INSTRUCTIONS TO BIDDERS

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SPECIAL INSTRUCTIONS TO BIDDERS

1. Named Parties

For the purposes of this contract the following parties are identified:

Owner:	**Niagara Region**
Engineer:	**Parsons Inc.**
Contract Administrator:	**Niagara Region**
Inspector:	**Niagara Region**
Contact for Enquiries:	Vicki Lafford-Field, Purchasing Agent Niagara Region Telephone: 905-980-6000, extension 3659

2. Tender Procedure

The following policy regarding the submission of tenders and the tender opening procedures will be applicable for this project. Bidders are requested to adhere strictly to the instructions concerning submission.

(a) **All tenders must be submitted in a sealed envelope to:**

Title: **Vicki Lafford-Field, Purchasing Agent**

Address: **Purchasing Services Office,**
First Level (Upstairs), Campbell West Entrance
1815 Sir Isaac Brock Way, Thorold, ON. L2V 4T7

By the following time, as determined on the clock located at the location receiving bids:

Time: **2:00 p.m.**
Date: **Tuesday, April 2, 2019**

(b) Submissions received after this deadline will not be accepted and will be returned unopened to the bidder. Please note that bidders are solely responsible to ensure that their submissions are received by the office of the Purchasing Agent's on or before the deadline. The Purchasing Agent will not accept any submission after this deadline notwithstanding the reason for its late receipt.

Please also note that, in the event of any question regarding the timely receipt of any submission, the time on the clock designated by the Purchasing Agent will absolutely prevail over any other time piece regardless of any discrepancies between the time on the Purchasing Agent's designated clock and actual time.

Tenders must be plainly marked to reveal the contents and the Bidder's name and address.

(c) Tenders shall be submitted in the one envelope, as follows:

i) The envelope shall contain:

* "Agreement to Bond", duly signed and sealed (no copies or facsimiles will be accepted).

* Tender deposit in the form of a Certified Cheque, Bank Draft or Bid Bond and in the amount of **$ 200,000.00** made payable to The Regional Municipality of Niagara.

* Form of Tender (including addenda if applicable).

(d) Tenders will be opened the same day that tenders close.

Time: **2:15 p.m.**

Location: **Niagara Region, Campbell West Entrance**
1815 Sir Isaac Brock Way, P.O. Box 1042, Thorold, ON L2V 4T7

Firms submitting tenders will be permitted to attend the tender opening.

(e) The total tender price will be announced for each tender opened, (excluding H.S.T.).

3. Estimated Tender Value

The estimated tender value of the project is as follows (excluding H.S.T.).

Estimated Tender Value **$5,000,000.00**

4. Tender Award

The award of this tender is subject to the Owner obtaining approval from:

The Regional Municipality of Niagara Council

City of Niagara Falls

Ministry of Environment, Conservation and Parks

Tentatively, construction may commence, but is not guaranteed, by:

May 20, 2019

5. Maintenance Holdback

This contract will be subject to a Maintenance Holdback of two percent (2%) of the final contract value (excluding HST). The holdback will be released as specified in Special Provisions – General.

6. Liquidated Damages

The liquidated damages for this contract shall be One Thousand and Five Hundred Dollars ($1,500.00) for each and every day's delay as outlined in Niagara Peninsula Standard Contract Document Special Provisions - General.

7. Additional Insured

The following parties are identified to be included as additional insured for this project:

The Regional Municipality of Niagara

The Corporation of the City of Niagara Falls

Parsons Inc.

Soil-Mat Engineers & Consultants Ltd.

8. Confidentiality

The Region will treat all bids as confidential. The Region will comply with the *Municipal Freedom of Information and Protection of Privacy Act,* and its retention by-law pursuant to the *Municipal Act*, in respect of all bids. All Public Reports approved by the Council of the Region will become public information. Such Public Reports will not include bid documents. The Region will not return or destroy any copies of any unsuccessful bid.

9. Procurement By-Law

Submissions will be solicited, received, evaluated, accepted, and processed in accordance with the latest version of the Region's Procurement By-Law as amended from time to time. In submitting a bid, in response to this solicitation, the Bidder agrees and acknowledges that it has read and will be bound by the terms and conditions of the Procurement By-Law.

The Procurement By-Law can be viewed on the Region's website, www.niagararegion.ca

Bidding System Registration

Niagara Region will only consider bids received from bidders who have registered with Niagara Region's electronic bidding system at https://niagararegion.bidsandtenders.ca (the "Bidding System") and have obtained the RFT directly from the Procurement Office.

All bidders must establish a Bidding System account and be registered as a Plan Taker for the bid opportunity, which will enable the bidder to receive addenda email notifications, and download addenda.

10. Dispute Resolution

(a) The Corporation encourages competitive bidding and an open, accountable and transparent process for the Purchase of Goods and/or Services.

(b) To maintain the integrity of the Bid Solicitation process, Suppliers who believe they have been treated unfairly in a Bid Solicitation process shall submit a Substantive Objection to the Director of Procurement and Strategic Acquisitions providing sufficient detail regarding their complaint within:

  (i) 7 days from the conclusion of the Bid opening process for Request for Quotations or Request for Tenders.

  (ii) 7 days of the Supplier being notified of the results of a Request for Pre-Qualification or Request for Expressions of Interest or Request for Proposals.

(c) The Director of Procurement and Strategic Acquisitions will arrange a debriefing with the Supplier to explain the Bid Solicitation process that led to the selection of the successful Supplier.

(d) The Director of Procurement and Strategic Acquisitions will investigate the complaint and will make a recommendation to the Commissioner of Corporate Services/Treasurer, CAO or Council, as appropriate.

(e) To ensure that the Dispute Resolution process for the particular Bid Solicitation process is seen to be fair and impartial, elected officials shall

not advocate on behalf of Suppliers who have submitted a Substantive Objection.

(f) Should a Supplier continue to have concerns respecting the Award and the decision, the Supplier may then request, in writing to the Commissioner of Corporate Services/Treasurer, a mediator, to assist in resolving any outstanding issues between the Supplier and the Corporation.

(g) The recommended mediator will be approved by both the Supplier and the Corporation.

(h) The mediator shall make his/her best efforts to assist the parties to reach a mutually acceptable solution.

(i) Costs for the mediator shall be equally shared by the Supplier and the Corporation.

(j) Any resolution reached through the mediation process shall remain confidential if requested by either of the parties.

11. Lobbying Restrictions

(a) Lobbying restrictions shall apply to Suppliers, their staff members, or anyone involved in preparing a Bid, shall not engage in any form of political or other Lobbying whatsoever or seek to influence the outcome of the Bid Solicitation process or subsequent Award. This restriction extends to all of the Corporation's staff and anyone involved in preparing a Bid Solicitation or participating in a Bid evaluation process, and members of Council.

(b) The Corporation may reject any Bid by a Supplier that engages in such Lobbying, without further consideration, and may terminate that Supplier's right to continue in the Bid Solicitation process.

(c) During a Bid Solicitation process, all communications shall be made through Procurement and Strategic Acquisitions. No Supplier or person acting on behalf of a Supplier or group of Suppliers, shall contact any elected official, consultant or any employee of the Corporation to attempt to seek information or to influence the Award.

(d) Elected officials shall refer any inquiries about a Bid Solicitation process to the Commissioner of Corporate Services/Treasurer.

12. Bidder Performance (Litigation)

The Corporation may, in its sole discretion, reject a Bid if a bidder:

(i) has, at any time, threatened, commenced or engaged in legal claims or litigation against the Corporation;

(ii) is involved in a claim or litigation initiated by the Corporation;

(iii) previously provided goods or services to the Corporation in an unsatisfactory manner;

(iv) has failed to satisfy an outstanding debt to the Corporation;

(v) has a history of illegitimate, frivolous, unreasonable or invalid claims;

(vi) provides incomplete, unrepresentative or unsatisfactory references; or

(vii) has engaged in conduct that leads the Corporation to determine that it would not be in the Corporation's best interests to accept the Bid.

13. Tender Deposit

Tender deposits, with the exception of those from the two lowest Bidders will be returned within fifteen (15) days after the tenders are opened.

The Tender Deposit of the two lowest Bidders will be held until all necessary documentation has been provided by the successful Bidder (i.e. – Insurance, W.S.I.B. Certificate of Clearance, Bonding, etc.), the Agreement has been duly executed and the Bidder has provided evidence, satisfactory to the Region, that all arrangements have been made for commencement of the services to be provided, on the Contract start date.

No interest will be paid for deposits retained and/or cashed by The Regional Municipality of Niagara. Bidders are deemed to have made due allowances for this requirement in their total contract tender price, including contingency items and excluding HST.

14. Insurance Certificate

Immediately upon Award, the successful Bidder shall provide the Region with a Certificate of Insurance acceptable to the Region and, if requested by the Region, certified copies of the insurance policies. The Certificate of Insurance must comply with the insurance requirements outlined in this Bid Solicitation and must be on the Region's form of Certificate of Insurance, which can be found on the Region's website – www.niagararegion.ca/business/fpr/cert-insurance.aspx. If the Certificate of Insurance is provided in a non-original form (e.g. a facsimile, photocopy or scanned electronic copy), the Bidder acknowledges and agrees that the Region is fully entitled to treat any such Certificate as an original and that the Bidder will be responsible for the accuracy and validity of the information contained therein.

15. Exclusion

Except as expressly and specifically permitted herein, no Bidder shall have any claim for any compensation of any kind whatsoever, as a result of participating in this Tender, and by submitting a tender each Bidder shall be deemed to have agreed that it has no claim.

16. Maintenance of Traffic

Tenderers are advised that it will be essential that local traffic flow be maintained during the entire construction period. Allowance for one lane of traffic flow at all times will be mandatory during working hours. It is also mandatory that both traffic lanes shall be open in non-working hours unless otherwise directed.

The successful Tenderer shall submit a construction schedule and Traffic Management Plan (Item 1.08) to the Contract Administrator within seven (7) days of the contract award. The schedule shall show in a clear critical path diagram the proposed progress of all activity for the main items and site development of the contract, including key milestones and completion of work within the specified time allowed. Construction will not be allowed to commence until these documents are received and accepted.

17. Additions and Deletions

The Regional Municipality of Niagara reserves the right to add to or delete from any portion or portions of the Schedule of Work. These changes under this contract shall **NOT** be subject to the unit price adjustment provisions in the General Conditions of Contract.

18. Construction Schedule

The successful Tenderer shall submit a construction schedule to the Contract Administrator within seven (7) days of the contract award. The schedule shall show in a clear critical path diagram the proposed progress of all activity for the main items and site development of the contract, including key milestones and completion of work within the specified time allowed.

19. Examination of Plans, Specifications, and Site of Work

Tenderers shall carefully examine and study all of the Contract Specifications and the site of work in order to satisfy themselves by examination as to all conditions affecting the contract and as to the detailed requirements of the construction.

20. Geotechnical Investigation

A copy of the soil investigation report is appended to these specifications.

The geotechnical investigation and supporting data is provided for information only and represents the considered opinion and findings of the firm which undertook the work. The Owner does not take responsibility for the accuracy of the information and provides it for consideration by tenderers. Tenderers are to make further investigation as they deem necessary, and at their own expense, to accurately assess the subsurface conditions to be encountered.

21. Accessibility Regulations for Contracted Services

Contracted employees, third party employees, agents and others that provide customer service on behalf of Owner are legally responsible to be in compliance with the provisions outlined in Section 6 of the Ontario Regulation 429/07 with respect to training under the Customer Service Standard of the *Accessibility for Ontarians with Disabilities Act (2005).* The Contractor shall ensure that such training includes, without limitation, a review of the purposes of the Act and the requirements of the Regulation, as well as instructions regarding all matters set out in Section 6 of the Regulation. By signing Statement "C" the bidder has agreed to be in full compliance with this regulation. The successful bidder will be expected to complete the confirmation form, prior to the issue of the agreement or purchase order. For any further information please contact accessibility@niagararegion.ca

Contractors shall be responsible for notifying the general public when planning/implementing a disruption to any transportation walkway, pathway, driveway, roadway, etc. It shall be the Contractor's responsibility to notify the general public of any disruption to regular service; prior to the commencement of the disruption. In the case where construction activities will cause a disruption to normal service appropriate signage shall be installed. At the Owner's request, information relating to the disruption shall be supplied to allow for the posting of disruption notices on the Owner's web page of choice.

The posted signage shall – as a minimum - include the headings listed below (or format supplied by the Owner) and shall be filled out by the Contractor and installed in advance of the service disruption.

NOTICE OF SERVICE DISRUPTION
Please be advised of a disruption to:
Reason for disruption:
This service will be unavailable for the period of:
Alternative facilities or services:
For more information or service accommodation, please contact:

WE APOLOGIZE FOR THE INCONVENIENCE.
THANK YOU

22. Contractor Safety Program

The successful contractor must comply with the Region's Contractor Safety Policy #C3.H17. The policy and forms can be found on the Region's website at:

http://www.niagararegion.ca/business/tenders/compliance-with-standards.aspx.

Failure to comply with this policy will result in disqualification of the contractor.

23. Tender Enquiries

The deadline for tender enquiries is March 26, 2019 at noon.

Prior to the Deadline for Questions, bidders may ask questions or seek additional information in relation to this RFT through the Bidding System using the "Submit a Question" link associated with this bid opportunity. Niagara Region will not accept any bidder's questions or requests for information by any other means, except as specifically stated in this RFT.

24. Order of Precedence

OPSS.MUNI 100 clause GC 2.02.01, Order of Precedence, shall be amended as follows:

In the event of any inconsistency or conflict in the contents of the following documents, such documents shall take precedence and govern in the following descending order:

(a) Agreement

(b) Addenda

(c) Special Provisions

  (i) Special Provisions – Supplementary Special Provisions

  (ii) Special Provisions – Contract Items (Niagara Peninsula Standard Contract Document)

  (iii) Special Provisions – General (Niagara Peninsula Standard Contract Document)

(d) Contract Drawings

(e) Standard Specifications

  (i) Ontario Provincial Standard Specifications

(f) Standard Drawings

(g) Special Instructions to Bidders

(h) Instructions to Bidders

(i) Form of Tender

(j) Supplementary General Conditions of Contract

(k) OPSS.MUNI 100 General Conditions of Contract (Ontario Provincial Standard Specifications)

(l) Working Drawings

Later dates shall govern within each of the above categories of documents.

INSTRUCTIONS TO BIDDERS

(Refer to Niagara Peninsula Standard Contract Document)

FORM OF TENDER

Contract No. 2019-T-105
(RN19-05)

Reconstruction of Road 98 (Montrose Road)
from Regional Road 49 (McLeod Road)
to Charnwood Avenue
In the City of Niagara Falls

FORM OF TENDER

We, the undersigned Contractor(s) have carefully examined the attached documents as herein listed and forming part of this Tender

DOCUMENTS INCLUDED IN CONTRACT

Special Provisions
Special Instructions to Bidders
Instructions to Bidders
General Conditions
Supplementary General Conditions
Standard Specifications (as noted)
Supplementary Specifications (as noted)
Plans (as noted)
Addenda (if applicable)

and have carefully examined the site and location of the work to be done under this Contract. We, the undersigned Contractor(s), understand and accept the said drawings and contract documents, and, for the prices set forth in this Tender, hereby offer to furnish all machinery, labour, tools, apparatus, and other means of construction, furnish all materials except as otherwise specified in the Contract, and to complete the work in strict accordance with the drawings and contract documents referred to above, for the total tender price of: _____

_____ Dollars ($_____) including contingency and *excluding H.S.T.*.

ADDENDA

We acknowledge that we have received Addendum/Addenda No. inclusive, and that all changes specified in the Addendum/Addenda have been included in the prices submitted.

COMMENCEMENT AND COMPLETION

We agree to commence work as specified to proceed continuously to completion specified as **130 working days**.
Top asphalt and permanent line painting completion date May 29, 2020.

TENDER IS OPEN TO ACCEPTANCE & IRREVOCABLE

We agree that this tender is to continue open to acceptance and irrevocable until the formal contract has been executed by the successful tenderer for the said work, and the bond or bonds as specified have been executed by the approved surety or sureties, and that the Corporation may, at any time, within 90 (ninety) calendar days of the closing date, accept this tender without notice, whether any tender has been previously accepted or not.

** to be filled in by the Tenderer.*

OFFERED ON BEHALF
OF THE CONTRACTOR

Insert Workplace Safety & Insurance Board Account No.

_____
Signature

_____
Signature

Company Name

_____
Address

Contractor's Seal

_____
Witness

_____
Date

_____
Witness

NOTE:

(a) If the Tenderer is a Corporation, the Corporate Seal must be affixed under the signature of a duly authorized officer or officers of the Corporation.

(b) If the Tenderer is not a Corporation or a Partnership, the Tenderer must sign in the presence of a witness who must also sign.

(c) If the Tenderer is a Partnership, each member of the Partnership must sign in the presence of a witness who must also sign.

SCHEDULE OF TENDER UNIT PRICES

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
SECTION 1: GENERAL						
1.01	**A1**	**Bonding**	L.S.	1		$
1.02	**A2**	**Preconstruction Survey**	L.S.	1		$
1.03	**A3 SSP5**	**Site Office**	L.S	1		$
1.04	**A4 SSP6**	**Construction Layout**	L.S.	1		$
1.05	**A5**	**Clearing and Grubbing**				
		a) Remove existing brush & shrubs	m^2	2,200	$	$
		b) Trim existing tree branches	m	15	$	$
		c) Relocate / remove existing boulder	m^2	270	$	$
1.06	**A6**	**Tree Relocation**	ea	15	$	$
1.07	**A7 SSP7**	**Install, Maintain and Remove Silt Control Devices**				
		a) Rock check dam, OPSD 219.210	ea	1	$	$
		b) Light duty silt fence barrier, OPSD 219.110	m	210	$	$
1.08	**A8 SSP8**	**Construction Signs, Traffic Control, and Traffic Management Plan**	L.S.	1		$
1.09	**A9**	**Contingency Allowance**	L.S.	1		$
					Total Section 1	**$**

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
SECTION 2: ROADS						
2.01	**B2**	**Earth Excavation**				
		a) Complete roadway excavation within road allowance and disposal	m^3	14,730	$	$
2.02	**B3 SSP14**	**Granular "A"**	t	48,015	$	$
2.03	**B6**	**Subdrain**	m	3,030	$	$
2.04	**B7**	**300mm Dia CSP Culvert**	m	6	$	$
2.05	**B8 SSP16**	**Concrete Curb and Gutter**				
		a) Straight and curved sections as per OPSD 600.040 tangent	m	2,200	$	$
		b) Straight and curved sections as per OPSD 600.080	m	730	$	$
		c) Barrier curb, OPSD 600.110	m	100	$	$
		d) Termination curb OPSD 608.010	ea	2	$	$
		e) Recessed catch basin detail for CB	ea	1	$	$
		f) Recessed catch basin detail for DCB	ea	1	$	$
2.06	**B9 B29 SSP17**	**Construct concrete sidewalk any width, OPSD 310.010, OPSD 310.020, OPSD 310.050**				
		a) 125mm thick concrete sidewalk	m^2	2,010	$	$
		b) 150mm concrete at residence driveway	m^2	40	$	$
		c) 200mm thick concrete at commercial and industrial driveway with wiremesh	m^2	55	$	$
2.07	**B9 SSP17**	**Construct Salsa Red Concrete Boulevard/Median Island any width, OPSD 310.010, OPSD 310.020, OPSD 310.050**				
		a) 125mm thick red concrete boulevard	m^2	690	$	$
		b) 125mm thick red concrete boulevard at median island	m^2	360	$	$
2.08	**B11**	**Asphalt Milling**				
		a) 50 mm depth	m^2	930	$	$
		b) 40 mm depth	m^2	370	$	$

2.09	**B12**	**Supply and Application of Tack Coat**	m^2	20,700	$	$
2.10	**B13**	**Adjustment of Appurtenances**				
		a) Adjust existing manhole frame and cover up to 300mm	ea	4	$	$
		b) Adjust existing manhole frame and cover up to 450mm	ea	3	$	$
		c) Adjust existing valve and curb boxes	ea	5	$	$
		d) Install concrete collar for proposed manhole	ea	19	$	$
		e) Install concrete collar for valve box within roadway	ea	2	$	$
2.11	**SSP50**	**Supply & Place Hot Mix Asphalt**				
		a) Superpave Category D PGAC 64-28 (Polymer Modified)				
		i) SP 19.0				
		1) Montrose Rd (120mm thickness, 2 lifts)	t	6,210	$	$
		2) Charnwood Ave trench restoration	t	45	$	$
		3) Kinsmen Ct trench restoration	t	12	$	$
		ii) SP 12.5 FC2 (echelon paving including MTV in 2020)				
		1) Montrose Road 50mm thickness	t	2,590	$	$
		2) Charnwood Ave 40mm thickness	t	25	$	$
		3) Kinsmen Ct trench restoration	t	6	$	$
		b) Supply and place HL8 HS hot mix asphalt, QPR 2000 high performance bituminous cold patch or approved equivalent (50mm thickness) for storm sewer temporary trench restoration	t	170	$	$
		c) Supply and place HL8 HS hot mix asphalt, QPR 2000 high performance bituminous cold patch or approved equivalent (50mm thickness) for sanitary sewer/watermain temporary trench restoration	t	200	$	$
2.12	**B15 SSP50**	**Asphalt Sidewalks and Driveways**				
		a) Asphalt driveway restoration - (fix gravel base prior to asphalt paving)				

		i) Asphalt driveways - residential (50mm SP 9.5 + 200 mm Granular "A")	m^2	70	$	$
		ii) Asphalt driveways - commercial (40 mm SP 9.5 + 50 mm SP 19 + 300 mm Granular "A")	m^2	390	$	$
		b) Multi-use trail (50 mm SP 9.5 + 200 mm Granular "A")	m^2	1,200	$	$
2.13	**B18**	**Granular Driveway**				
		a) Residential - 200mm Granular 'A'	m^2	70	$	$
		b) Industrial - 375 mm Granular 'A'	m^2	40	$	$
2.14	**B19**	**Regrading/restoration of Ditches and Swales**	m	200	$	$
2.15	**B20**	**Hand Laid Riprap with Filter Cloth**	m^2	20	$	$
2.16	**B21 SSP18**	**Topsoil and Sod**				
		a) Boulevard grading and sodding including 100mm topsoil	m^2	800	$	$
2.17	**B22 SSP19**	**Topsoil, Seed and Mulch**				
		a) Boulevard grading and hydraulic mulching and seeding including 100mm topsoil	m^2	4040	$	$
		b) Reinstate existing asphalt trail and sidewalk by hydraulic mulching and seeding including 100mm topsoil	m^2	320	$	$
2.18	**B23**	**Supply and Apply Calcium Chloride**	t	20	$	$
2.19	**B27**	**Removal of Existing Items**				
		a) Guide rail including extruder	m	30	$	$
		b) Remove Existing Storm Sewer Appurtenances				
		i) Maintenance Holes	ea	2	$	$
		ii) Catchbasins	ea	1	$	$
		iii) Double Catchbasins	ea	1	$	$
		iv) Ditch inlets	ea	1	$	$
		c) Remove/Abandon Existing Pipes and Culverts				
		i) Existing CSP (any size)	m	320	$	$
		ii) Existing sewer pipe (any size)	m	70	$	$

		d) Remove Sewer				
		i) sewer pipe - all sizes	m	12	$	$
		e) Remove existing watermain				
		i) Removal and disposal of existing watermain pipe and fittings (all sizes)	m	12	$	$
		ii) Remove valve boxes	ea	3	$	$
		f) Disposal of asphalt material including road, sidewalk and driveway and median to an approved recycle site.	m^2	11,150	$	$
		g) Removal and disposal of concrete sidewalk and driveway and to an approved site	m^2	240	$	$
		h) Removal and disposal of curb and/or curb and gutter to an approved site	m	430	$	$
		i) Remove and return sign and post to the Region	ea	6	$	$
2.20	**B34**	**Tactile Warning Surfaces**	ea	36	$	$
2.21	**SSP20**	**Pavement markings (Durable in 2020):**				
		a) Supply and apply approved traffic paint and reflectorized glass beads for all truck mounted applications:				
		i) Directional broken dividing lines	m	1,565	$	$
		ii) Directional solid dividing lines	m	920	$	$
		ii) Bike Lane	m	1,990	$	$
		iv) Hatch	m	795	$	$
		b) Supply and apply approved traffic paint and reflectorized glass beads for all hand machine pavements marking applications:				
		i) Stop bars (600 mm wide)	m	65	$	$
		ii) Pavement symbols	ea	36	$	$
		iii) Pedestrian crossings	m	360	$	$
		c) Layout and application of pre-marking	L.S.	1		$
2.22	**SSP20**	**Pavement markings (Paint-Temporary):**				
		a) Supply and apply approved traffic paint and reflectorized glass beads for all truck mounted applications:				
		i) Directional broken dividing lines	m	1,565	$	$

		ii) Directional solid dividing lines	m	920	$	$
		ii) Bike Lane	m	1,990	$	$
		iv) Hatch	m	795	$	$
		b) Supply and apply approved traffic paint and reflectorized glass beads for all hand machine pavements marking applications:				
		i) Stop bars (600 mm wide)	m	65	$	$
		ii) Pavement symbols	ea	36	$	$
		iii) Pedestrian crossings	m	360	$	$
		c) Layout and application of pre-marking	L.S.	1		$
2.23	**SSP21**	**Traffic Signs**				
		a) Supply and install 100mm x 100mm wood post	ea	1	$	$
		b) Supply and install U- channel post	ea	19	$	$
		c) Install Signs				
		i) KEEP RIGHT Rb-25	ea	2	$	$
		ii) RIGHT LANE ENDS - Wa-23 R	ea	1	$	$
		iii) HAZARD MARKER - Wa-33L	ea	2	$	$
		iv) TRAFFIC SIGNALS AHEAD - Wb-2	ea	2	$	$
		v) SIGNAL CONTROL 'NEW' - Wb-3	ea	2	$	$
		vi) INTERSECTION SIGN - Wa-11A	ea	2	$	$
		vii) ONE WAY - Rb-21	ea	2	$	$
		viii) BIKE LANE - sign	ea	10	$	$
		d) Relocate Existing Signs on Pole&Post, including new brackets	ea	2	$	$
		e) Relocate existing sign and post	ea	14	$	$
2.24	**SSP22**	**Replace existing wood fence**	m	40	$	$
2.25	**SSP23**	**Relocate Steel Post and Wire Fence**	L.S.	1		$
2.26	**SSP24**	**Landscaping**	L.S.	1		$
					Total Section 2	**$**

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
SECTION 3 : STORM SEWER						
3.01	**C1 SSP26**	**Sewers (Depth is surface to invert)**				
		a) 300mm diameter storm sewer, PVC DR 35 with CLASS 'B' bedding, and Granular 'A' cover and backfill				
		i) STM CBMH 6 to Existing culvert (Avg. depth 2.5 m)	m	6	$	$
		b) 375mm diameter storm sewer, PVC DR 35 with CLASS 'B' bedding, and Granular 'A' cover and backfill				
		i) STM MH 10 to STM MH 11 (Avg. depth 2.9 m)	m	105	$	$
		ii) STM MH 7 to Ex. Box Culvert (Avg. depth 2.0 m)	m	3	$	$
		c) 450mm diameter storm sewer, 65-D RC pipe, CSA A256 with Class 'B' bedding and Granular 'A' cover and backfill				
		i) STM MH 16 to STM MH 1 (Avg. depth 3.5 m)	m	78	$	$
		ii) STM CBMH 11A to STM MH 11 (Avg. depth 3.1 m)	m	14	$	$
		d) 525mm diameter storm sewer, 65-D RC pipe, CSA A256 with Class 'B' bedding and Granular 'A' cover and backfill				
		i) STM MH 11 to STM MH 12 (Avg. depth 3.2 m)	m	43	$	$
		e) 600mm diameter storm sewer, 65-D RC pipe, CSA A256 with Class 'B' bedding and Granular 'A' cover and backfill				
		i) STM MH 1 to STM MH 2 (Avg. depth 5.0 m)	m	150	$	$
		ii) STM MH 12 to STM MH 13 (Avg. depth 3.5 m)	m	90	$	$
		iii) STM MH 2A to STM MH 2 (Avg. depth 4.3m)	m	16	$	$
		iv) Plug to STM MH 3 (Avg. depth 4.5m)	m	20	$	$
		f) 675mm diameter storm sewer, 65-D RC pipe, CSA A256 with Class 'B' bedding and Granular 'A' cover and backfill				
		i) STM MH 2 to STM MH 3 (Avg. depth 4.5 m)	m	61	$	$
		ii) STM MH 13 to STM MH 14 (Avg. depth 3.1 m)	m	50	$	$
		iii) STM MH 14 to STM MH 17 (Avg. depth 3.0m)	m	9	$	$
		iv) STM MH 17 to STM MH 15 (Avg. depth 2.9m)	m	25	$	$

		v) STM MH 15 to Ex. STM MH S3 (Avg. depth 3.0m)	m	20	$	$
		g) 825mm diameter storm sewer, 65-D RC pipe, CSA A256 with Class 'B' bedding and Granular 'A' cover and backfill				
		i) STM MH 3 to STM MH 4 (Avg. depth 4.5 m)	m	97	$	$
		ii) STM MH 4 to STM MH 5 (Avg. depth 3.1 m)	m	150	$	$
3.02	**C2 SSP26**	**Installation of New Storm Leads**				
		a) Roadside catchbasin leads PVC DR-35 with Class 'A' bedding and Granular 'A' cover and backfill				
		i) 250 mm diameter	m	310	$	$
		ii) 300 mm diameter	m	50	$	$
		iii) 375mm diameter catchbasin lead	m	15	$	$
		b) Private storm sewer leads PVC DR-28 with Class 'B' bedding, Granular 'A' cover and backfill -				
		i) 100 mm diameter	m	20	$	$
		ii) 150 mm diameter	m	10	$	$
3.03	**C4 SSP27**	**Reconnect Private Existing Sewer Laterals**	ea	3	$	$
3.04	**C5**	**Flush and T.V. Inspection of Storm Sewers**				
		a) New Sewers	m	685	$	$
		b) CB Leads	m	580	$	$
		c) Private laterals	ea	3	$	$
3.05	**C6 SSP28**	**Pre-Cast Concrete Manholes, Catch Basins and Ditch Inlets (Depth is rim to invert)**				
		a) Maintenance holes - standard 1200mm diameter circular precast concrete maintenance hole complete as per OPSD 701.010 (2-3m)	ea	2	$	$
		b) Maintenance holes - standard 1200mm diameter circular precast concrete maintenance hole complete as per OPSD 701.010 (3-4m)	ea	2	$	$
		c) Maintenance holes - standard 1200mm diameter circular precast concrete maintenance hole complete as per OPSD 701.010 (4-5m)	ea	2	$	$

		d) Maintenance holes - standard 1500mm diameter circular precast concrete maintenance hole complete as per OPSD 701.011 - (3-4m)	ea	5	$	$
		e) Maintenance holes - standard 1500mm diameter circular precast concrete maintenance hole complete as per OPSD 701.011 - (4-5m)	ea	2	$	$
		f) Maintenance holes - standard 2400mm diameter circular precast concrete maintenance hole complete as per OPSD 701.013 - (3-4m)	ea	1	$	$
		g) Catchbasin maintenance holes - standard 1200mm diameter circular precast concrete as per OPSD 701.030 (2-3m)	ea	3	$	$
		h) Precast concrete catchbasin				
		i) single, OPSD 705.010	ea	28	$	$
		ii) double, OPSD 705.020	ea	6	$	$
		iii) ditch inlet - 3:1, OPSD 705.030	ea	2	$	$
3.06	**SSP31**	**Connect existing 250 mm dia storm sewer to Storm MH 17**	ea	1	$	$
3.07	**SSP31**	**Connect existing 300 mm dia storm sewer to Storm MH 17**	ea	1	$	$
3.08	**SSP31**	**Connect proposed 675mm dia sewer to existing storm MH at Charnwood Ave**	ea	1	$	$
3.09	**SSP31**	**Connect existing 1350 dia sewer to proposed Storm MH 5**	ea	1	$	$
3.10	**SSP30**	**Proposed 600mm diameter sewer concrete plug including restoration**	ea	2	$	$
					Total Section 3	**$**

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
SECTION 4: SANITARY SEWER						
4.01	**C1 SSP26**	**Sewers (Depth is surface to invert)**				
		a) 200mm sanitary sewers PVC SDR 35 with Granular 'A' bedding, cover and backfill				
		i) Plug TO MH 'A' (Avg. 5.4)	m	21	$	$
		ii) PLUG TO MH 'B' (Avg. 5.2m)	m	12	$	$
		iii) Plug TO MH 'D' (Avg. 5.1m)	m	12	$	$
		b) 250mm sanitary sewers PVC SDR 35 with Granular 'A' bedding, cover and backfill				
		i) MH 'A' TO MH 'B' (Avg. 5.7m)	m	62	$	$
		ii) MH 'B' TO MH 'C' (Avg. 7.6m)	m	150	$	$
		iii) MH 'C' TO MH 'D' (Avg. 6.9m)	m	120	$	$
		iv) MH 'D' TO Ex. San MH (Avg. 4.8m)	m	50	$	$
4.02	**C2 SSP27**	**Sanitary lateral**				
		a) 200mm sanitary lateral PVC SDR 35 connection to sewer between MH 'B' and MH 'C' with Granular 'A' bedding, cover and backfill	m	11	$	$
4.03	**C5**	**Flush and T.V. Inspection of Sanitary Sewers**	m	430	$	$
4.04	**C6 SSP28**	**Pre-Cast Concrete Manhole (Depth is rim to invert)**				
		a) Maintenance holes - standard 1200mm diameter circular precast concrete maintenance hole complete as per OPSD 701.010 (4-5m)	ea	1	$	$
		b) Maintenance holes - standard 1200mm diameter circular precast concrete maintenance hole complete as per OPSD 701.010 with safety landing (6-7m)	ea	2	$	$
		c) Maintenance holes - standard 1200mm diameter circular precast concrete maintenance hole complete as per OPSD 701.010 with safety landing (7-8m)	ea	1	$	$
4.05	**SSP31**	**Connect proposed 250 mm dia Sanitary MH on Kinsmen Ct**	ea	1	$	$

4.06	**SSP32**	**Proposed 200mm diameter sewer pvc plug including restoration**	ea	2	$	$
					Total Section 4	**$**

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
SECTION 5: WATERMAIN						
5.01	**D1 SSP33**	**Watermains**				
		a) Watermain and large water services PVC DR-18 pipe by open cut				
		i) 150 mm	m	140	$	$
		ii) 200 mm	m	750	$	$
		b) Watermain and large water services fusible PVC DR 18 pipe by directional drill				
		i) 200 mm	m	200	$	$
		c) Watermain connections - including all required bends, sleeves, tees, reducers, thrust restraints and appurtenances to connect to existing watermain -				
		i) Proposed 200 mm to existing 300mm WM	ea	1	$	$
		ii) Proposed 200 mm to existing 250mm WM	ea	1	$	$
		iii) Proposed 200 mm to existing 200mm WM	ea	1	$	$
5.02	**D2 SSP34**	**Water Valves, Boxes and Tapping Sleeve and Valve**				
		a) Water valves and valve boxes				
		i) 150 mm diameter valve & box	ea	3	$	$
		ii) 200 mm diameter valve & box	ea	6	$	$
		b) Supply and install tapping sleeve, gate valve and valve box complete to finished grade				
		i) 200 x 200 mm	ea	1	$	$
		ii) 200 x 300 mm	ea	1	$	$
		c) 25 mm diameter blow-off assembly (OPSD 1104.030) including restoration	ea	3	$	$
5.03	**D3 SSP35**	**Hydrant sets, complete with anchor tee, OPSD 1105.01**	ea	10	$	$
5.04	**D10**	**Cathodic Protection of Watermains and Appurtenances**				
		Cathodic protection - supply and install zinc anodes complete with size and packaging as outlined in the specifications -				
		a) Type DZP 550-12 at all services, fittings, valves & plugs	ea	33	$	$
		b) 3 each - Type DZP 1110-24	ea	10	$	$
5.05	**D13 SSP42**	**Watermain Disinfection and Testing**	L.S.	1		$

5.06	**D1 SSP43**	**Connection to existing watermain**	ea	1		$
					Total Section 5	**$**

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
SECTION 6: ELECTRICAL						
6.01	**SSP49**	**Street Lighting**				
		Supply and Install rigid ducts (thick wall rigid pvc only)				
		a) 1x50mm	m	1,628	$	$
		b) 2x50mm	m	135	$	$
6.02	**NRS 2020 SSP49**	Supply and install junction boxes				
		a) 330 x 600mm	ea	35	$	$
6.03	**SSP49**	Supply and install grounding				
		a) Ground rods or plates	ea	26	$	$
		b) Ground wire #6 RWU 90 insulated	m	1,738	$	$
		c) Ground wire bare #6 AWG	m	65	$	$
6.04	**SSP49**	Supply and install LV cable in rigid ducts:				
		a) #2 RWU 90	m	2,284	$	$
		b) #6 RWU 90	m	4,428	$	$
		c)3x#12 RWU 90 riser	m	468	$	$
6.05	**SSP49**	Supply and install sectional steel poles - base mounted				
		a) Tye 6 - 10.5m	ea	26	$	$
6.06	**SSP49**	Supply and install street light arm and luminaire.				
		b) 160 watt led with 2.4m arm and 15A KTK fuse kits	ea	36	$	$
6.07	**SSP49**	Relocate base mounted steel pole c/w luminaire and arm	ea	1	$	$
6.08	**NRS 2001 2002 SSP49**	Supply and install concrete footings				
		a) Type 6 - Concrete pole base 2.6m deep	ea	26	$	$
					Total Section 6	**$**

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
SECTION 7: TRAFFIC SIGNALS						
7.01	**NRS 2001 2002; SSP51**	**Concrete Footings, Pads and Concrete Pole Bases (anchor assembly supplied by Region)**				
		a) Type 1 - Concrete Pole base 1.22m deep	ea	4	$	$
		i) Additional hydrovac excavation (PROVISIONAL)	ea	4	$	$
		b) Type 6 - Concrete Pole base 2.60m deep	ea	9	$	$
		i) Additional hydrovac excavation (PROVISIONAL)	ea	9	$	$
7.02	**NRS 2003M; SSP51**	**Concrete Controller Base including 1.0m x 1.0m x 150mm concrete pad at cabinet door**				
		a) Type M - Concrete base for Traffic Controller Cabinet	ea	1	$	$
7.03	**SSP51**	**Conduit * Includes fish rope, sweeps and all reinstatement Common Trench or Directional Drill ***				
		a) Supply and install 1-100mm and 1-50mm PVC Conduits	m	270	$	$
		b) Supply and install 1-50mm PVC Conduits (Signal Plant)	m	115	$	$
		c) Supply and install 1-100mm PVC Conduits	m	55	$	$
		d) Supply and install 2-100mm PVC Conduits	m	10	$	$
7.04	**SSP51**	**Cable - Install (supplied by Region) Including sufficient length of cable for all connections and drip loops**				
		a) Install 4 conductor cable (cameras, 3 section heads)	m	70	$	$
		b) Install 7 conductor cable (ped heads)	m	140	$	$
		c) Install 25 conductor cable (traffic signals)	m	310	$	$
		d) Install Beldon cable - BLACK/RED (audible push buttons)	m	620	$	$
		e) Install Beldon cable - BLACK/WHITE (loops)	m	925	$	$
		f) Install coaxial cable(vehicle pre-emption detector)	m	20	$	$

7.05	**SSP51**	**Cable - Supply and Install Including sufficient length of cable for all connections and drip loops**				
		a) Supply and Install #6 cable - black/white (illumination underground)	m	225	$	$
		b) Supply and Install #6 cable - green (ground)	m	270	$	$
		c) Supply and Install #8 cable - black/white (power supply)	m	35	$	$
		d) Supply and Install 12/2 cable (illumination riser)	m	65	$	$
7.06	**NRS 2020; SSP51**	**Junction Boxes (supplied by Region) - Install 330 x 600mm junction box (signal plant)**	ea	18	$	$
7.07	**NRS 2130 2140; SSP51**	**Poles (supplied by Region) including all necessary mounting hardware**				
		a) Install Sectional Steel Poles - Direct Buried Type 6 - 7.0m (power pole)	ea	1	$	$
		b) Install Spun Aluminum Poles - Base Mounted Type 1 - 4.0m tall (pedestrian pole)	ea	4	$	$
		c) Install Sectional Steel Poles - Base Mounted				
		i) Type 6 - 6.3m tall (signal pole w/o luminaire/camera)	ea	5	$	$
		ii) Type 6 - 10.5m tall (signal pole with luminaire/camera)	ea	4	$	$
7.08	**SSP51**	**Signal Mast Arms (supplied by Region) Install traffic signal mast arm of appropriate length to position signal head at standard location - 1.2m to 7.6m mast arm**	ea	7	$	$
7.09	**SSP51**	**Luminaire Mast Arms (supplied by Region) Install luminaire mast arm of appropriate length at standard position and location - 0.6m to 3.0m mast arm**	ea	6	$	$
7.10	**NRS 2520 2521; SSP51**	**Loops - to be cut into final lift of base asphalt. Includes sawcutting, sealant, excavation and wire to loop junction box**				
		a) Supply and install 2.4m x 15.0m - Duplex	ea	9	$	$

		b) Supply and install 2.0m x 10.0m - Duplex	ea	1	$	$
		c) Supply and install 2.0m x 4.0m - Duplex	ea	1	$	$
7.11	**SSP51**	**Grounding Rods - Supply and install grounding rods including all wires necessary for connection**	ea	12	$	$
					Total Section 7	**$**

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
SECTION 8: INTERCONNECT						
8.01	**SSP51**	**Conduit * Including fish rope, sweeps and all reinstatement - Common Trench or Directional Bored * - Supply and install 1-50mm PVC Conduit (Interconnect)**	m	1,180	$	$
8.02	**SSP51**	**Cable - Install (supplied by Region) including sufficient length of cable for all connection and drip loops. - Install Fibre Optic communication cable (interconnect)**	m	1,230	$	$
8.03	**SSP51**	**Junction Boxes (supplied by Region) - Install 330 x 600mm junction box (interconnect)**	ea	5	$	$
					Total Section 8	**$**

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
SECTION 9: RETAINING WALL STRUCTURES						
9.01	**SSP52**	**Protection Systems**	m^2	53	$	$
9.02	**SSP52**	**Earth Excavation for Structure**	m^3	70	$	$
9.03	**SSP52**	**Dewatering Structure Excavations**	L.S.	1	[redacted]	$
9.04	**SSP52**	**Granular Bedding**	m^3	15	$	$
9.05	**SSP52**	**Backfill to Structure**	m^3	44	$	$
9.06	**SSP52**	**Site Grading**	L.S.	1	[redacted]	$
9.07	**SSP52**	**Mass Concrete**	m^3	1.5	$	$
9.08	**SSP52**	**Concrete in Retaining Walls**	m^3	20	$	$
9.09	**SSP52**	**Pedestrian Railing**	m	13	$	$
9.10	**SSP52**	**Reinforcing Steel Bars**	t	2	$	$
9.11	**SSP52**	**Stainless Steel Reinforcing Steel Bars**	t	0.071	$	$
9.12	**SSP52**	**GFRP II Reinforcing Bars**	m	22	$	$
9.13	**SSP52**	**Dowels into Concrete**	ea	28	$	$
					Total Section 9	**$**

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
SECTION 10 : PROVISIONAL						
10.01	**SSP9**	**Trench or road sub-excavation 50mm crusher-run stone**	m^3	30	$	$
10.02	**SSP10**	**Concrete**				
		a) 15 MPa concrete	m^3	10	$	$
		b) 20 MPa concrete	m^3	10	$	$
		c) 25 MPa concrete	m^3	10	$	$
		d) 32 MPa concrete	m^3	10	$	$
10.03	**SSP12**	**Unshrinkable fill**	m^3	10	$	$
10.04	**SSP13**	**19 mm Clear Stone**	t	10	$	$
10.05	**B1**	**Test Pits**				
		a) By mechanical digging				
		i) depth up to 0.5 m	ea	5	$	$
		ii) depth up to 1.0 m	ea	5	$	$
		iii) depth up to 2.0 m	ea	5	$	$
		iv) depth up to 4.0 m	ea	3	$	$
		b) by vacuum methods				
		i) depth up to 0.5 m	ea	5	$	$
		ii) depth up to 1.0 m	ea	5	$	$
		iii) depth up to 2.0 m	ea	5	$	$
		iv) depth up to 4.0 m	ea	3	$	$
		v) depth up to 6.0 m	ea	1	$	$
10.06	**B3 SSP14**	**Granular 'A' for temporary driveway or pedestrian access**	t	50	$	$
10.07	**B10**	**Sawcutting Asphalt Pavement**	m	50	$	$
10.08	**B24**	**Application of Water for Dust Control**	m^3	200	$	$
10.09	**B41**	**Traffic pole base adjustment**	ea	1	$	$
10.10	**C2 SSP27**	**Sewer Laterals (All sizes)**	m	15	$	$
10.11	**C4**	**Reconnect Existing Sewer Laterals (All sizes)**	ea	1	$	$
10.12	**SSP11**	**Rock Excavation hoe-ramming**	m^3	30	$	$

10.13	**D5**	**Main Stop (20 mm)**	ea	2	$	$
10.14	**D4 SSP36**	**Water Services (20mm)**	m	20	$	$
10.15	**D6 SSP37**	**Curb Stops (20mm)**	ea	2	$	$
10.16	**D7 SSP38**	**Curb Box (20mm)**	ea	2	$	$
10.17	**D8 SSP39**	**Reconnect Water Services (20mm)**	ea	1	$	$
10.18	**SSP45**	**Leaking and Damaged Water Service Repair**	m	10	$	$
10.19	**SSP46**	**Additional Bends, Tees & Fittings**	ea	5	$	$
10.20	**SSP47**	**Water Valve Cleaning & Exercising**	ea	1	$	$
10.21	**SSP48**	**Existing Watermain Repairs**	ea	1		
10.22	**SSP52**	**Subexcavation**	m^3	15	$	$
					Total Section 10	**$**

TENDER SUMMARY

SECTION 1: GENERAL	$
SECTION 2: ROADS	$
SECTION 3 : STORM SEWER	$
SECTION 4: SANITARY SEWER	$
SECTION 5: WATERMAIN	$
SECTION 6: ELECTRICAL	$
SECTION 7: TRAFFIC SIGNALS	$
SECTION 8: INTERCONNECT	$
SECTION 9: RETAINING WALL STRUCTURES	$
SECTION 10 : PROVISIONAL	$
TOTAL TENDER PRICE (excluding H.S.T.)	$

STATEMENT "A"

Contract No. 2019-T-105
(RN19-05)

Reconstruction of Road 98 (Montrose Road)
from Regional Road 49 (McLeod Road)
to Charnwood Avenue
In the City of Niagara Falls

TENDERER'S EXPERIENCE IN SIMILAR WORK

UNLESS THIS LIST IS PROPERLY COMPLETED, THE TENDER MAY BE DISQUALIFIED

YEAR COMPLETED	DESCRIPTION OF WORK	FOR WHOM WORK PERFORMED	VALUE

STATEMENT "B"

Contract No. 2019-T-105
(RN19-05)

Reconstruction of Road 98 (Montrose Road)
from Regional Road 49 (McLeod Road)
to Charnwood Avenue
In the City of Niagara Falls

(a) Harmonized Sales Tax:

The Contractor shall **NOT** include any amount in his tender price for the Harmonized Sales Tax (H.S.T.). Any amount to be levied with respect to the H.S.T. will be included as a separate item on the payment certificate. The appropriate H.S.T. levy will be paid to the Contractor in addition to the amount approved by the Contract Administrator for work performed under the contract and will, therefore, not affect the amount of the contract. The Contractor will be required to make the appropriate remittance to Revenue Canada in accordance with the legislation.

i) Total Tender Price including contingency and excluding HST $

ii) Estimated Cost of Harmonized Sales Tax..... $

iii) Total Contract Amount [(i) + (ii)] ..... $

iv) H.S.T. Registration Number: _____

_____ _____
Company Name **Contractor's Signature(s)**

_____
Address **Contractor's Seal**

Witnesses: _____

_____

STATEMENT "C"

Contract No. 2019-T-105
(RN19-05)

Reconstruction of Road 98 (Montrose Road)
from Regional Road 49 (McLeod Road)
to Charnwood Avenue
In the City of Niagara Falls

ACCESSIBILITY REGULATIONS FOR CONTRACTED SERVICES CONFIRMATION FORM

If the nature of your business with the Regional Municipality of Niagara (the "Region") creates the opportunity that any of your staff, contractors or any others associated with you would interact with the public on behalf of the Owner, it is necessary that the Owner ensure those providing service on our behalf have received the Customer Service Training in order that we retain our compliance with the requirements of the *Accessibility for Ontarians with Disabilities Act 2005.*

Please sign below to ensure you are the person able to bind your company. Companies whose employee's role may require them to interact with the public on behalf of the Owner, shall receive the CUSTOMER SERVICE STANDARD TRAINING of the ACCESSIBILITY FOR ONTARIANS WITH DISABILITIES ACT 2005.

If you have any questions, please contact the **Accessibility Advisory Coordinator** at 905-980-6000, ext. 3252 or email **accessibility@niagararegion.ca**

Please enclose this form with your bid submission.

Company Name: _____

Signature of Authorized Individual: _____

Position: _____

STATEMENT "D"

Contract No. 2019-T-105
(RN19-05)

Reconstruction of Road 98 (Montrose Road)
from Regional Road 49 (McLeod Road)
to Regional Road 20 (Lundy's Lane)
In the City of Niagara Falls

LIST OF SUB-CONTRACTORS

The bidders shall list hereunder the names of all sub-contractors intended to be used in the execution of this work subject to the approval of the Contract Administrator.

All work not performed directly by the Contractor's forces shall be included in this list. All changes to this list must be approved by the Contract Administrator.

SUB-TRADE	NAME OF SUB-CONTRACTOR	ADDRESS OF SUB-CONTRACTOR

AGREEMENT TO BOND

Contract No. 2019-T-105
(RN19-05)

Reconstruction of Road 98 (Montrose Road)
from Regional Road 49 (McLeod Road)
to Charnwood Avenue
In the City of Niagara Falls

AGREEMENT TO BOND

We, the undersigned, hereby agree to become bound as surety for:

.....

.....

in a bond totalling One Hundred Percent (100%) of the contract amount, and conforming to the Instruments of Contract attached hereto, for the full and due performance and maintenance of the works shown as described herein if the Tender for

.....

.....

is accepted by the Owner. We also agree to bond as surety for the payment of the cost of all labour and materials for an amount equal to 100% of the contract sum used by the contractor in due performance of his work.

It is a condition of this Agreement that if the above mentioned Tender is accepted, application for a Performance Bond and Labour Materials Payment Bond must be completed with the undersigned within fourteen (14) days of acceptance of the tender related thereto, otherwise this Agreement shall be null and void.

Dated this _____ day of _____, 2019

_____
Name of Bonding Company

_____
Signature of Authorized Person Signing for Bonding Company

_____

(Company Seal)

_____
Position

FORM OF CONTRACT AGREEMENT

THIS AGREEMENT made in triplicate this _____ day of _____ 20 .

- BETWEEN -

THE REGIONAL MUNICIPALITY OF NIAGARA
1815 Sir Isaac Brock Way, P. O. Box 1042
Thorold, Ontario, L2V 4T7

Hereinafter called the "Region" (of the first part)

- AND –

CONTRACTOR NAME
Address

Hereinafter called the "Contractor" (of the second part)

WHEREAS on **(date),** the Region issued Tender # **(insert number)** (*if applicable* **and Addendum # (insert number) dated (date)** *[repeat for each Addendum])* for **(enter the description of work)** (the "Tender");

AND WHEREAS on **(enter date of Contractor's proposal)** the Contractor submitted a bid in response to the Tender (the "Bid");

AND WHEREAS the Region wishes to enter into an agreement with the Contractor for the services, as more particularly described in the Tender and the Bid, attached hereto as Schedule "A" and forming part of this Agreement (the "Services");

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the premises and other good and valuable consideration, the sufficiency whereof is acknowledged hereby by the parties, the parties hereto agree with each other as follows:

1. The Contractor shall provide the Services pursuant to all the terms and specifications set out in Schedule "A". If there should be any conflict between the provisions of this Agreement and the provisions of Schedule "A", the provisions of this Agreement shall prevail.

2. The term of this Agreement shall commence _____.

3. The Region shall pay the Contractor for Services as outlined in Schedule "A".

4. If either party, acting reasonably, determines that the other party has failed to perform its obligations pursuant to this Agreement, then such party may terminate this Agreement upon giving at least thirty (30) days' written notice to the other party.

5. The Contractor shall indemnify and save harmless the Region, its elected officials, officers, employees and agents from and against any and all claims of any nature, actions, causes of action, losses, expenses, fines, costs (including legal costs), interest, or damages of every nature and kind whatsoever arising out of the negligence, errors, omissions, fraud or willful misconduct of the Contractor its officers, employees, agents and subcontractors, or any of them, attributable to or connected with the performance, non-performance or purported performance of the Contractor obligations pursuant to this Agreement, except to the extent that same is attributable or caused by the negligence of the Region, its officers, employees and agents, or any of them. Further, this indemnity shall survive the expiration or early termination of this Agreement and continue in full force and effect.

6. This Agreement together with its schedule constitutes the entire understanding between the parties. Any change, addition to, or waiver of the terms hereof must be specifically agreed upon, in writing, and signed by both parties. Failure on the part of either party to insist upon the strict observance of any of the terms and/or conditions herein shall not operate as a waiver of such party's right to require the future observance of any such terms or conditions.

7. This Agreement shall not be assigned, in whole or in part, by either party hereto without the prior written consent of the other party. This Agreement, all its covenants, promises and conditions shall enure to the benefit of and be binding upon the parties hereto and their respective permitted successors and assigns.

8. Either party may terminate this Agreement at any time, without notice, for just cause which shall include, without limitation, dishonesty, fraud, willful deceit or failure to properly fulfill the obligations hereunder where such failure is not remedied within ten (10) days after notice of same is given.

9. This Agreement shall be construed and interpreted in accordance with the laws of the Province of Ontario, Canada.

IN WITNESS WHEREOF the parties hereto have duly executed this Agreement.

(CONTRACTOR NAME)

Per: _____
Name:
Position:

Per: _____
Name:
Position:
I/We have authority to bind the Corporation.

THE REGIONAL MUNICIPALITY OF NIAGARA

Per: _____
Name:
Position:

Per: _____
Name:
Position:
I/We have authority to bind the Corporation.

SPECIAL PROVISIONS - GENERAL

(Refer to Niagara Peninsula Standard Contract Document)

SPECIAL PROVISIONS - CONTRACT ITEMS

(Refer to Niagara Peninsula Standard Contract Document)

SUPPLEMENTARY SPECIAL PROVISIONS

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REGIONAL MUNICIPALITY OF NIAGARA

Contract No. 2019-T-105 (RN19-05)

Road Widening and Reconstruction of Regional Road 98
(Montrose Road)
In the City of Niagara Falls

SPECIAL PROVISIONS - SUPPLEMENTARY SPECIAL PROVISIONS

GENERAL REQUIREMENTS & INFORMATION

The following General Requirements should be considered as amendments and/or extensions to the Special Provisions - General, as listed in the Niagara Peninsula Standard Contract Document, latest revision.

SSP1 PROJECT SCOPE

This contract encompasses the provision of all labour, materials and equipment necessary for the installation of underground services and road reconstruction on:

Montrose Road from 120m south of McLeod Road to 140m north of Charnwood Avenue; Charnwood Avenue from Montrose Road to 90m west; Kinsmen Court from Montrose Road to 60m east.

The work involves the installation of a full road excavation and reconstruction, storm sewer, sanitary sewer, water main and appurtenances, street lighting, traffic signals and landscaping.

The above description is general only and shall not be construed as limiting the scope of the contract.

SSP2 PRE-CONSTRUCTION REVIEW MEETING

Prior to the start of construction, the successful Contractor will attend a pre-construction review meeting. In order to allow for a relevant review and discussion, the Contractor is required to have all submittals necessary, as per the contract requirements, delivered to the Contract Administrator two (2) working days prior to the pre-construction meeting, including but not limited to the following:

- All documentation required for contract execution, if not already submitted to Niagara Region, as per Special Provisions - General Item G1 of the Niagara Peninsula Standard Contract Documents including the necessary bonding, requested Certificate of Insurance and Workplace Safety and Insurance Board certification of good standing.
- A copy of the Ministry of Labour Notification as per Special Provisions - General Item G6 of the Niagara Peninsula Standard Contract Documents.

- A listing of all products controlled under WHMIS expected to be used on the project and related Material Safety Data Sheets as per Special Provisions - General Item G7 of the Niagara Peninsula Standard Contract Documents.
- A detailed construction schedule for construction on the project for review and approval. The schedule shall be in the form of a bar chart showing the sequencing of intended construction works indicating proposed start and finish dates and duration in working days of the broken down tasks or activities. The construction schedule should identify the critical path and will need to be updated by the Contractor for any subsequent site progress meetings. Once approved by the Contract Administrator, the Contract Administrator will provide the Contractor with the required notice to commence construction based upon the approved start date as per the requirements in the Special Provisions - General Item G3 of the Niagara Peninsula Standard Contract Documents. The Contractor is to note the requirements of the noted provision regarding the charging of working days. Following issuance of the notice to commence construction, any revisions to the construction schedule must be made in the form of a written request by the Contractor, to be reviewed for approval by the Contract Administrator.
- A list of proposed recycling facilities and disposal sites, including written authorizations as required, to be utilized on this contract.
- A copy of the proposed Traffic Control and Management Plan, in accordance with the Special Provisions - Contract Item A8 of the Niagara Peninsula Standard Contract Documents for review by the Niagara Region.
- A listing of the Contractor's proposed supervisory personnel for this project, including contact information. This list must include a 24 hour land line that will be answered 24 hours a day and is not a voice mail box.
- A listing of all the Contractor's staff that are planned to take part in the project, complete with a list of training received and copies of all their applicable certificates.
- A list of the proposed sub-contractors and material suppliers intended to be utilized on this contract, for review.
- A listing of all equipment proposed to be used on this project, with rental rates, where applicable.
- Written notification if the Contractor intends to use recycled concrete or asphalt in place of Granular "A" on part or all of the project. Included with the notification will be the location of the proposed recycled material stockpile(s). Reference is to be made to Supplementary Special Provisions Item SSP14 regarding QA/QC and measurement for payment provisions.
- A copy of the Contractor's Health and Safety Policy and Program.
- Any other necessary submittals required by provisions elsewhere in this contract that are needed for review such as shop drawings or sampling and testing plans.

Please also note that any proposed changes, revisions, additions or deletions to the information, lists, plans and schedules noted above must be submitted, in advance and in writing, to the Contract Administrator for review and approval.

If not already undertaken, all necessary notifications and arrangements for undertaking of the pre-condition surveys, in accordance with the provisions of Contract Item A2, are to be coordinated with the Contract Administrator.

SSP3 EXISTING CONDITIONS

Damages

Any unreasonable damage, as determined by the Niagara Region, to lawns, driveways, etc., shall be repaired or replaced immediately by the Contractor at their expense.

SSP4 OPERATIONS

The Contractor shall be responsible to obtain all required inspections and permits before commencing construction operations, including the payment of any associated application fees.

Half Load Roadways

Tenderers are advised to note and abide by the policy the City of Niagara Falls regarding half loads during the months of March and April.

When a trench box is used to support the wall of a trench, its removal shall be as per clause 404.07.02 in OPSS 404.

Waste (Garbage) and Recycling Pickup

The Contractor shall maintain access for waste and recycling pickup at normal pickup locations or move waste or recycling from within the work zone to an accessible location.

Winter Maintenance

The Contractor will be responsible for winter maintenance, snow clearing, storage and removal activities on the road and sidewalks within the construction work zones unless otherwise noted in this section.

The work zone will be defined as including the following areas:

1. Montrose Road from 120m south of McLeod Road to 140m north of Charnwood Avenue;
2. Charnwood Avenue from Montrose Road to 100m west;
3. Kinsmen Court from Montrose Road to 60m east.

For this project, this item will apply to both roads and sidewalks for the entire work zone from the Construction Begins sign to the Construction Ends sign if the Contractor has any portion of the roads closed to traffic or not restored with hot mix asphalt or cold patch. This item will not apply to the work zone if no construction is in progress, there are no traffic restrictions and all road restoration is completed.

All unit prices bid will be deemed to have included an allowance for these provisions.

CONTRACT ITEMS

SSP5 SITE OFFICE

In addition to the condition stipulated in item A3 of the Special Provisions – Contract Items of the Niagara Peninsula Standard Contract Document, the following shall also apply:

Site office provided shall include wall mounted electrically operated heater and air conditioner with integral thermostats capable of maintaining a room temperature of 21 degrees C.

Provide private washroom facilities for the Inspector' exclusive use adjacent to the site office complete with flush or chemical type toilet, mirror and sink with hot and cold running water. Contractor shall supply paper towels, hand soap and toilet tissue throughout duration of the contract. Washroom facilities shall be heated during winter months.

SSP6 CONSTRUCTION LAYOUT AND RECORD INFORMATION

Construction Layout

In addition to the conditions stipulated in item A4 of the Special Provisions – Contract Items of the Niagara Peninsula Standard Contract Document, the following shall also apply:

The Contractor shall include in the lump sum cost for this item; the checking of all grades and alignment with the use of batter boards and boning rods or digital survey equipment to ensure proper adherence to design; re-staking of layout lost due to destruction or removals; any additional layout within the intent of the contract for minor revisions to the water, storm and sanitary sewer system design.

An absolute minimum of three (3) layout stakes shall be provided for any single line of layout. Maximum spacing of grade stakes shall be 15 metres for all layout and at all changes of grade or direction. Layout for curb and gutter shall include offset stakes placed a maximum of 2 metres behind the proposed lip of gutter. Layout for curb shall also include the drop locations for all curb depressions, the bottom of slope shall be marked out, on site, prior to curb pour.

Catchbasin layout shall consist of three (3) grade stakes installed in line with the inside back wall of the catchbasin (front face of curb), a centre stake representing centre of catchbasin and a 3 metre offset stake to the left and right of the centre point stake.

Failure to comply with the above conditions will result in a reduction in payment to this item.

SSP7 INSTALL, MAINTAIN AND REMOVE SILT CONTROL DEVICES

In addition to the conditions stipulated in item A7 of the Special Provisions – Contract Items of the Niagara Peninsula Standard Contract Document, the following shall also apply:

The provisions of OPSS 805 apply except as amended or extended herein.

Install Filter Fabric Cloth under C.B. grates and M.H. covers.

The Contractor shall place filter cloth under all catch basin grates and maintenance hole covers. The Fabric shall be Terrafix 270A.

The installation shall be done prior to any excavation. The Contractor is responsible for maintaining the filter cloth and cleaning and replacing as required. Filter cloth shall have sufficient overlap or be secured to grates and covers to prevent failure under full silt loads.

SSP8 CONSTRUCTION SIGNS, TRAFFIC CONTROL & TRAFFIC MANAGEMENT PLAN

In addition to the conditions stipulated in item A8 of the Special Provisions – Contract Items of the Niagara Peninsula Standard Contract Document, the following shall also apply:

The Contractor shall prepare a Traffic Management and Control Plan and submit to the Contract Administrator for review prior to the preconstruction meeting.

This plan shall have details for the following requirements but shall not be limited to:

- Traffic flows with regard to work schedule
- Traffic management during peak traffic flows
- Maximum delay time
- Number of flag persons and communication devices
- Pedestrian access
- Driveway access and Business access
- McLeod Road / Charnwood Avenue / Kinsmen Court

Road closures shall NOT be permitted.

Interference with normal flow of traffic shall be kept to a minimum. The Contractor shall be prepared to supply and erect any barricades and signs which may be required for complete control of both pedestrians and vehicular traffic including the supply of competent flag persons in accordance with Ontario Traffic Manual Book 7. The Contractor shall further provide a traffic control plan in accordance with current version. The lump sum price for this item shall be deemed to have included this provision.

A minimum of one lane of traffic in each direction shall be maintained at all times during construction. A minimum of one lane of traffic in each direction plus turning lanes shall be maintained at all other times. The Contractor's proposed sequencing and staging of works and operations is to make due allowance for this requirement.

The Contractor will also be required to work closely with the Contract Administrator and the Construction Inspector to keep property owners informed of potential impacts to their businesses and residences, in order to minimize disruption to access and servicing to their properties by planned construction activities.

Pedestrian access to all businesses and residences is to be maintained at all times whenever possible. Access closures are to be scheduled at least 2 business days in advance between the

Contractor and the Business owner or Residents and approved by Contract Administrator or Construction Inspector, including the type and form of any temporary access provisions.
Any disruption to pedestrian access is to be kept to a minimum duration.

At least one access must be fully maintained or with minimal disruption to the abutting businesses and residences.

The Contractor shall advise the Niagara Regional Police Service, the Niagara Falls Fire Department and Niagara Emergency Medical Service on a daily basis, with current status of the construction as it pertains to the passage of traffic within the contract limits.

The Contractor will co-ordinate with Niagara Falls Transit and Niagara Region Transit to ensure minimum interruption to their bus schedules on Montrose Road and McLeod Road. Niagara Falls Transit, Niagara Region Transit, school buses and garbage service vehicles shall be given priority to maintain their schedules.

The Contractor shall also maintain and provide existing pedestrian access at all times to the businesses and residents during all phases of construction in an acceptable manner.

The traffic control signage requirements shall include the following:

Supply, locate, erect, operate, maintain, relocate as necessary and remove all necessary traffic signs, construction signs, including delineators, barricades and flashing lights, in accordance with the latest editions of the Ontario Traffic Manual (OTM) Book 7 and the Traffic Control Manual for Roadway Work Operations - Field Edition .

The Contractor is responsible for the installation and removal of all construction signage. The Contractor is also responsible for daily maintenance of all signs throughout the contract.

Regulatory signs and street name signs along Montrose Road cannot be removed without approval of the Niagara Region or approval of the City of Niagara Falls for signs along Charnwood Avenue and Kinsmen Court.

Any existing signs removed by the Contractor to accommodate construction shall be kept operational by placement on a temporary support.

All signs are to be replaced by the Contractor.

Use of Niagara Regional Police Services for Traffic Control

Within 30 metres of the intersection of Montrose Road and McLeod Road, in the interest of the safe movement of both vehicular and pedestrian traffic, the Contractor shall employ Niagara Regional Police Services to undertake Traffic Control during Contractor Operations. This issue will be reviewed along with the Contractor's Traffic Control and Management Plan during the Pre-Construction Review Meeting. The scheduling and coordination of this work will be undertaken by the Contractor at the Contractor's expense. Notwithstanding discussions at the Pre-Construction Review Meeting, if in the opinion of the Contract Administrator, unsafe traffic conditions are arising during certain Contractor operations, the Contractor may be requested to employ Niagara

Regional Police Services for Traffic Control. Any costs associated with using Niagara Regional Police Services will be deemed to be included in the Lump Sum price bid for this item.

SSP9 TRENCH SUB-EXCAVATION

The provision of OPSS 314 shall apply as amended or extended herein.

The unit price for this item shall include all sub-excavation below the required trench bottom or unsuitable sub-grade material, any additional sheathing and shoring required and disposal of excavated material. The supply and placement of 50mm crusher-run stone in the trench or sub-grade compacted to 100% Proctor Density is also included in the price indicated.

Payment shall be made by the cubic metre measurement based on the calculated volume of the theoretical trench width, the average depth and length of sub-excavation.

SSP10 CONCRETE 15MPA/20MPA/25 MPA/32MPA

The concrete shall have a minimum 28 day compressive strength of 15 Mpa, 20 Mpa, 25 Mpa or 32 Mpa respectively. The price indicated in the Form of Tender per cubic metre shall include supply and placement of concrete in a trench at any depth for whatever purpose as directed by the Contract Administrator.

SSP11 ROCK EXCAVATION IN TRENCH

The provisions of OPSS 403 shall apply as amended or extended herein.

Additional compensation for any rock excavation in trench as defined by OPSS 401 shall be paid for under this item at the unit price indicated in the Form of Tender.

Rock excavation for these installations shall be limited to a maximum depth of 300mm below the O.D. of the pipe and a maximum trench width of the pipe O.D. plus 1000mm. Measurement for payment shall not exceed the above maximum.

SSP12 UNSHRINKABLE FILL

The provisions of OPSS 1359 apply as amended herein.

All unshrinkable fill materials shall conform to the requirements of OPSS.MUNI 1350.

Basis for Payment

Payment at the unit price bid for this item shall include all labour, materials and equipment necessary to supply and place unshrinkable fill for whatever purpose as directed by the Contract Administrator.

SSP13 19 MM CLEAR STONE

Payment at the unit price bid for this item are to include all labour, material and equipment costs necessary to supply and place 19 mm Clear Stone in areas as directed by the Contract Administrator or designate in the field. Payment will be by the tonne, based on submitted weigh

tickets for same.

SSP14 GRANULAR A CRUSHED LIMESTONE

In addition to the conditions stipulated in item B3 of the Special Provisions – Contract Items in the Niagara Peninsula Standard Contract Document, the following shall also apply:

Granular "A" must be placed on all road, future road and sidewalk trenches to the existing grade to provide safe access. The Contractor will be responsible for maintaining the granular until the pavement restoration work is carried out. The Contractor must include in this unit price bid all labour and equipment to remove the excess Granular "A" from the trenches prior to final restoration, and reuse of uncontaminated granular as trench backfill. The Contractor is responsible to remove the Granular "A" in a manner that avoids contamination of the Granular "A" with asphalt, concrete or native material. Any contaminated material is to be removed at the Contractor's expense. Any cost for these requirements must be included in the unit price bid for Granular "A".

SSP15 RECYCLED GRANULAR MATERIAL

In addition to the conditions stipulated in item B3 of the Special Provisions – Contract Items in the Niagara Peninsula Standard Contract Document, the following shall also apply:

Recycled Granular Material meeting Granular "A" specifications may be permitted, in accordance with OPSS for sewer and watermain trench backfill only. Written notification of the Contractor's intention to utilize recycled material is to be provided at the pre-construction review meeting. The proposed material must conform to the provisions of OPSS 1010 for both composition (physical properties) and gradation as specified for Granular "A". Access to the Contractor's recycled material stockpile(s) is to be made available for sampling and testing by a QA/QC testing company retained by the Niagara Region to verify compliance with the above noted provision. The Contractor may submit their own testing results to the Contract Administrator for review and approval, but the Niagara Region reserves the right to undertake any confirmatory testing it deems necessary prior to approving use of any proposed recycled material on this project. The provisions of Special Provisions General - Item G8 of the Niagara Peninsula Standard Contract Document will apply to payment for testing in this regard.

No deliveries of recycled material to the site are to be made until written approval is received from the Contract Administrator. Approval will be subject to confirmation that the material complies with quality criteria and weigh tickets are the only acceptable measurement.

If Recycled Granular Material is approved for use on this project and the Recycled Granular Material is used by the Contractor on this contract, the Granular "A" tender quantity shall be reduced by an amount equal to the quantity of Recycled Granular Material used.

SSP16 CONCRETE CURB & GUTTER

In addition to the conditions stipulated in item B8 of the Special Provisions – Contract Items of the Niagara Peninsula Standard Contract Documents and OPSS 353, the following shall also apply:

The Contractor shall take due precaution to protect green concrete from being damaged, marred

or defaced, particularly at driveway entrances. In the event that the green concrete is marred or damaged in any way, the Contractor shall breakout and replace the damaged sections. Patching or grinding of damaged, marred or defaced concrete will not be accepted. The unit price bid shall be deemed to have made due allowance for this requirement.

SSP17 CONCRETE SIDEWALKS, MEDIANS AND BOULEVARDS

In addition to the conditions stipulated in item B9 of the Special Provisions – Contract Items of the Niagara Peninsula Standard Contract Document and OPSS 351, the following shall also apply:

The unit price bid shall include all necessary equipment, materials and labour to excavate to subgrade, form, finish and cure 32 MPa concrete sidewalks to the specified thickness, on a 125mm granular base.

Commercial and industrial driveways shall also include wire mesh and an allowance to pour the driveways in two (2) sections to allow access at all-times. As an alternative to two (2) separate concrete pours, the Contractor may elect to use 'High Early Strength Concrete' at no additional cost to the contract provided approval from the businesses is provided.

The unit price bid shall also include provisions for cold weather work as noted in OPSS 351.

Private concrete sidewalks will be constructed to match the existing or minimum 125mm depth, whichever is greater, and paid for under this item.

The Contractor is to adjust the sidewalk crossfall where required to allow for positive drainage from the driveway and housewalks. Where the new sidewalk has caused ponding, the Contractor shall remove and replace the sidewalk at no additional cost to the Niagara Region.

The Contractor shall take due precaution to protect the finished surface of freshly laid concrete sidewalk from being damaged, marred or defaced. In the event that the freshly placed concrete is marred or damaged in any way, the Contractor shall break out and replace the damaged sections. Patching or grinding of damaged, marred or defaced concrete will not be accepted. The unit price bid shall be deemed to have allowed for this contingency.

Coloured concrete shall be Colortech Synthetic Oxide Pigments by QC Construction Products Canada, Salsa Red 4lbs CC16. Should there be a colour or pattern mismatch after placement, the Contractor will be required to remove and reinstate all concrete at no additional cost to the Owner. Niagara Peninsula Standard Contract Document Special Provisions – Contract item B9 and item B16 apply to this item.

SSP18 BOULEVARD GRADING, TOPSOIL AND SOD

In addition to the conditions stipulated OPSS 802 and 803, and item B21 in the Special Provisions – Contract Items Niagara Peninsula Standard Contract Document, the following shall also apply:

All areas to be sodded shall be regraded to provide proper drainage. Any areas on private property shall also be included.

All unnecessary damage to lawns, boulevards or grassed areas caused by the Contractor's carelessness shall be reinstated at their own expense.

The Maintenance Period for sod identified in OPSS 803.07.05 shall be **one year** from the date of sod placement.

Topsoil :

Topsoil shall be a **PREMIUM BLEND** with a pH of 6.5 to 7.5, weed free and naturally sterilized through composting. The blend shall consist of 50% Triple Mix (a 30% mixture of topsoils, sands and shredded wood mulch, a 30% mixture of black organic compost and manure and a 30% mixture of peat loam) and 50% Premium Topsoil (a 50% mixture of topsoils, sands and shredded wood mulch, a 25% mixture of black organic compost and a 25% mixture of composted cow manure). In general, the resulting topsoil mix should meet the following parameters :

pH : 6.5 - 7.5
Potassium : 100 - 120 ppm
Phosphorous : 15 - 30 ppm
Magnesium : 100 - 120 ppm
Organic Matter : $\geq$ 3%

Unless otherwise specified, the minimum depth of applied Premium Blend Topsoil shall be 100 mm.

Topsoil Testing :

Prior to commencement of the project, the Contractor shall supply two samples of topsoil from each stockpile to be used to the Contract Administrator. Additionally, the Contract Administrator may randomly sample topsoil arriving on-site. The samples will be tested by Agri-Food Laboratories (AFL) using the AFL Basic III test package plus % sand, % silt and % clay. These tests will rate the soil in accordance with AFL and Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) recommendations. Topsoil with tests resulting in "low, very high or excessive" ratings for the various parameters will be rejected.

Preparation and Timing :

As soon as practically possible after the main construction is completed, the Contractor shall rough grade and level all of the affected areas to the sub-grade elevation. The Contractor must ensure that all granular and foreign material is removed from areas adjacent to any driveway or sidewalk and from behind new curbs prior to the placement of topsoil. If the areas are lower than the required depth, the Contractor may use suitable native fill material properly compacted to prevent undo settlement.

All 'cut-in' areas adjacent to the existing sod shall be squared off and removed by means of a mechanical sod cutter. An additional 25 mm of existing topsoil shall be removed to accommodate a 25 mm dressing thickness of Premium Blend Topsoil to ensure new sod growth at abutting sod areas.

In the event of inclement or hot weather conditions, the Contract Administrator may delay the placement of sod until more appropriate weather conditions prevail. Nevertheless, the Contractor shall still prepare and apply the topsoil to all of the affected areas as soon as

construction is completed to tidy up the construction zone and reduce the possibility of weed infestation.

Fertilizer :
A granular starter fertilizer of 0-20-0 shall be applied at a rate of 2.0 kg per 100 m^2 spread on the topsoil immediately prior to sodding. In addition, an application of 20-20-20 water soluble fertilizer shall be applied 21 days after the sod is laid.

Sod :
Sod shall be placed in accordance with OPSS 803.07. Sodded areas shall be rolled with a light roller to ensure a good bond between the sod and topsoil and to remove minor depressions and irregularities. Heavy rolling to correct irregularities in grade will not be permitted.

Initial watering of all sod shall be completed within 12 hours after placement and shall be sufficient to penetrate the root zone of the sod and wet the surface of the topsoil. The Contractor shall apply all water required during the maintenance period to ensure growth. The Contractor shall distribute an information door hanger to each affected residence outlining turf care information. The door hanger shall be supplied by the Owner.

In accordance with OPSS 803.07.05, the maintenance period shall commence once all of the sod has been placed. At the end of the maintenance period, the Contractor shall arrange a suitable time with the Contract Administrator to inspect all of the sod that has been placed. Deficient areas shall be resodded as outlined in OPSS 803.08.

Measurement and Basis for Payment :
The Contractor shall contact the Contract Administrator to arrange a suitable time to review the limits and calculate areas for payment on site.

If the placement of sod has been delayed due to weather yet the area to be sodded has been prepared and topsoiled as specified, payment at 50 % of the unit price bid for topsoil and sod will be made. The balance will be paid upon satisfactory completion of the sodding.

Measurement will be by the square metre of topsoil and sod placed as measured in the field by the Contract Administrator.

The unit price bid shall also include all final grading of the boulevards and all work required to ensure growth is maintained during the maintenance period.

SSP19 BOULEVARD GRADING , SEED, AND MULCH

In addition to the conditions stipulated in OPSS 802 and 804, and item B22 of the Special Provisions – Contract Items Niagara Peninsula Standard Contract Document, the following shall also apply:

All areas to be seeded shall be regraded to provide proper drainage. Any areas on private property shall also be included.

All unnecessary damage to front lawns, boulevards or grass areas caused by the Contractor's

carelessness shall be reinstated at their own expense.

The Maintenance Period for seed and mulch shall be one year from the date of placement.

Topsoil :
Topsoil shall be a **PREMIUM BLEND** with a pH of 6.5 to 7.5, weed free and naturally sterilized through composting.

The blend shall consist of:

- 50% Triple Mix (a 30% mixture of topsoils, sands and shredded wood mulch, a 30% mixture of black organic compost and manure and a 30% mixture of peat loam): and
- 50% Premium Topsoil (a 50% mixture of topsoils, sands and shredded wood mulch, a 25% mixture of black organic compost and a 25% mixture of composted cow manure).

In general, the resulting topsoil mix should meet the following parameters:

pH : 6.5 - 7.5
Potassium : 100 - 120 ppm
Phosphorous : 15 - 30 ppm
Magnesium : 100 - 120 ppm
Organic Matter : $\geq$ 3%

Unless otherwise specified, the minimum depth of applied Premium Blend Topsoil shall be 100 mm.

Hydraulic Seed and Mulch:
Hydraulic seed and mulch shall be placed in accordance with OPSS 804

The seed mix shall meet the requirements of the *Standard Roadside Mix* outlined in Appendix Table A-1 of OPSS 804.

Basis of Payment

Payment shall per OPSS MUNI 804.10

The unit price bid shall also include all final grading of the boulevards and all work required to ensure growth is maintained during the one year maintenance period.
Topsoil shall be as described in B21.

SSP20 PAVEMENT MARKING

The provisions of OPSS 710, OPSS 1716 (Waterborne Paint) OPSS 1714 (Field Reacted Polymeric) or OPSS 1713 (Thermal Plastic) shall apply except as amended herein.

Line marking shall be applied to conform to the provisions of Book 11 – Pavement, Hazard and Delineation Markings, of the Ontario Traffic Manual.

Pavement markings, where specified as paint, shall be yellow and white waterborne traffic paint or approved equal.

Reflectorized Field reacted polymeric also known as durable shall be used at intersections for crosswalks, stop bars and all lines from the beginning of lane tapers or if no tapers exist, 30 metres from the stop bars.

Pavement pre-marking shall be undertaken by the Contractor and approved by the Niagara Region's Supervisor Signs & Pavement Marking Operations prior to the application of **temporary and permanent markings. The unit price bid shall be deemed to have made allowance for pavement pre-marking and co-ordination of pavement pre-marking with the Niagara Region.**

Contact: Mr. Don Pierson
Regional Municipality of Niagara – Public Works
Supervisor Signs & Pavement Marking Operations
Telephone: 905-685-1571, extension 2221
Cell: 289-668-2971

Pavement marking removal where required shall minimize damage to the existing pavement surface. The method of removal (soda blast, shot blast or grinding) shall be approved by Niagara Region.

The Contractor is responsible for temporary pre-marking immediately following asphalt operations.

Payment shall be made by the unit price bid for pavement markings and removal as outlined in the schedule of quantities.

SSP21 GROUND MOUNTED SIGNS

The following references shall apply to this item:

OPSS – 543 Traffic Control Signing
Manual of Uniform Traffic Control Devices (MUTCD)
Sign Support Manual
King's Highway Guide Signing Policy Manual
Highway Traffic Act (HTA), Regulation 615

Timber or steel posts as well as sign boards shall be installed in accordance with Part A, Division 1, 2 and 3 of the MUTCD, Section 6 of the Sign Support Manual, King's Highway Guide Signing Policy Manual, and Regulation 615 of the HTA, at the locations indicated in the contract.

Footing depths for sign boards requiring more than one timber post as the support structure shall

be in accordance with Section 6.1.5 of the Sign Support Manual. All other posts shall be placed to a minimum of 1m below finished ground elevation.

The signs shall not obstruct the view of existing permanent signs. The existing permanent signs and roadside objects shall not obstruct the view of the signs. The sign boards shall be covered until they are appropriate for display.

New sign boards shall be supplied by Regional Niagara Public Works.

Contact: Mr. Don Pierson
Regional Municipality of Niagara – Public Works
Supervisor Signs & Pavement Marking Operations
Telephone: 905-685-1571, extension 2221

Payment will be made for each sign erected and the unit price bid shall include the supply and installation of a timber or steel post as specified and the installation of the sign board.

Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and material to do the work.

SSP22 WOOD BOARD FENCE

The Contractor is to replace the existing wood fence identified in the contract drawings with similar wood board fence as the existing.

All wood materials shall be treated wood, or wood of a natural resistance to decay. Materials shall be free from loose knots, cracks, and other imperfections.

Wood boards or slats shall be of cedar, redwood, combed spruce or similar wood acceptable to the Contract Administrator. Wood boards or slats shall be between 3/8 inches and 5/8 inches thick and be no greater than 6 inches wide.

Fence posts shall be 4-inch by 4-inch. Posts shall be pressure treated redwood, douglas fir-larch, cedar or similar wood acceptable to the Contract Administrator. The maximum spacing of posts shall be 2.44 metres (8 feet).

Set posts in 0.3m diameter concrete footings extending at least 1.2m into undisturbed natural ground or properly compacted fill. Concrete shall be 25 MPA at 28 days minimum.
The Contractor shall submit the shop drawing for review to the Contract Administrator.

Basis for Payment
The unit price bid for fence replacement shall include all labour, materials and equipment necessary to complete the work including removal of existing board fence. Measurement for payment will be made horizontally along the fence.

SSP23 RELOCATE EXISTING STEEL POST AND WIRE FENCE

The Contractor is to relocate the existing steel posts and wire fence at Dwelling # 6716 on Montrose Road as shown on the contract drawings.

Basis for Payment
The unit price bid for this relocation shall include all labour, materials and equipment necessary to complete the work. Measurement for payment will be lump-sum.

SSP24 LANDSCAPING

CONSTRUCTION SPECIFICATION FOR PLANTING

1.0 SCOPE

This specification covers the requirements for the planting of trees, shrubs, perennials, bulbs and aquatic vegetation.

2.0 REFERENCES

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 801 Protection of Trees

Ontario Ministry of the Environment

Interim Guidelines for the Production and Use of Aerobic Compost in Ontario
Guideline for the Production of Compost in Ontario.

Other

Canadian Nursery Trades Association/Landscape Canada
Canadian Standards for Nursery Stock
International Code of Botanical Nomenclature for Cultivated Plants
Standardized Plant Names

3.0 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Aquatic Vegetation means a plant that grows partly or wholly in water whether rooted in the streambed, floating without anchorage or rooted along a waterbody bank.

Broken Bud means the point at which buds swell and bud scales split apart.

Composite Soil Sample means several smaller subsamples taken randomly throughout the field,

then mixed together for one large representative sample.

Green Organic Waste Material means a solid mature product resulting from composting, which is a managed process of bio-oxidation of a solid heterogeneous organic substrate including a thermophilic phase.

Horticultural soil means a mixture of existing topsoil and other recommended amendments as specified in the Contract Documents.

Root Crown means the part of the root system from which the stem arises.

Root Zone means the area of roots and soil beneath the canopy of the tree measured 38 cm out from the trunk for every 2.5 cm of trunk diameter; or in the case of newly planted trees the root zone is the volume comprised of roots and soil contained within the wire basket, burlap or container.

Streambed means the bottom of the channel where a watercourse flows.

Subsoil means the layer of soil under the topsoil on the surface of the ground. Like topsoil it is composed of a variable mixture of small particles such as sand, silt and/or clay, but it lacks the organic matter and humus content of topsoil.

Systemic Herbicide means a chemical substance used to destroy or inhibit the growth of plants.

Topsoil means the upper, outermost layer of soil usually the top 2 inches (5.1 cm) to 8 inches (20.3 cm).

Waterbody means any permanent or intermittent, natural or constructed body of water including lakes, ponds, wetlands and watercourses, but does not include sewage works as defined in the Ontario Water Resources Act.

Waterbody Bank means the slope on or adjacent to a waterbody from the normal water level to the top of slope.

Watercourse means a stream, creek, river, or channel including ditches, in which the flow of water is permanent, intermittent, or temporary.

4.0 DESIGN AND SUBMISSION REQUIREMENTS

4.01 Proof of Qualifications

Proof that all personnel performing planting and related work are qualified and experienced in doing such work shall be provided to the Contract Administrator prior to commencement of planting. This shall include proof that the crew foreman has at least five (5) years of horticultural planting experience and that at least one member of the crew has a horticultural diploma unless otherwise specified in the Contract Documents.

4.02 Submission of Soil Analysis Report

A soil analysis report shall be submitted to the Contract Administrator at least twenty four (24) hours prior to use of the material as horticultural soil.

A soil analysis report shall be submitted for each distinct source and type of material intended for use as horticultural soil.

A soil sample submission form shall be completed in full for each soil sample submitted.

The soil analysis report shall include:

a) Texture analysis or particle size analysis, percent composition by mass of sand, silt and clay;
b) Level of soluble salts;
c) Organic matter percent composition;
d) Acidity or alkalinity (pH); and
e) Phosphorus (P), Potassium (K), Magnesium (Mg), Chloride (Cl) and Sodium (Na) nutrient levels.

The soil analysis report shall include the soil science laboratory recommendations for improving any of the tested soil values for the following indicators:

a) Organic matter
b) Acidity (pH)
c) Phosphorus (P), Potassium (K) and Magnesium (Mg)

5.0 MATERIALS

5.01 Aquatic Vegetation

Preference shall be given to aquatic vegetation collected on-site from areas specified in the Contract Documents.

5.02 Horticultural Soil

Horticultural soil shall be a fertile, loose, friable, natural sandy loam containing not less than 15% organic matter with and acidity value ranging from pH 6.0 to pH 7.5. Clods from 1 to 3 inches (2.5 to 7.5 cm) shall make up less than 10% of the soil volume and clods 3 to 6 inches (7.5 to 15 cm) shall be < 5%.

Horticultural soil shall not contain any unsuitable materials greater than 2 inches (5 cm) in diameter. Unsuitable materials include but are not limited to, debris, man-made materials, roots, stumps, rocks stones, subsoil, or other foreign material

Horticultural soil shall be free of toxic chemical substances and contaminants that adversely affect plant growth.

5.03 Compost

Compost shall be derived from well-composted green organic waste matter or cow or sheep manure and shall contain a minimum of 15% organic matter.

All compost material shall meet or exceed the Ontario Ministry of the Environment and Climate Change (MOECC) requirements for compost as a product for unrestricted use as described in the MOECC publication Guideline for the Production of Compost in Ontario.

5.04 Fertilizer

Fertilizer used at the time of planting shall be in granular form, dry, free flowing, free of lumps and shall consist of superphosphate, with a minimum content of 20% phosphoric acid.

All fertilizer shall be supplied in bags bearing the manufacturer's label indicating mass and chemical composition.

5.06 Stakes

All stakes shall be new wood stakes with a hole drilled 50 mm from the top to accommodate a support wrap.

Stakes used for staking trees shall be 50 mm by 50 mm by 2 m. A minimum of 60 cm of the stake shall be underground with the stake no higher than half the height of the tree.

Stakes used for guying trees shall be 50 mm by 50 mm by 150 cm.

5.07 Support Wraps

All support wraps shall be bio-degradable fabric.

Wire and rubber hose for guying trees shall not be permitted.

5.08 Anti-Desiccant

Anti-desiccant emulsion shall be specifically manufactured to provide a flexible surface film to reduce transpiration yet not impede passage of carbon dioxide and oxygen.

5.09 Mulch

Mulch shall be shredded bark, free of twigs, leaves, branches and other foreign material in a finished product size of 20 mm to 50 mm.

5.10 Tree Guards

Tree guards to protect deciduous trees from rodent damage shall be a spiral plastic tree wrap, perforated, ultra-violet protected, and supplied in minimum 600 mm lengths.

5.11 Plant Material

All plant material shall be nursery grown and meet the horticultural standards for grading and quality according to the Canadian Standards for Nursery Stock except for those plants that have been designated for protection and relocation.

Only nursery stock that has been propagated vegetatively or from seed shall be utilized. Native plant material collected from the natural environment shall not be accepted.

Nomenclature of specified plants shall be according to the International Code of Botanical Nomenclature for Cultivated Plants and shall be according to the approved scientific names given in the latest edition of the Standardized Plant Names.

All plant material upon arrival at the site shall be clearly identified by labels indicating species, size and supplier. Substitutions for the specified plants will not be accepted unless approved in writing by the Contract Administrator.

Plant material shall be true to type and structurally sound, with straight trunks and leaders intact, and be well and characteristically branched for the species. All plant materials shall be free of disease, insect infestation, rodent damage, sun scald, frost cracks and other abrasions or scars to the bard. Plant material shall be densely foliated when in leaf and have a healthy, well developed root system.

Container grown plant material shall have been grown in the same container for a minimum period of six (6) continuous months prior to planting.

Plant material shall not be cut back from larger sizes to meet the material requirements.

Bare root plant material shall not have broken bud at the time of planting.

Root balls shall be free from pernicious perennial weeds.

5.12 Burlap, Rope and Tie Materials

Where balled and burlapped plant material is specified, the burlap, rope, and any tie materials shall be manufactured from natural organic fibers.

Burlap used for rootballs shall be untreated and free from toxic contaminants.

5.13 Water

Water shall be free from contaminants which would adversely affect plant growth.

6.0 EQUIPMENT

6.01 Pruning Tools

All pruning equipment shall be designed specifically for tree work and shall be capable of

producing clean, flush cuts without tearing or fraying the bark.

Pruning equipment shall be disinfected between each use to reduce contamination.

7.0 CONSTRUCTION

7.01 Operational Constraints

All planting and related work shall be done by experienced, qualified personnel under the direction and supervision of foremen with at least five (5) years of horticultural and planting experience. At least one person on the crew shall have a horticultural diploma.

Planting shall be performed within the time periods specified in Table 1 or as specified in the Contract Documents.

Container grown or balled and burlapped plant material of the same species and variety may be substituted for bare root plants, at no additional cost to the Owner.

The location of trees and the perimeter of areas to be planted with shrubs shall be laid out by staking as specified in the Contract Documents a minimum of five (5) Business Days in advance of the commencement of planting for approval by the Contract Administrator.

7.02 Mixing Existing Topsoil and Compost

Existing topsoil shall be mixed with compost in the following ratios:

Topsoil	0.7 per m^3
Compost	0.3 per m^3
Superphosphate	0.6 per kg

After mixing, the organic matter content shall not exceed 15% or be less than 10%.

Compost shall be mixed into planting areas on site.

7.03 Transportation, Storage and Excavation

7.03.01 General

All plant material shall be protected from damage according to OPSS 801, and protected from environmental conditions during transport and until planted.

All plant material, including balled, burlapped and container grown, shall be kept moist at all times.

The Contract Administrator shall be notified of the source of plant material at least seven (7) Days in advance of transportation to the site. Plant material shall be made available for inspection upon arrival at the site. Approval of plant materials at source of supply shall not ensure acceptance upon arrival at the site or during the course of construction.

Labels shall not be removed from plants until they have been inspected, planted and approved by the Contract Administrator.

Roots, trunks and branches of all trees and shrubs shall be protected from abrasion, breakage, and exposure to sun and wind during transport.

Plant materials shall be transported in enclosed vehicles or covered with a tarpaulin. The temperature during transportation shall be maintained as uniformly as possible by mechanical or other means and shall not be cracked, broken, or damaged at time of planting.

All plant materials that cannot be planted immediately upon arrival on the site shall be well protected with soil or similar materials to prevent drying out.

Transport of plant material and excavation of planting holes shall be co-ordinated to ensure minimum time lapse between excavation and planting.

Root masses collected from job sites or adjacent properties as authorized prior to construction shall be kept moist and shaded prior to installation. Masses shall be installed with the root crown at the same elevation existing prior to removal.

7.04.02 Bare Root Stock

All bare root material shall be dug according to the Canadian Standards for Nursery Stock.

Bare root material shall be moved while dormant with the major portion of the fibrous root system provided.

Bare root stock shall be kept dry. Plants not immediately installed shall be kept in refrigerated conditions.

7.04.03 Balled and Burlapped or Container Grown Stock

Balled and burlapped or container grown plant material shall be dug and potted according to the Canadian Standards for Nursery Stock.

All deciduous trees and shrubs which have broken bud and all coniferous trees shall be thoroughly sprayed with an anti-desiccant.

7.05 Aquatic Vegetation

Where aquatic vegetation is excavated from a streambed or waterbody bank, there shall be a 20 cm radius from the stem of the vegetation and 20 cm depth excavated to ensure sufficient root material remains intact. The streambed material excavated with the roots of the vegetation shall also be kept intact.

Aquatic vegetation purchased from a nursery shall be transported in a manner that keeps it moist and free of damage.

Aquatic vegetation shall be stored on-site in a manner that keeps it moist and free from damage prior to planting.

7.06 Area Preparation

Excavation shall not commence prior to the Contract Administrator's inspection and approval of staking.

Areas of established turf such as riparian areas and other areas of undisturbed ground shall be cultivated prior to planting. Cultivating shall occur to a depth of 600 mm and areas shall be protected between cultivation and planting to prevent compaction by other machinery on site.

Areas that are to be planted with shrubs in mass shall have the entire area cultivated in two directions, perpendicular to one another, and prepared.

7.07 Excavation of Planting Pits

For bare root plant material, all planting pits shall be excavated and prepared to accommodate the size of the bare root. The minimum width of excavation shall be two times the circumference of the root system.

Disturbed subgrade or fill below the rootball shall be compacted to prevent settlement such that the top of the rootball remains at the proper finished grade. Planting pits or areas shall be tested for drainage and percolation by filling with water prior to planting. Water should percolate at a rate no less than 2.5 to 5 cm/hour. Poor drainage or percolation shall be reported to the Contract Administrator.

Planting pits for trees shall have a minimum width of excavation of five times the root ball or root system diameter at the top, and three times the root ball or root system diameter at the bottom.

The bottom of all planting pits shall be protected from freezing.

7.08 Planting of Trees, Shrubs, Perennials, and Bulbs

All plant material shall be placed in the planting pit on undisturbed ground.

All trees shall be planted so that their normal root crown is 50 mm above existing grade. All shrubs shall be planted so that the ground elevation in the pit after planting is 25 mm above existing grade. Perennials shall be set 25 mm above grade.

Plant material supplied in plastic containers shall have the containers carefully removed prior to planting. The rootball shall be cut vertically three times evenly around the circumference. Depth of cut shall be 10 mm to 15 mm. Plants with circling roots will not be accepted and shall be replaced.

Plant material supplied in fiber pots shall have the pot removed prior to planting. If roots have

grown into fiber pot, the pot shall be left in place and slit vertically from top to bottom of pot in three locations.

Plant material supplied bare root shall be placed so that the roots lie in their natural position. Broken roots shall be pruned prior to planting.

Plant material supplied balled and burlapped shall have the burlap, ropes, and ties removed from the top of the rootball by folding down at least 100 mm into the excavated pit. All synthetic materials shall be removed prior to planting.

Plant material supplied in wire baskets shall have the wire baskets cut. The top 100 mm of the wire basket shall be removed from the entire circumference of the wire basket after placement of the plant material and prior to backfilling.

Outside roots of root bound plants shall be gently loosened. Rootballs shall be pruned if defects are present.

Following planting, all shrubs shall be sprayed with rodent guard according to the manufacturers recommendations to prevent rodent damage.

All bulbs shall be planted according to the planting recommendations for that particular bulb (rhizome or tuber).

7.09 Planting Aquatic Vegetation

Aquatic vegetation shall be planted as soon as practicable after on-site collection or purchase from a nursery.

A hole large enough to accommodate the roots of the aquatic vegetation shall be dug into the streambed or waterbody bank. The roots shall be placed in the hole and any remaining voids in the hole filled in with previously excavated or adjacent streambed material.

The streambed material surrounding the planted aquatic vegetation shall be tamped down to secure the vegetation into the streambed.

7.10 Backfilling of Planting Pit

The planting pit shall be backfilled with the horticultural soil firmly tamped layers of 150 mm depth, taking care not to injure the root system or create air pockets. Each layer shall be watered after tamping.

When the planting pit has been backfilled, an earth berm of 100 mm height and 150 mm width shall be formed around each planting pit. The berm may be formed from the excavated material. If the pit is on a slope, the lower edge and sides shall be built up to match the edge height on the opposite side.

Horticultural soil that is in a frozen or saturated condition shall not be used to backfill.

7.11 Watering

All plant material shall be watered immediately after planting.

Water shall be uniformly applied to each tree by two injection applications directly into the soil. Both injections shall be located at the outer edge of the planting pit area and shall penetrate the ground to a depth of 450 mm at the commencement of the watering operation. The second injection shall be located 180 degrees from the initial injection. Sufficient water shall be applied to each tree to thoroughly soak the root zone.

Water shall be applied to each shrub uniformly at a maximum precipitation rate of 5 mm per hour. A soft spray nozzle shall be used to thoroughly soak the root zone and to avoid damage or dislodging of the soil.

7.12 Guying, Staking and Tying

All shrubs, deciduous trees less than 2.0 m in height, and coniferous trees less than 1.5 m in height, do not require staking or guying.

Trees shall be staked or guyed as follows:

a) All deciduous trees greater than 2.0 m and less than 3.0 m in height require one stake.
b) All deciduous trees 45 mm caliper require one stake.
c) All deciduous trees 60 mm caliper or greater require two stakes.
d) All coniferous trees equal to or greater than 1.5 m in height require guying.

All trees requiring staking and guying shall be staked and guyed immediately following planting to ensure vertical alignment and plant stability.

Bright red plastic surveyor's tape shall be tied to all guy wires. The tape shall be tied halfway up the length of wire and shall be clearly visible. Guy wires shall be tightened using galvanized turnbuckles or guy wire tighteners.

Support wraps and stakes shall be removed from the tree after one growing season and shall be inspected periodically within the one year period for trunk damage. One finger width of space shall be maintained between the trunk and support wrap to allow movement in the trunk. Wraps shall not criss cross.

Stakes shall not be driven through any part of the root ball.

7.13 Pruning

Each deciduous tree or shrub shall be pruned to remove dead, broken or injured branches after planting. Pruning shall not change the natural shape of the plant and shall be carried out according to size and species in accordance with accepted arboricultural practice.

Coniferous trees shall be pruned only to remove dead, broken or injured branches.

7.14 Tree Guard Installation

Tree guards shall be installed around all deciduous trees prior to the application of mulch.

Deciduous trees less than 1.75 m in height shall be protected using a spiral, plastic, perforated tree wrap installed according to the manufacturer's instructions. Wrap should be cut short of branches if branches are lower than 600 mm. Tree guards shall be installed with no gaps between the wraps. Wrap shall touch the soil surface.

7.15 Mulch Application

Immediately after planting, initial watering and tree guard installation, mulch shall be applied in a uniform continuous blanket of 100 mm minimum depth to the surface area surrounding each individual plant.

For all trees the bark chip surface area shall extend over the actual planting pit and the earth berm and shall include a 200 mm radius beyond the circumference of the planting pit. Mulch is to come no closer than 100 mm to trunk of tree.

For all shrubs the complete surface area of each shrub bed, including the entire surface area within the perimeter of the shrub grouping, shall be covered with mulch. Mulch shall extend a minimum of 500 mm from the centre of the outside row of shrubs.

7.16 Management of Excess Material

Management of excess material shall be as specified in the Contract Documents.

8.0 QUALITY ASSURANCE

8.01 Prior to Planting

All plant material will be inspected by the Contract Administrator upon delivery to the site.

Plant material shall be acceptable when it is structurally sound, well furnished with living foliage, normal colour, show adequate annual growth and formation of buds and be free from blight of any description.

Roots shall be well established and uniformly spread throughout the specimen. Roots shall be free of defects, disease or evidence of girdling.

Plant material which does not meet the above requirements or which has severely "died back" and has re-grown from a bud or shoot, or been damaged by rodents, shall be rejected.

Rejected plant material shall be removed from the Working Area and replaced with acceptable material.

8.02 After Planting

8.02.01 Establishment

A minimum thirty (30) day establishment period shall take effect immediately after all planting has been completed to allow for evidence that new plants are alive and thriving. If planting is not completed until after October 15th the minimum thirty (30) day establishment period shall commence on May 15th of the following year.

Plants that fail to meet the acceptance criteria shall be replaced within 30 days of notification by the Contract Administrator and within the time constraints identified in Table 1. If there is insufficient time remaining within the time constraints identified in Table 1 then replacement shall be completed the following year within 30 days of the commencement of the time constraints identified in Table 1.

There shall be a maximum one-time replacement of plants required during the establishment period. The establishment period shall extend for an additional 30 days from the date that all necessary replacements have been completed after which time the warranty period shall commence.

The establishment period does not apply to bulb planting.

8.02.02 Maintenance

Maintenance shall be provided from the time of planting to the end of the warranty period.

Maintenance shall include watering and fertilizing, control of weeds and grasses in all mulched areas, application of rodent protection and pesticides as required, repairs to stakes, ties, wire and hose, tree guards, and the wrapping and unwrapping of all coniferous trees 1.25 m or greater for winter protection.

Stakes, guy wires and support ties shall be maintained then removed after one full growing season. Ties shall be checked every three (3) months to ensure that they are not rubbing against the bark, and shall be loosened, repaired or replaced as necessary. All stakes, guy wires and support ties shall be removed after the first growing season.

Plant material shall only be pruned to remove all dead, damaged, weak, or diseased, wood or growth that poses a threat to human health and safety.

Plant material shall be fertilized only as required to correct symptoms of nutrient deficiency, except where otherwise recommended on the basis of soil or tissue test results. All work shall be done in accordance with the Canadian Fertilizer Act and in agreement with all applicable local legislation federal, provincial and municipal, codes and by-laws, which may restrict or prohibit certain activities such as the application of pesticides.

The Contract Administrator shall be notified twenty four (24) hours prior to commencing any maintenance operation. A monthly maintenance report shall be provided to the Contract Administrator, indicating the maintenance that was carried out and the dates on which it was

completed.

8.02.03 Warranty

If all plants are accepted at the end of the initial 30 day establishment period then the warranty period shall commence immediately after the initial 30 day establishment period.

If all plants are not accepted at the end of the initial 30 day establishment period then the warranty period shall commence 30 days from the date that all necessary replacements are completed.

The warranty period shall extend for two years (24 months) and shall cover any defects in material and workmanship. Plants that fail to meet the acceptance criteria at any time during the warranty period shall be replaced within 30 days of notification by the Contract Administrator.

Plants that fail to meet the acceptance criteria more than twice shall only be replaced after consultation with the ministry Landscape Architect to determine alternate solutions.

Plants damaged by ungulates are exempt from replacement.

8.02.04 Acceptance and Replacement

Plants may be inspected for acceptance any time after planting provided the date is prior to leaf drop or last frost. If the date is after leaf drop or frost, the inspections shall be scheduled for 30 days after the start of the next growing period. No inspections will occur after leaf drop. Plants that do not meet the acceptance criteria shall be replaced within 30 days notification by the Contract Administrator.

Plants shall be accepted when they are:

a) alive and thriving,
b) structurally sound,
c) furnished with living foliage of normal colour,
d) show adequate annual growth and formation of buds, and
e) are free from blight of any description.

Plants that do not meet this criteria or that have severely "died back" and regrown from a bud or shoot, or have been damaged by rodents, shall be replaced.

Replacements shall be plants of the same size and species and shall be supplied and planted as specified in the Contract Documents and this specification. The Owner reserves the right to extend the warranty responsibilities for one (1) additional year if, at the end of the initial warranty period, leaf development and growth is not sufficient to ensure future survival.

9.0 MEASUREMENT FOR PAYMENT

9.01 Actual Measurement

9.01.01 Deciduous Tree, 60 mm Caliper
Transplanted Trees

For measurement purposes, a count shall be made of the number of bulbs, perennials, trees, shrubs, shrub root masses, and aquatic vegetation planted.

9.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

10.0 BASIS OF PAYMENT

10.01 Deciduous Tree, 60 mm Caliper – Item
Transplanted Trees

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

Progress payments shall be based on the following percentages of the Contract price for milestones accepted by the Contract Administrator:

a) 50% for planting

b) 30% at the end of the establishment period

c) 20% at the end of the warranty period

Final payment for these contract items shall occur at the end of the warranty period, provided all plant material has been properly maintained, stakes, guys and ties have been removed and unacceptable plant material properly replaced.

The replacement of plants that fail to meet the acceptance criteria shall be at no additional cost to the Owner.

Table 1 - Time Constraints for Planting

Plant Type	Southwestern Ontario (Note 1)	Southern Ontario (Note 2)	Northern Ontario (Note 3)
Bare Root Deciduous Shrubs and Trees	May 1 - to May 31	May 1 - Jun 7	Jun 1 - Jun 30
Balled and Burlapped or Container Grown Deciduous Shrubs and Trees	May 1 - Jun 30 Sep 1 - Sep 30	May 1 - Jun 30 Sep 1 - Sep 30	May 1 - Jun 30 Sep 1 - Sep 15
Balled and Burlapped or Container Grown Coniferous Trees	Frost Free Conditions	Frost Free Conditions	Frost Free Conditions

Notes:
1. That area south of a line joining Grand Bend and Clarkson.
2. That area between the boundaries of Southwestern and Northern Ontario.
3. That area north of a line joining Waubaushene, Severn Bridge, Bancroft and Ottawa.

SSP25 ADJUSTMENT OF TRAFFIC POLE BASE

The Contractor is to adjust the existing traffic pole base on the median at the intersection McLeod Road and Montrose Road. The adjustment height will be less 150mm. The existing traffic pole base is to match the proposed median surface. The finished adjusted elevation of traffic pole base shall not vary more than 5 mm from the finished median surface elevation.

Basis for Payment

The unit price bid for the adjustment of traffic pole base shall include all labour, materials and equipment necessary to complete the work. Measurement for payment will be lump sum.

SSP26 SANITARY SEWERS, STORM SEWERS AND CATCHBASIN LEADS

In addition to the conditions stipulated in item C1 of the Special Provisions – Contract Items Niagara Peninsula Standard Contract Document, the following shall apply:

The provisions of OPSS 410 shall apply except as amended or extended herein.

The unit prices bid shall include excavation of all types of soil including asphalt, road base for a vertical trench, any required sheathing, shoring and bracing for the vertical trench, temporary and permanent supports of all utilities and services within the trench, placement of bedding, pipe installation, connections to existing or new maintenance holes and existing or new service laterals, placement or removal of manufactured plugs, placement of cover and backfill material, compaction, disposal of surplus excavated material, removal and disposal of existing sewers or watermains.

The removal and disposal of existing maintenance holes will be paid separately. The cost to remove and dispose of existing sewer or watermain pipe in the sewer trench must be included in the unit

price bid.

The price bid for catchbasin leads shall include connections to the existing sewer main by coring and using approved saddles and to the new and existing storm sewer using manufactured tees, all bends, proper couplings at maintenance holes and catchbasins and manufactured plug.

Where the new pipe installation crosses or is adjacent to an existing pipe or structure, the Contractor shall support the existing pipe or structure. In the event the existing pipe or structure becomes disturbed, the Contractor shall replace or repair the pipe or structure regardless of the material and at no additional cost.

Where the new pipe or lateral installation crosses a pipe which is abandoned, or is to be abandoned and requires removal, the abandoned pipe sections remaining shall be plugged and sealed on either side of the new pipe at no additional cost.

During sewer installations, the Contractor shall be responsible to maintain the proper functioning of each sanitary, storm and water service lateral located in the field or shown on the construction drawings, at no additional cost to the contract. Should the Contractor choose to make temporary connections to ensure the same, these connections shall be removed in full and at no additional cost to the contract.

The Contractor shall note that the removal, disposal and saw cutting of the roadway or driveway asphalt, concrete sidewalk and curb or curb and gutter in the sewer trench will be paid under a separate item.

Payment for these items is at the unit prices bid in the Form of Tender and will include all items in the "Basis of Payment", as specified in OPSS 410.

SSP27 SUPPLY AND INSTALL SANITARY OR STORM SEWER LATERALS

In addition to the conditions stipulated in item C2 of the Special Provisions – Contract Items Niagara Peninsula Standard Contract Document, the following shall apply:

The Contractor is advised that this item shall also be used to repair or relocate sanitary laterals that are conflicted with the proposed installations.

THE CONTRACTOR SHALL ALSO PAY SPECIAL ATTENTION TO AND MAKE ALL NECESSARY ALLOWANCES FOR THE FOLLOWING ITEMS:

i. The Contractor is advised that many of the existing sewer laterals are directly adjacent to the existing water services. The Contractor shall make due allowance in the unit prices bid for the protection, maintenance, repair and supporting of such water services throughout the adjacent installation of the new sewer laterals.

ii. The Contractor is advised that individual records of diameter, material types and number of sewer laterals is unavailable and thus the actual quantity of replacement materials cannot be determined at this time. As such, a quantity of couplings of varying diameters must be available

on site and the Contractor shall make due allowance in the unit prices tendered to account for this requirement.

iii. The Contractor is advised that not all laterals are shown on the contract drawings and those that are shown are approximate only. Furthermore, all laterals are not necessarily connected to a particular residence, used for sanitary sewer purposes and may either be used, unused or abandoned. The Contractor shall include in his/her unit price bid allowances for all necessary Subcontractor's, time, standby time, equipment, materials and labour to determine the exact location, purpose and usage of each and every connection, either known or otherwise, to the existing sewer. Where appropriate, CCTV camera inspections and dye testing may be used in verifying laterals and shall be paid for separately under the respective item within the Schedule of Tender Unit Prices. It is expected that a number of existing sewer laterals will be either abandoned or used for storm water connections.

iv. It is expected that this determination will include, but shall not be limited to, careful examination of the trench, trench walls and sewer for possible connections, notifying and meeting with the City and each homeowner and/or resident to discuss connections, arrange for flushes of water and/or dye testing to confirm possible connections, usage of in line/remote service location devices and close co-ordination and co-operation with the City.

v. No new connections will be made until the Contract Administrator has reviewed the proposed connection with the Contractor.

vi. It is the intention of this contract to provide one (1) new sanitary sewer service connection to each serviced residence along a new sanitary sewer, within the limits of this contract. It is suspected that some residences may have more than one active service. Additional 'extra' connections shall not to be made until it is completely reviewed, inspected and approved by the Contract Administrator.

vii. Laterals which have been proven to be abandoned or otherwise unused shall be plugged at the face of the excavation with a suitable watertight cap or concrete, as required. No additional payment for this requirement shall be made and the Contractor shall make due allowance in the unit prices tendered to account for this requirement.

viii. Missed or overlooked lateral connections and any and all damage caused by these missed or overlooked connections shall remain the sole responsibility of the Contractor and no additional payments or claims pertaining to these items shall be considered for payment.

ix. The Contractor shall notify all affected residents or businesses of any scheduled disruption of their sanitary service at least 24 hours in advance and shall endeavour to minimize their inconvenience to a maximum four (4) hours.

Basis for Payment

As stipulated in item C2 of the Special Provisions – Contract Items Niagara Peninsula Standard Contract Document.

The unit price bid for sewer lateral replacement or new sewer laterals from the sewer main to the existing lateral shall include all labour, materials and equipment necessary to complete the work. The supply and placement of Granular 'A' shall be paid for separately under the appropriate item in the Schedule of Tender Unit Prices.

SSP28 PRECAST SANITARY OR STORM MAINTENANCE HOLES & CATCHBASINS

In addition to the conditions stipulated in item C6 of the Special Provisions – Contract Items Niagara Peninsula Standard Contract Document, the following shall apply:

All structures shall be founded on a 300mm (min.) thick layer of compacted Granular 'A'. All Granular material shall be placed in maximum 300mm loose lifts and compacted to 100% of Standard Proctor Maximum Dry Density (SPMDD) at optimum moisture content.

Excavation, removal and disposal of surplus excavated materials shall be included in the unit price. The removal and disposal of any existing structure shall be paid under the appropriate item.
The Contractor shall make due allowance in the unit prices tendered for any bypass pumping, dewatering, sheathing, shoring and bracing to complete the work.

Kor'n Seal adapters or an approved equivalent shall be used in all cases where PVC pipe is to be connected to concrete structures (excluding catchbasin connections). Where concrete pipe is used, a concrete cradle shall be required at each structure connection in addition to Fernco large diameter manhole connectors.

Maintenance Holes (MH)
All new MHs within the travelled portion of the roadway shall be fitted with a standard frame and cover. MH top elevation shall be set to blend with the surrounding grades.

Sanitary MH
In addition to the maintenance hole manufacturer's rubber gaskets, each section of the manhole shall be sealed with an approved bituminous tape material, a minimum 1 mm thick and 150mm wide, wrapped around the outside of joint, 75 mm overlap on each side of the joint.

Catchbasins (CB)
The frames and grates shall be in accordance with OPSD 400.020.
The CB shall provide for a minimum 1.5m depth to invert of CB lead unless otherwise specified and the placement of a minimum 100mm to a maximum 300mm of concrete adjustment units, per OPSD 704.010.

SSP29 REMOVE & DISPOSE OF MAINTENANCE HOLES, SEWER PIPE, SEWER LATERALS OR CATCHBASINS

In addition to the conditions stipulated in item B27 of the Special Provisions – Contract Items Niagara Peninsula Standard Contract Document, the following shall apply:

Granular "A" backfill compacted to 100% Proctor Density shall be utilized to fill the resulting void but SHALL NOT be included in the price bid for this item; compensation for granular backfill shall be as per its specific item. The existing pipes shall be plugged at all open ends including leads for catchbasins that are removed as noted on the drawings. The existing frames and tops are to be salvaged and delivered to the Region Municipality of Niagara Service Centre on Townline Road in the City of Thorold, as directed by the Contract Administrator.
Full depth removal of a maintenance hole means the complete removal and disposal of the walls,

base, grate, frame and all other portions of the maintenance hole.

The Granular "A" will be paid under SSP14 and SSP15.

SSP30 PLUG, GROUT AND ABANDON SEWERS

In addition to the conditions stipulated in OPSS.MUNI 510, the following shall apply:

As directed by the Contract Administrator, sections of the existing sewer are to be plugged at both ends with watertight seal plugs and the pipe grouted with concrete, where:

- Concrete for concrete seals shall be according to OPSS.MUNI 1350 with minimum specified 28-Day compressive strength of 30 MPa.
- Concrete for filling abandoned pipes shall be according to OPSS.MUNI 1350 with minimum specified 28-Day compressive strength of 15 MPa.

The unit price bid for this item shall be complete compensation for all labour, material and equipment necessary to complete all work for this item.

SSP31 SEWER AND/OR STRUCTURE CONNECTIONS

The provisions of OPSS 407, OPSS 410 and OPSS 412 apply as amended herein.

This item shall be used for connection of a new sewer to an existing structure or sewer and the reconnection of an existing sewer or forcemain to a new structure.

Kor'n Seal adapters or an approved equivalent shall be used in all cases where PVC pipe is to be connected to concrete structures (excluding catchbasin connections). Where concrete pipe is used, a concrete cradle shall be required at each structure connection. The unit bid price shall have made due allowance for these requirements.

Basis for Payment

The unit price bid this item shall be full compensation for all labour, material and equipment required to complete the connection including excavation, backfilling, structure coring and re-benching where required.

The supply and placement of Granular 'A' shall be made separately under the appropriate item in the Schedule of Tender Unit Prices.

SSP32 PROPOSED SEWER PLUG

The Contractor is to plug proposed sewer per contract drawings. Concrete plug (Forterra concrete plug or the Niagara Region approved equivalent) is to be used for concrete sewer. 200mm diameter PVC plug (Ipex PVC plug or the Niagara Region approved equivalent) is to be used for PVC sewer. Restore the ground to original condition or better.

Basis for Payment

The unit price bid for the proposed sewer plug shall include all labour, materials and equipment

necessary to complete the work. Measurement for payment will be each plug.

SSP33 WATERMAINS AND LARGE WATER SERVICES

In addition to the conditions stipulated in the Niagara Peninsula Standard Documents and OPSS 441, the following shall also apply:

General

Watermain and water services shall be installed to a minimum depth of 1.8m throughout.

All watermain installation shall be by open cut trench excavation method except when specified elsewhere in the contract documents and drawings.

Materials

All Waterworks materials must meet AWWA current quality criteria standards and American National Standard ANSI/NSF Standard 61.

All brass curb stops, corporation stops, service line valves, fittings and all other brass products used that come into contact with potable water must meet the requirements of ANSI/AWWA C800 Standard.

Watermain shall be DR18 PVC conforming to AWWA C900 or approved equivalent, unless otherwise specified.

Joints and fittings shall be compatible with pipe material and class and shall be in accordance with OPSS 441.

> Mechanical Joint Fittings shall be ductile (cast) iron, or grey (cast) iron per AWWA C110/A21.10 with cement lining to AWWA C104/A21.4 and fastened with stainless steel nuts and bolts.
>
> PVC Fabricated Fittings per AWWA C900 and CSA B137 Series-13.

All couplings and adaptors shall be bronze with one piece combination nut and tail, compression type stainless steel insert (heat flaring of tubing is not allowed) and conform to AWWA C800 and ANSI/NSF Standard 61.

Open Trench

It is strongly recommended that the Contractor use a trench box to install the watermain, sanitary sewer, storm sewer catchbasin leads, water services and any other pipes. The width of the trench box shall conform to OPSD 802.010 for Flexible Pipe, and OPSD 802.020 and OPSD 802.031 for Rigid Pipe. The height of the trench box shall be from 150mm below the bottom of the pipe to the level of the existing ground.

If the Contractor does not use a trench box as described above, then payment for Granular 'A' material will be based on theoretical dimensions, as follows:

Width: Follow OPSD 802.010, OPSD 802.030 and OPSD 802.031 as applicable

Height: From 150mm below the pipe to the level of the existing ground surface.

Length: Equal to the pipe length

Therefore, to calculate Granular 'A' weight (tonnes):

Granular "A" (tonnes) = 2.4 x (Width x Height x Length - (π x D^2 x L) / 4)

where,

D = Pipe OD

L = Length of Pipe

π = 3.1416

When a trench box is used to support the wall of a trench its removal shall be as per clause 404.07.03 in OPSS 404.

Bedding and Cover

Bedding and cover shall always be Granular 'A' material; recycled materials will not be accepted for this purpose.

Backfill

Where native material is used, the Contractor is to include in their price all handling, hauling, stockpiling, placement and compaction.

General Construction

Care shall be taken during construction to minimize any contamination of the pipe from soil or water during installation; only clean pipe shall be installed.

If in the opinion of the Contract Administrator, trench water or an excessive amount of dirt or debris has entered the new pipe during construction, additional sampling may be requested in accordance with Section 5.1.2 of ANSI/AWWA C651, at the discretion of the Contract Administrator or designate.

Cathodic Protection

Cathodic protection must be provided at all metallic pipes, fittings, valves, water services and hydrants etc., installed underground in accordance with the NPSCD Special Provisions – Contract Items item D10. All costs for cathodic protection shall be included in the watermain item, specifically Item 5.01 in the Schedule of Tender Unit Prices.

Tracer Wire

Tracer wire will be required on all new non-metallic watermains and services installed as part of this contract and shall be 8-guage, 7 strand copper insulated wire or #10 AWG solid steel core soft drawn high strength tracer wire. Tracer wire shall be supplied and installed in accordance with the NPSCD Special Provisions – Contract Items item D14. All costs for tracer wire shall be

included in the watermain item, specifically Item 5.01 in the Schedule of Tender Unit Prices.

Watermain Disinfection and Testing

Watermain Disinfection and Testing shall be at the lump sum price bid and in accordance with SSP42.

Existing Mains and Utilities

Known utilities shall be exposed in advance of construction in that location. A minimum of three (3) pipe lengths, and a maximum of five (5) lengths of open trench shall be maintained to allow for adjustment to grade to avoid utilities and sewer service laterals. No extra payment will be considered for removal and re-excavation to avoid obstructions.

Certified Water Operators (CWO)

All operation of the live water system shall be performed or supervised by a Certified Water Operator (holding a valid certificate) according to O. Reg. 128/04.

Operation of the water system includes disconnection of any service from a live water system, reconnecting of any service to a live water system and any works performed on a live water system (such as maintenance, repairs, or connection).

Noncompliance with this requirement is a contravention of the Safe Drinking Water Act. Failure to comply with this Act will subject the Contractor to any penalties, fines or consequences as deemed applicable by the Ministry of the Environment, Conservation and Parks.

The City will assign a Certified Water Operator to supervise all works required which are to be completed to the live water system. The City may require the assistance of the Contractor in operating the water system at no additional cost to the contract.

The Contractor is responsible for ensuring that the Contract Administrator is given 48 hours advanced notice, in writing, as to when the operation of the live system is scheduled to take place.

Water Service Interruptions

The existing watermain and water services must remain in operation until all water services have been connected to the new main(s), except during transfer periods.

The Contractor must advise the Contract Administrator of any proposed service interruption, in writing, a minimum of 48 hours in advance.

When shutting down watermains for any reasons, all affected properties are to be notified in writing, a minimum of 24 hours in advance of the water service interruption.

The Contract Administrator or designate shall prepare the notice and the Contractor will be responsible for door-to-door delivery to the affected customers. If there is no response at the door, the notice shall be left at the premises (mailbox).

The following City of Niagara Falls departments must also be notified when watermains, services or fire hydrants are to be shut down or used in any way:

- Environmental Services: 905-356-1355

- Niagara Falls Fire Department: 905-356-1324

THE CONTRACTOR SHALL ALSO PAY SPECIAL ATTENTION TO AND MAKE ALL NECESSARY ALLOWANCES FOR THE FOLLOWING ITEMS:

i. The existing watermain and water services must remain in operation until all water services have been connected to the new main(s), except during transfer periods.

In many cases the existing watermain has exceeded its expected service life. The Contractor is advised to take all precautions and provide any support necessary to protect the existing main from damage.

The Contractor may consider installing the new watermain and abandoning the existing main prior to the sewer installations. Should the Contractor elect to proceed with sewer installations before the existing watermain replacement, the Owner will not entertain additional costs to repair the existing watermain as a result of failure directly associated with the sewer construction activities.

ii. During the watermain installation, the Contractor shall be responsible to maintain the proper functioning of each sanitary, storm and water service lateral located in the field or shown on the construction drawings, at no additional cost to the contract.

iii. The Tenderer shall note that where it is necessary to install the new watermain deeper than the depth specified to avoid elevation conflict with certain utilities, the unit price bid shall be deemed to include due allowance for this contingency. This may include deflecting a new main or service by up to 600mm.

iv. The unit price bid shall also include the removal and disposal of all abandoned underground services or pipes (of any material or diameter) in conflict with the new alignment of the watermain. Any abandoned services shall be capped and sealed on both sides of the remaining sections.

Basis for Payment

Measurement for payment will be made horizontally over the centreline of the watermain as installed.

Payment will be made at the unit price bid in the Schedule of Tender Unit Prices and shall be full compensation for all work required including cathodic protection, tracer wire, and conductivity testing.

Fifteen percent (15%) of the final payment, at the unit price bid in the Schedule of Tender Unit Prices, shall be withheld until the conductivity test has been passed in accordance with this specification.

The unit price shall also include payment for supply and installation of pipe, reducers, bends, fittings, tracer wire, conductivity testing, restraints, thrust blocks and temporary and permanent support of all utilities encountered in the trench.

The supply and placement of Granular 'A' shall be paid separately under the appropriate item in the Schedule of Tender Unit Prices.

SSP34 VALVES

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document Special Provisions – Contract Items item D2 and OPSS 441, the following shall also apply:

Materials

All gate valves shall have stainless steel stem or cast bronze, resilient seat, interior epoxy coating and polyurethane outside coating. Gate valves shall be manufactured in accordance with AWWA Standard C509 with protective epoxy interior coating to AWWA C550.

Live Tapping

City of Niagara Falls forces will complete all live taps and invoice the Contractor $100.00 for taps less than 100mm and $400.00 for taps 100mm and greater. The Contractor is to make allowance for this provision in the unit price bid.

The unit price bid for tapping sleeve and valves shall include all labour, material and equipment for the complete installation.

Installation

Gate valves and valve boxes shall be installed level and plumb and supported by concrete blocking. The anchor block shall secure the valve or tee or cross and shall be sized as for bulkhead thrust blocks.

Backfilling shall be conducted so the valve box will not be knocked off plumb. Backfill material will be the same as that used for backfilling the watermain pipe in the immediate area.

The valves shall be subjected to pressure test of 1035kPa (150 psi), at the same time as the watermain is tested.

Prior to acceptance by the Contract Administrator, the Contractor must demonstrate the operation of all valves to the Contract Administrator or designate.

Basis for Payment

The unit price tendered shall include all necessary labour, materials and equipment to complete the work in accordance with the specifications referenced within this contract.

The supply and placement of Granular 'A' shall be paid separately under the appropriate item in the Schedule of Tender Unit Prices.

The supply of Type DZP-550-12 zinc anodes shall be included at no additional cost to the contract (See SSP33).

SSP35 HYDRANT SETS

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document Special Provisions – Contract Items item D3 and OPSS 441, the following shall also apply:

Fire hydrants shall conform to AWWA C502 for dry barrel hydrants and be ANSI/NSF Standard 61 compliant. All Hydrants containing bronze or brass material must conform to AWWA C800.

Protective epoxy interior and exterior coating must conform to AWWA C550.

Materials

Hydrants shall be Canada Valve Century, McAvity M-67 Brigadier or American AVK 2780.

All hydrants shall be three-way with STORTZ quick connect nozzles, specifically one 114mm (4-1/2") pumper nozzle and two 65mm (2-1/2") hose nozzles.

Hydrants shall be the City of Niagara Falls red in colour and shall be ordered with a minimum 1.5 m riser. Hydrants shall also be supplied with both stainless steel upper and lower stems with epoxy coating, pipe, thrust blocks, grip rings, extensions. Hydrant valve and valve box to conform to SSP35.

THE CONTRACTOR SHALL ALSO PAY SPECIAL ATTENTION TO AND MAKE ALL NECESSARY ALLOWANCES FOR THE FOLLOWING ADDITIONAL REQUIREMENTS:

i. Existing utilities including gas mains must be exposed to ensure hydrant can be installed in designated location. The final location of all hydrants shall be determined in the field and must be approved by the Contract Administrator or designate.

ii. All hydrant valves must be directly connected to a mainline anchor tee unless otherwise indicated on the contract drawings or directed by the Contract Administrator.

iii. **All hydrants shall be bagged when not in service and the Fire Department immediately notified at 905-356-1324.** Covers only to be removed upon approval from Contract Administrator.

iv. Hydrant leads shall be installed with **minimum 1.8m cover**. Where leads cross under ditches, other obstructions are encountered, or minimum cover would be otherwise reduced, the Contract Administrator must be notified. Proposed resolutions shall require the Contract Administrator's written approval.

v. Hydrants on leads less than 1.5m long shall be restrained by the use of tie rods. The tie rods including nuts shall be coated with TC Mastic.

vi. Hydrant extensions shall be provided in 150mm or 300 mm lengths to ensure flange is a maximum 100mm above finished grade. Where more than 300mm extension is required, adjustment may be directed with 45-degree bends.

The unit price bid is to include all hydrant extensions required to properly install the hydrant to proposed grade.

vii. Cathodic protection: Zinc Anode DZP-1100-24 anodes to be used at each hydrant. Tie rods shall be made electrically continuous with other metallic components for cathodic protection.

viii. **Hydrants shall be tested with the watermain**; the hydrant-isolating valve must be open. The isolating valves shall also be tested at 1035 kPa (150 psi) with the hydrants in the open position. Hydrants and valves shall be flushed and disinfected to the approval of the Contract Administrator.

ix. Salvaged hydrants shall be delivered to the City's Service Centre at no additional cost to the contract. (Refer to SSP40)

Fire Flow Testing, Colour Coding & Numbering of Hydrants

All flow testing and colour coding shall be done in accordance with the Ontario Fire Code, Section 6.6.6.1.

Flow Testing Hydrants

All new or refurbished hydrants are to be fire flow tested by a qualified professional within **one (1) week** of the connection of the new/replaced watermain to the municipal water distribution system. The Contractor shall keep a written record of all testing procedures and results and this information will be immediately provided to the Contract Administrator for review and approval.

De-chlorination

An approved neutralizing chemical shall be applied to all chlorinated water used for disinfection, testing and flushing, before being discharged into the environment. Refer to Table C.1 - Appendix C of ANSI/AWWA C651 for the appropriate amount of chemicals required to neutralize chlorine.

A Certified Water Operator shall verify using an approved field test kit that the chlorine residual concentration of the water discharged to the environment shall not exceed 0.02mg/L.

Colour Coding Hydrants

Following the City's review of the fire flow testing results, and upon approval by the Contract Administrator, the Contractor shall colour code the new hydrants with an oil base, gloss finish in accordance with the National Fire Protection Association (NFPA) 291, "Fire Flow Testing and Marking of Hydrants", as summarized in the following table.

National Fire Protection Association (NFPA) 291				
Class	**Rated Capacity**		**Capacity Indicating Colour Scheme**	**Paint Colour Code Benjamin Moore** (or Equivalent)
	GPM	**(L/min)**		
AA	≥ 1500	≥ 5680	Light Blue	2065-50
A	1000-1499	3785-5675	Green	2036-20
B	500-999	1900-3780	Orange	2015-20
C	< 500	< 1900	Red	2001-20

Hydrant Numbering

The Contractor shall be responsible for applying the hydrant identification numbers to all new hydrants at no additional cost to the contract. The Contract Administrator shall provide black, peel and stick numbers that shall be placed in the centre front of the hydrant barrel.

Basis of Payment

The unit price tendered shall include all necessary labour, materials and equipment to complete the work in accordance with the specifications of this contract including, cathodic protection,

connection to the watermain, flow testing and painting and all necessary adjustments to ensure flange is a maximum 100mm above finished grade.

The supply and placement of Granular 'A' shall be paid separately under the appropriate item in the Schedule of Tender Unit Prices.

The supply of Type DZP-550-12 zinc anodes shall be included at no additional cost to the contract (See SSP33).

SSP36 WATER SERVICES

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document Special Provisions – Contract Items item D4 and OPSS 441, the following shall also apply:

This item shall be used for:

a. Supply and installation of new water services associated with watermain replacement/installation;

b. Replacement of any existing lead, iron, cast iron, and/or services less than 19mm diameter. **The Contract Administrator should be notified immediately when lead services are encountered**. The Contractor and the Contract Administrator shall then notify the homeowner of the type and condition of their existing water service; and

c. Replacement of any existing water service(s) where they conflict with proposed works, from the new/existing watermain to property line or as required to be replaced due to its condition, as determined or directed by the Contract Administrator.

Materials

Services shall be 19mm (3/4") diameter, type 'K' soft copper tubing, to ASTM B88 Standards, unless otherwise noted on the contract drawings or directed by the Contract Administrator.

Where plastic service pipe is specified within Montrose Road, cross-linked polyethylene (PEX) pressure pipe conforming to AWWA C904 and certified to CSA B137.5 shall be used (MUNICIPEX® or approved equivalent).

The PEX pipe shall include continuous tracer wire connected to the PVC watermain. Water service connections shall be made with a brass tee fitting. The unit price bid shall be deemed to include due allowance for this requirement.

All couplings and adaptors shall be bronze one piece combination nut and tail, compression type stainless steel insert and must conform to AWWA Standard C800 and ANSI/NSF Standard 61 compliant LXI water works brass. Heat flaring of tubing is not allowed.

All water services shall have Type DZP-550-12 zinc anodes installed and attached to the curb stop with an electrical tail nut.

Installation

All water services shall be **laid in one continuous length** (i.e. no joints) between the main stop and the curb stop.

Water services must have a minimum of 1.8m cover at property line and throughout the length between the watermain and curb stop. Any proposed variance to this depth must be submitted to and approved by the Contract Administrator, in writing. The Contractor shall make due allowance in his/her unit price bid for this requirement.

If necessary, the Contractor shall cut back beyond the new curb stop to raise the new water service back up to match the existing on the private side using sufficient specified new copper/PEX tubing and proper pre-manufactured couplings and fittings to properly complete the connection. In such cases, exploratory excavation may be required to determine the elevation, size and material of the existing service. The unit prices bid for this item shall be deemed to have made due allowance for this requirement.

The maximum shutdown time for any valves which disrupt the water service to any home or business shall be four (4) hours after which time the Contractor shall make such temporary water service connections as are necessary to provide a water supply to those homes or businesses affected. These temporary water service connections shall be installed at no additional cost to the contract.

The Contractor shall supply all labour, equipment and materials necessary to replace the water services from the watermain to the property line (curb stop) and beyond where required to achieve appropriate cover and/or remove an existing curb stop and box.

THE CONTRACTOR SHALL ALSO PAY SPECIAL ATTENTION TO AND MAKE ALL NECESSARY ALLOWANCES FOR THE FOLLOWING ITEMS:

i. The Contractor is advised that individual records of diameter, material type and/or replacement history is not available for properties within the construction limits. As such, there may be a number of unidentified, capped/crimped or otherwise abandoned services along the length of the existing watermain that have not been shown on the contract drawings (or located in the field). The Contractor must take all due precautions not to break, pull or otherwise damage these services as they may be live. The Contractor shall make due allowance in the unit price bid to account for this requirement.

   If an existing service is damaged and it in the opinion of the Contract Administrator or designate, the Contractor has taken reasonable care to avoid the same, then repair costs may be compensated at the unit price bid under the Provisional 'Leaking Water Service Repair' SSP45).

ii. Water services shown on the contract drawings have been generally located by the curb stop only. The actual alignment (vertical and horizontal) between the existing watermain and serviced house/building cannot be guaranteed. The Contractor must take all necessary precautions not to damage these live services. The Contractor shall make due allowance in the unit price bid to account for this requirement.

iii. The Contractor shall locate and expose the existing watermain prior to making the connection to confirm the pipe material, elevation and accessibility for the connection, at no additional cost to the contract. No work will be allowed to proceed until all materials required to make the connection and return the watermain to full service, are on site.

iv. Exploratory excavations may be required to locate existing curb stops and to determine the material and size to be connected to on private property. Suitable adapters to reconnect to the existing service will be required and must be available on-site prior to starting the work. The Contractor shall make due allowance in the unit price bid to account for this requirement.

v. The Contractor is advised that many of the existing water services are directly adjacent to existing sewer laterals. The Contractor shall make due allowance in the unit prices bid for the protection, maintenance, repair and supporting of such laterals throughout the installation of the new water service.

vi. It is the intention of this contract to provide one (1) new water service to each property within the limits of this contract.

Some residences may have more than one active service. **Additional 'extra' connections shall not to be made until they are completely reviewed, inspected and approved by the Contract Administrator**.

Basis of Payment

The unit price bid shall represent the Contractor's complete costs to supply and install the water service in accordance with these specifications. All unit prices bid must allow for the requirements stipulated above and all components of the work including excavation, removal and disposal of the existing service (including curb stop and box), backfilling and compaction in addition to supply and placement of all necessary materials, fittings and couplings.

The unit price bid for this item shall also be complete compensation for the preparation and additional handwork that may be required to restore landscape, fence, sidewalk, driveway aprons and driveways, as necessary, and as directed by the Contract Administrator.

Water services will be measured horizontally from the centre line of the watermain to the curb stop or the connection to the private service if greater than a metre beyond the curb stop, for payment. No allowance will be made for the goose-neck at the corporation stop or additional appurtenances or fittings necessary to carry out this work.

Separate items have been provided in the Schedule of Tender Unit Prices for main stops, curb stops and boxes.

SSP37 CURB STOPS

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Documents Special Provisions – Contract Items item D6, the following shall apply:

Curb stops shall be in accordance with AWWA C800. Curb stops shall be brass ball valves with both inlet and outlet flared or compression to operate at 1035 KPa (150 psi). Curb stops are to be CSA Classified to NSF Standard 61.

All curb stops will use stainless steel stems to operate the valves.

Water services must have a minimum of 1.8m cover at property line and throughout the length between the watermain and curb stop. If necessary, the Contractor shall cut back beyond the new curb stop to raise the new water service back up to match the existing elevation on the

private side. Specified copper tubing and appropriate pre-manufactured couplings and fittings necessary to complete the connection, shall be used. In such cases, exploratory excavation may be required to determine the elevation, size and material of the existing service. The unit prices bid for this item shall be deemed to have made due allowance for this requirement.

The Contractor shall not leave existing curb stops on any new water service installations. It may be necessary to extend the new water service beyond the new curb stop and box at property line so as to remove and dispose of an existing curb stop and box on private property. **There shall not be multiple curb stops left on any new water service installation.**

Basis of Payment

As stipulated in item D6 of the Special Provisions – Contract Items Niagara Peninsula Standard Contract Document.

The costs for the extended service and connection will be paid under the appropriate item in the Schedule of Tender Unit Prices, specifically Item 10.15 – Curb Stops.

SSP38 CURBBOX

In addition to the conditions stipulated in item D7 of the Special Provisions – Contract Items Niagara Peninsula Standard Contract Document, the following shall apply:

Curb boxes shall be cast iron, slide-type and adjustable to suit depth of service.

Service rods shall be **stainless steel** with a minimum 13mm diameter and include **stainless steel cotter pin retainer clips**.

The cap shall be a ribbed cover with bronze cap and 25mm I.P.S. tapping. The service box shall be installed and adjusted such that the telescopic portion of the box does not rest on the curb stop.

Basis for Payment

As stipulated in item D7 of the Special Provisions – Contract Items Niagara Peninsula Standard Contract Document.

SSP39 RECONNECT WATER SERVICES

The provisions of OPSS 441 apply as amended herein.

This item shall be used for reconnection of an existing water service to a new watermain.

Basis for Payment

Payment will be made at the unit price bid in the Schedule of Tender Unit Prices and shall be full compensation for all labour, material and equipment required to complete the connection including excavation, backfilling, temporary and permanent support of all utilities encountered in the trench, and the supply and installation of pipe, reducers, bends, fittings, tracer wire, restraints, thrust blocks.

The supply and placement of the main stop shall be paid separately under the appropriate item in the Schedule of Tender Unit Prices.

The supply and placement of Granular 'A' shall be paid separately under the appropriate item in the Schedule of Tender Unit Prices.

SSP40 ABANDON OLD WATERMAINS

In addition to the conditions stipulated in item D11 of the Special Provisions – Contract Items Niagara Peninsula Standard Contract Document and OPSS.MUNI 510, the following shall apply:

This item shall be used for:

a. Existing watermain(s) that are decommissioned and left in place;
b. Salvaging existing line valves and boxes; and
c. Salvaging existing hydrant assemblies.

Watermain

As noted on the contract drawings or otherwise directed by the Contract Administrator, sections of the existing watermain are to be plugged at both ends with watertight seal plugs and the pipe grouted with concrete, where:

> Concrete for concrete seals shall be according to OPSS 1350 with minimum specified 28-Day compressive strength of 30 MPa.
>
> Concrete for filling abandoned pipes shall be according to OPSS 1350 with minimum specified 28-Day compressive strength of 15 MPa.

Access points shall be provided to allow for confirmation that the pipe has been completely filled.

The unit price bid for this item shall be complete compensation for all labour, material and equipment necessary to complete all work for this item. The unit price bid for this item shall also be complete compensation for the preparation and additional handwork that may be required to restore landscape, fence, sidewalk, driveway aprons and driveways, as necessary, and as directed by the Contract Administrator.

Line Valves & Boxes

Where existing watermains are removed, existing line valves, boxes and caps shall be salvaged and delivered to the City of Niagara Falls Service Centre, 3200 Stanley Avenue, Niagara Falls.

Where existing watermain(s) are abandoned, the existing line valve boxes and caps shall be salvaged and delivered to the City of Niagara Falls Service Centre.

The unit price bid for this item shall be complete compensation for all labour, material and equipment necessary to complete the work for this item. Fifty percent (50%) payment shall be made upon removal of the item with the remainder to be paid upon delivery to the City's Service Centre. If in the Contract Administrator's opinion, the item has sustained unnecessary damage further to its removal and prior to delivery to the Service Centre, the final 50% payment may be withheld. The unit price bid for this item shall also be complete compensation for the preparation and additional handwork that may be required to restore landscape, fence, sidewalk, driveway aprons and driveways, as necessary, and as directed by the Contract Administrator.

Fire Hydrants

All existing fire hydrants shall be removed including hydrant valves, valve boxes and caps are to be salvaged and delivered to the City of Niagara Falls Service Centre.

The unit price bid for this item will include the cut, cap and block or plugging of the fire hydrant lead at the mainline tee.

The unit price bid for this item shall be complete compensation for all labour, material and equipment necessary to complete the work for this item. Fifty percent (50%) payment shall be made upon removal of the item with the remainder to be paid upon delivery to the City of Niagara Falls Service Centre. If in the Contract Administrator's opinion, the item has sustained unnecessary damage further to its removal and prior to delivery to the City of Niagara Falls Service Centre, the final 50% payment may be withheld. The unit price bid for this item shall also be complete compensation for the preparation and additional handwork that may be required to restore landscape, fence, sidewalk, driveway aprons and driveways, as necessary, and as directed by the Contract Administrator.

The City of Niagara Falls Service Centre is open for scheduled deliveries between 8:00 am to 4:00 pm, Monday to Friday.

SSP41 TEMPORARY WATER SUPPLIES)

In addition to the conditions stipulated in the Niagara Peninsula Standard Contract Document, the following shall apply:

The lump sum price bid for this item is to include all labour, material and equipment required for the provision of temporary potable water to those affected properties during the installation of the replacement watermain on that street.

All provisions for installation of a new watermain as per Contract Item 5.01 and Item 5.05 (disinfection) shall apply to the temporary supply system.

SSP42 WATERMAIN DISINFECTION AND TESTING

The provisions of ANSI/AWWA C651, OPSS 441, MOECC Watermain Disinfection Procedure and the Niagara Peninsula Standard Contract Document shall be followed except as amended or extended herein.

Disinfection and testing of all new main shall be accordance with the 'New Watermain Commissioning Process' flowchart and checklist included at the end of this section.

Testing and Sampling Plan

Prior to the pre-construction meeting the Contractor must submit to the Contract Administrator, a chlorine residual and bacteriological test sampling plan for approval as stipulated in the Niagara Peninsula Standard Contract Document.

As a minimum, the Testing and Sampling Plan must include:

- The location for source water connection.
- The location of sampling points.
- Lengths and volume of watermain to be tested.
- Chlorination product and dosage.
- The discharge location for flushing and de-chlorination.
- Identified method of de-chlorination (neutralizing agent and physical process).
- The final connection locations.
- Provisions for hydrostatic testing and disinfection of all water services (up to and including the curb stop).
- Provisions for temporary service whips (installed after the curb stops up to the existing grade) to allow for chlorination and flushing of all water services.

Any changes to the sampling plan requested by the Contractor must be made prior to commencement of construction and will be subject to Contract Administrator approval.

The Contractor is responsible for supplying, installing and removing all necessary valves, fittings and taps required for removing air and/or draining the watermain, introducing swabs, filling, pressure testing and chlorinating.

Municipal Water Distribution System

Failure to comply with the requirements under the Safe Drinking Water Act will subject the Contractor to any penalties, fines or consequences as deemed applicable by the Ministry of the Environment, Conservation and Parks.

All operation of the live distribution system shall be performed or supervised by a City of Niagara Falls **Certified Water Operator (CWO)** (certified according to O. Reg. 128/04).

Operation of the live distribution system includes but is not limited to:

- Operation of water valves and hydrants;
- Disconnection of any service from a length of live watermain;
- Reconnection of any service to a length of live watermain; and
- Any works performed on a live distribution system (ex. maintenance repairs, and connections to the live system).

All new watermain shall remain physically separated from the active municipal water distribution system (except as described below). Final connections to the municipal distribution system will only be permitted once the Contractor receives written Authorization for Final Connection from the Contract Administrator.

All pressure testing, disinfection and de-chlorination shall be supervised by a City of Niagara Falls CWO.

Source Water

Water for disinfection and testing of new watermain may be supplied via a temporary connection to the municipal distribution system (fire hydrant), subject to City approval and in accordance with the following:

- ONLY City of Niagara Falls Certified Water Operators will make connections /disconnections to the municipal distribution system.
- As part of the temporary connection, the City CWO will provide and install a:
  - Water Meter to monitor and account for water used on the project;
  - Reduced Pressure Zone Assembly (RPZA); and
  - Secondary control valve (e.g. attached to hydrant port) to allow the Contractor access to water in the absence of a CWO.
- The rate of draw from existing watermains shall be limited so that the system pressure does not fall below 250 kPa (36 psi). Pressure gauges shall be supplied and installed by the Contractor to confirm that adequate system pressures are maintained.

The Contractor will be responsible for the security and rental fee of the water meter and backflow assemblies provided by the City of Niagara Falls (on-site), for the duration of the project.

If additional water is required as a result of failure of the initial procedures to provide acceptable results, the additional cost will be charged to the Contractor at the prevailing bulk water charge rate.

New Watermain Commissioning Process

Swabbing

Prior to disinfection, all sections of the watermain shall be swabbed in accordance with the NPSCD Special Provision - Contract item D13.

Flushing and swabbing must be carried out under the supervision of the Contract Administrator or designate.

Hydrostatic (Pressure) Testing

Hydrostatic testing shall be completed under the supervision of the Contract Administrator or designate on all newly installed pressure pipe, joints, valves and all service lines (up to and including the curb stop) and only after all trenches have been completely backfilled and compacted in accordance with appropriate specifications.

Water shall be used for carrying out hydrostatic testing; alternative liquids or air testing will not be permitted. **The temporary water supply connection must be disconnected (physically separated) from the new watermain during the hydrostatic test.**

Only pressure gauges with a testing certificate valid within one (1) year of its use will be permitted. The test pressure shall be 1035kPa (150psi) for a two (2) hour test period.

The allowable leakage within the City of Niagara Falls shall be ZERO (0) for all new watermain.

Should the measured leakage exceed the allowable, all leaks shall be located and repaired, and the watermain retested until an acceptable result is achieved.

Measured Leakage	=	The amount of water (L) added to the test section to maintain the specified test pressure for the test duration.
Allowable Leakage	=	0.0 L/m of pipe

Disinfection

After flushing is complete, chlorination may commence as per ANSI/AWWA C651 **"Continuous Feed Method"**. Chemicals used for disinfection shall meet the requirements of ANSI/AWWA B300 or ANSI/AWWA B301. The placement of calcium hypochlorite granules in the watermain during construction will not be permitted.

Source water shall be added into the new watermain at a controlled rate and liquid chlorine added so that a minimum total chlorine level of 25mg/L is achieved throughout the new watermain. Sampling points identified in the testing and sampling plan shall be used to verify chlorine levels.

Overloading the test system with high levels of chlorine will not be permitted. Excessive chlorine loading negatively impacts test reliability and unnecessarily increases risks related to disposal, the environment and health and safety of workers. **The City of Niagara Falls will not accept chlorine levels greater than 150mg/L.**

Refer to Table B.1 - Appendix B of ANSI/AWWA C651 for the appropriate amount of chemicals required to achieve the desired level of chlorine. **The watermain shall be left charged with chlorine for a minimum period of twenty-four (24) hours.**

After the twenty-four (24) hour contact period, the chlorine level shall be measured throughout the watermain. The resulting chlorine level must be at least 40% of the initial concentration with less than a 50mg/L overall decrease. Should the chlorine level drop below 40% of the initial concentration or greater than 50mg/L, the main shall be flushed, re-chlorinated and retested under the direction of City staff.

A Certified Water Operator shall verify free chlorine levels using an approved chlorimeter; test strip readings will not be accepted.

De-chlorination

An approved neutralizing chemical shall be applied to all chlorinated water used for disinfection, testing and flushing, before being discharged into the environment. Refer to ANSI/AWWA C655 for the appropriate neutralizing chemicals.

A CWO shall verify using an approved chlorimeter that the chlorine residual concentration of the water discharged to the environment does not exceed 0.02mg/L.

Disinfection must be carried out under the supervision of a Certified Water Operator (CWO).

Recharge Watermain

After the disinfection procedure has been successfully completed, the watermain shall be flushed

and recharged with source water so that the free chlorine residual throughout the new watermain is equivalent to that of the distribution system (i.e. between 0.2mg/L and 4.0mg/L). A CWO shall verify free chlorine levels using an approved chlorimeter.

Microbiological Testing

Once the free chlorine levels within the charged main are verified, the first set of microbiological samples shall be taken.

The number of samples required (a set) shall be as follows:

- One (1) sample for every 200m (655 ft) of new watermain;
- Plus one (1) sample from each end of the new watermain;
- Plus one (1) additional sample on each branch greater than 6m (20ft);
- Watermain less than 50m (164ft) long shall have a minimum of sample sites, one at each end of the main.

After remaining charged for a minimum period of sixteen (16) hours, a second set of microbiological samples shall be taken. The watermain shall not be flushed during the sampling period.

Acceptable sample results (for both sets) must be achieved before the watermain will be considered acceptable for final connection.

Test failures will be handled as follows:

1st Round	- if sample results fail	=	flush and resample
2nd Round	- if sample results fail	=	flush, re-chlorinate and resample
3rd Round	- if sample results fail	=	flush, swab, re-chlorinate and resample

Where:

"Round" means two (2) set of samples taken a minimum sixteen (16) hours apart.

A fail is represented by test results at concentrations greater than the maximum acceptable for the following parameters as noted.

Each sample shall be tested for the following parameters and maximum acceptable concentrations:

Total Coliform	0 Counts
E. Coli	0 Counts
Heterotrophic Plate Count (HPC)	≤10 Counts

Only a Certified Water Operator will take water samples. The microbiological testing shall be completed at the City approved testing laboratory. City staff will ensure the safe delivery of the water samples to the laboratory. All laboratory test results shall be reviewed and either approved or failed by the Contract Administrator or designate.

The New Watermain Commissioning Checklist will be filled in by the Contract Administrator or designate and must be completed for each test section.

Final watermain connections must be completed within seven (7) calendar days of receiving acceptable microbiological sample results.

The approved Testing and Sampling Plan and all checklists shall be maintained on-site and available for review.

Basis for Payment

Measurement for payment will be on a lump sum basis for all associated work under this item for the entire contract.

Payment shall be full compensation for all equipment labour and material necessary to provide the required sample locations including the installation and removal of any temporary valves, blow-offs and services.

SSP43 WATERMAIN CONNECTIONS

In addition to the conditions stipulated in Item D1 the Special Provisions – Contract Items Niagara Peninsula Standard Contract Documents, OPSS 441and SSP33, the following shall apply:

The unit price bid shall include all labour, material and equipment to make the connection to the existing watermain. The unit price bid shall include all required fittings (bends, tees, sleeves, reducers) in accordance with OPSS 441, grey iron, ductile iron or PVC, thrust restraints and appurtenances to complete the connection. **All pipe used under this item shall be paid for separately under the appropriate item.**

All piping and fittings used shall be disinfected by swabbing or spraying. The connection must be isolated from the water distribution system and immediately upon completing the connection the watermain must be flushed to the nearest hydrant.

The Contractor is to note that three (3) DZP 1110-24 zinc anodes are required at all connections to existing ductile iron watermains. The supply and installation of a Type DZP 550-12 zinc anodes on all grey iron or ductile iron fittings shall be included at no additional cost to the contract (See SSP33).

SSP44 WATER SHUT DOWN DELAYS

This item will be used for delays due to the City's inability to shut down, isolate or charge a section of watermain and will only be applicable on 'scheduled shut downs' where the Contractor has made arrangements with Environmental Services 48 hours in advance.

Payment will be made at the Provisional unit price bid and shall cover the hourly crew rate for all equipment and labour on-site and affected by the delay.

SSP45 LEAKING AND DAMAGED WATER SERVICE REPAIR

The unit price bid for this provisional item is to include all labour, material and equipment required to undertake repair work to leaking existing water services or water services damaged by the Contractor.

For the purposes of this contract, a leaking or damaged water service will be the length of service from the existing watermain, excluding the main stop (See SSP48).

This provisional item will apply to:

a. Existing services discovered to be leaking that were not damaged as a direct result of the Contractor's work; and

b. Services damaged by the Contractor that are abandoned, not shown on the contract drawings, improperly or not located in the field or otherwise unidentified.

Payment will be made at the Provisional unit price bid and will include all required couplings, fittings, adaptors and up to two (2) metres of copper piping as well as all dewatering activities and removal and disposal of wet trench material, necessary to complete the repair.

Additional piping will be paid under the item for new service installation (Item 10.14).

SSP46 ADDITIONAL BENDS, TEES & FITTINGS

The unit price bid for this provisional item is to include all labour, material and equipment required for the supply and installation of the bend, tee or fitting complete with all required thrust restraint and zinc anodes. Reference should be made to SSP33 for acceptable fitting specifications and required cathodic protection.

The unit price bid shall have made due allowance for these requirements as well as all related excavation and backfilling.

Payment will be made at the Provisional unit price bid. Granular 'A' will be paid for separately under the appropriate item in the Schedule of Tender Unit Prices.

SSP47 WATER VALVE CLEANING & EXERCISING

The unit price bid for this provisional item shall be deemed to be full compensation for any additional cleaning and exercise of water valves performed by City forces within the project limits.

City forces will complete the required work and invoice the Contractor $100.00 for each valve cleaned and exercised. The approval of the Contract Administrator is required for any requests or co-ordination of activities under this item.

SSP48 EXISTING WATERMAIN REPAIRS

Where applicable, the horizontal alignment of the new watermain is designed to allow the existing main to remain in service for the duration of the construction project (until the new main is commissioned).

In many cases the existing main has exceeded its expected service life and may be subject to breaks as a consequence of the construction works. The Contractor is required to take practical precautions and provide all support required to protect the existing watermain from damage until the new main is in service.

This item may be used for the repair of breaks on the existing watermain should the Contract Administrator deem the break to be no fault to the Contractor.

For the purposes of this contract, an existing watermain break will include any failure of the existing main including damage to the main stop.

Basis for Payment
Measurement for payment will be by lump sum for each repair.

Payment will be made at the Provisional unit price bid and shall include all material, equipment and labour necessary to complete the repair, including dewatering and removal and disposal of wet trench material.

SSP49 STREET LIGHTING

General

This specification covers the requirements for electrical work and is applicable to all electrical work in the Contract. Unless otherwise amended herein, the provisions of the Ontario Provincial Standard Specifications listed under Section 2 – REFERENCES shall apply to this work.

References

This specification refers to the following standards, specifications or publications:

Ontario Provincial Standard Specifications:

Electrical Work General	In accordance with OPSS 106,
Electrical Chambers	In accordance with OPSS 602,
Duct Systems	In accordance with OPSS 603,
Cable Systems	In accordance with OPSS 604,
Grounding Systems	In accordance with OPSS 609,
Removal of Electrical Equipment	In accordance with OPSS 610,
Power Supply Equipment	In accordance with OPSS 614,
Poles	In accordance with OPSS 615,
Footings and Pads for Electrical Equipment	In accordance with OPSS 616,
Luminaires and Brackets	In accordance with OPSS 617,

OPS General Conditions of Contracts

Others:

Ontario Traffic Manual – OTM: Books 1, 1A, 1B, 1C, 5, 6, 7, 11 & 12
Electrical Utilities Safety Association of Ontario Rule Books.
Electrical Utility Safety Rules.
Telecommunications Utility Safety Rules.
Ontario Electrical Safety Code, 23rd Edition, 2002 and bulletins.

Definitions

For the purpose of this specification, the following abbreviations apply:
AISI – American Institute of Steel and Iron
CSA – Canadian Standards Association
IMSA- International Municipal Signal Association
ITE – Institute of Transportation Engineers

MTO – Ministry of Transportation of Ontario
NEMA – National Electrical Manufacturers Association
OPSS – Ontario Provincial Standard Specifications
OPSD – Ontario Provincial Standard Drawings
ESA – Electrical Safety Authority
For the purpose of this specification, the following definitions apply:
Contract Administrator: means the person, partnership or corporation designated by the Owner to be the Owner's representative for purposes of the Contract. (OPS General Conditions of Contract)
Contractor: means the person, partnership or corporation undertaking the Work as identified in the Agreement. (OPS General Conditions of Contract)
Operating Authority: means the Region of Niagara.

Electrical Work - General

Subsection 106.04 of OPSS 106 is amended to include the following:

106.04 MATERIALS

a) Poles

b) Anchor Assemblies

c) Luminaires – Philips – Road Focus

d) Junction Boxes – Hubbell power systems

e) Power Supply Assemblies

Unless otherwise specified in the Contract or by the Contract Administrator, all street lighting components for installation shall be new, fabricated and supplied by recognized equipment manufacturers to meet the requirements of the Operating Authority. All materials, components or custom equipment shall be CSA approved, where applicable, and comply with the requirements of the Electrical Safety Authority with respect to their application.
All materials shall be stored in accordance with manufacturers' instructions to prevent damage, soiling, or finish spoilage. New poles shall be stacked to prevent bending or warping and shall be protected against any condition that may cause chipping or pitting in the finish.
The Contractor shall supply all materials as specified in the Form of Tender and any miscellaneous hardware and material (electrical tape, marrettes, connectors, etc.) required for each installation.

106.05 Systems

While the specifications include specific requirements for the work, it shall be understood and acknowledge by the Contractor that complete illumination systems are required. Minor items or accessories not specified, but obviously required for such systems, shall be provided as if specified and in conformance with modern practice and workmanship. Any omission or errors or misinterpretations of the specifications or Contract order shall not relieve the Contractor of the responsibility of providing all the equipment necessary to complete the work.
Subsection 106.07 of OPSS 106 is amended to include the following:

106.06 CONSTRUCTION

106.07.01 Qualification of Workers

The Electrical Contractor shall have having a minimum of five (5) previous years experience in the construction of traffic signals and street lighting systems and approved by the Operating Authority prior to the submission of tender.

Subsection 106.07.01.01 of OPSS 106 is amended by deleting the first paragraph and replacing it with the following

106.07.01.01 Contractor's Workers

For electrical work, the Contractor or Subcontractor shall have a licensed master electrician on staff, and shall use workers qualified to do work in accordance with OPSS 106 and the following:

a) All electrical work shall be performed under the supervision of a licensed (Construction and Maintenance 309A) electrician.

b) Personnel certified under "The Apprenticeship and Tradesman's Qualification Act" shall perform all electrical work. All personnel performing electrical work shall carry proof of their certification under the Act on their person at all times while on the work site.

c) Electrical work at **Street Lighting Equipment Installations** shall be performed by a licensed electrician who has completed the IMSA Level 1 Roadway Lighting Certification Program.

d) Personnel shall have related experience in the overall fields of traffic signal and/or street lighting installations.

e) A qualified representative must be present and on-site whenever work is being carried out under the Contract.

Subsection 106.07.02 of OPSS 106 is deleted and replaced with the following:

106.07.02 Work to be Inspected by Electrical Safety Authority

The Contractor shall obtain permits for all work requiring ESA Inspection and shall file applications for inspection with ESA as necessitated by the progress of the work. The Contractor shall pay all fees related to permits, applications, inspections and connections.

The Contractor shall correct all defects in his workmanship and electrical equipment that is not approved by ESA. This work shall be done within such time and in such a manner as indicated by notices of deficiency from the ESA.

Upon completion of all work, the Contractor shall obtain a final certificate of approval from ESA and shall furnish one copy of the certificate to the Owner.

Subsection 106.07.06 of OPSS 106 is amended to include the following:

106.07.06 Temporary Electrical Work

Existing lighting systems and traffic signals are to remain in operation until new or temporary systems are in operation.

Subsection 106.07.07 of OPSS 106 is deleted and replaced with the following:

106.07.07 Layout of Equipment

The layout of equipment shown in the Contract Drawings is a schematic indication of the general requirements only. Equipment shall be located in accordance with the listed stations, offsets, and dimensions shown in the Contract Drawings and are to be reviewed by the Contract Administrator. The Contract Administrator, at his option, may revise the locations of equipment as required by field conditions, prior to installation.

Subsection 106.07.08 of OPSS 106 is deleted and replaced with the following:

106.07.08 Adjustment of Electrical Equipment

The Contractor shall adjust all luminaires, photoelectric controllers and other devices, which may be adjusted to give optimum performance. All equipment shall be installed in a neat and orderly manner to the satisfaction of the Contract Administrator. Minor adjustments to equipment, which in the opinion of the Contract Administrator are required to improve the appearance of the site, shall be carried out at the Contractor's expense.

The Contractor shall also make adjustments in luminaires during nighttime conditions, and if so required, to any equipment that can be adjusted to provide optimum performance. All such adjustments shall be carried out to the satisfaction of the Contract Administrator at the Contractor's expense.

Subsection 106.07.10.01 of OPSS 106 is deleted and replaced with the following:

106.07.10.01 General Requirements

Tests on electrical wiring and material shall, unless otherwise specified, conform to the Canadian Electrical Code Part 1 and Ontario Electrical Safety Code.

Testing shall be performed by qualified personnel only and shall be done in the presence of the Contract Administrator or an Electrical Safety Authority Inspector.

The Contractor shall provide all necessary instruments, equipment and personnel required to satisfactorily carry out prescribed tests at his own expense.

The following tests shall be performed as directed by the Contract Administrator:

a) All conduits and duct systems shall be proven free of stones, dirt, water or other debris by pulling a test mandrel 6mm smaller in diameter than the nominal conduit or duct size through each individual conduit or duct.

b) All circuits shall be proven continuous and free of short circuits or ground faults.

c) All circuits shall be proven operable. Each control or switching device shall be operated no less than five (5) times and each circuit no less than eight (8) hours.

d) The resistance to ground for all grounded equipment shall be proven to not exceed ten (10) ohms.

In addition to the above tests, the Contractor shall, where directed by the Contract Administrator, perform any tests called for where performance of the electrical system indicates a deficiency.

The Contract Administrator shall provide for tests on materials other than electrical measurements. The Contractor shall repair or replace the faulty equipment at his own expense, and to the satisfaction of the Contract Administrator.

All installations shall be made in a workmanlike manner to the satisfaction of the Contract Administrator. The Contractor shall take all necessary measurements in the field in order to enable him to completely dimension all Contract Drawings. The Contractor shall demonstrate that the materials supplied meet the standards set forth in the specifications. The Contractor at his expense shall correct all defects.

The Contractor shall provide an unconditional warranty on the work done by the Contractor for a period of one year from the date of acceptance by the Operating Authority.

Installation of Electrical Chambers (OPSS 602)

Subsection 602.01 of OPSS 602 is amended by adding the following:

Electrical maintenance holes, handholes and splicing service boxes shall be installed as shown on the Contract Drawings and in the Standard Specification Drawings.

Electrical Junction Boxes

Electrical junction boxes, when used for communication and streetlighting shall be installed as shown in the Standard Specification Drawing NRS 2020, set plumb and firmly bedded on the drainage pocket backfill.

The following junction boxes are approved for use:

a) Hubbell Power Systems – Model # B12132418A with cover Model # C12132402A with "LIGHTING" etched in top cover and stainless steel Penta bolts.

Rigid Ducts Direct Buried (OPSS 603)

The provisions of OPSS 603 shall apply excepted as amended or extended herein. Conduit material to be used under this item is 100mm and 50mm rigid PVC scepter-type conduit and the appropriate fittings. All conduit connections are to be made by the glue method unless specified on drawings.

The conduit is to be installed between 0.75m and 1.0m below finished grade. Conduit in new road base is to be installed in a trench just below the roadway subgrade elevation to prevent damage during granular compaction. Conduit in existing roads should be placed as close as possible to subgrade elevation.

Backfill in the road trench shall be Granular 'A' and compacted to 100% standard Proctor density unless otherwise indicated. All asphalt pavements shall be reinstated by matching the existing depth, or a minimum of 180 mm in total, (120 mm of base course and 60 mm top course), in 60 mm lifts of HL8 HS and milled to a minimum 0.6 m beyond the saw cut limit and reinstated with 60 mm lifts of HL3 HS surface course. The vertical edges and milled surfaces must be tack coated with a suitable asphalt emulsion prior to the replacement of the final surface layer of asphalt.

All conduits in junction boxes should extend up 100mm from the bottom of the junction box.

All conduits shall include End Bells on all open ends. Conduit intended for future use or as being spare shall be provided with a 6mm polypropylene fish line rope.

Marking tape shall be used to identify the location of all conduits. The location marking tape shall be placed horizontally along the centre of the conduit at a depth half the distance between the conduit and finished grade.

603.10 Basis of Payment

Payment for this item will be for all labour, material and equipment required to install the conduit, sweeps and appurtenances. Measurement for payment will be by the meter of horizontal length plus one and a half metres (1.5m) for each riser section in the junction boxes.

Cable Installation (OPSS 604)

Subsection 604.01 of OPSS 604 is deleted and replaced by the following:

604.01 Scope

This specification is intended to govern the supply, delivery and installation of the following cables including splicing and termination:

a) Low voltage Cable

The installation of cables shall be carried out in the following manner and according to drawings:

a) The Contract Administrator must approve materials used to facilitate the pulling of cables in conduit. Cable shall not be pulled at temperatures below -6 degrees C.

b) Cable runs shall be continuous between poles. Cable splices shall only be made within a steel / aluminum pole handhole. No cable splices are permitted below ground level.

c) Sufficient length of free cable shall be left in pole handholes or junction boxes to permit proper connection.

If, in the opinion of the Contract Administrator, any material used in the construction of any part of the cable is defective, or otherwise unsuitable, or if, in their opinion, the workmanship does not conform to accepted standards, the Contractor shall replace such defective cable at his own expense.

Any errors or omissions in, or misinterpretation of the specifications, or order shall not relieve the Contractor of the responsibility of providing cable conforming to modern practices and the best workmanship.

Cable type and sequential length markings shall be printed every one (1) meter on the surface of the outer jacket.

The Contractor must provide the Contract Administrator a schedule of the material suppliers delivery dates.

Subsection 604.02 of OPSS 604 is amended by deleting the references under the heading "Others" and replacing them with the following:

Others:

Electrical Utilities Safety Association of Ontario Rule Book.
Ontario Electrical Code, 23rd and bulletins. (Latest Edition)

Subsection 604.05.02.01 of OPSS 604 is deleted and replaced with the following:

604.05.02.01 General

Low-voltage single conductor cables for Underground Installations shall be type RWU90 cross-linked polyethylene according to CSA C22.2 No. 38.
Low-voltage single conductor cables for aerial installations on messenger cable shall be type RW90 stranded aluminum cross-linked polyethylene according to CSA C22.2.
Low-voltage neutral supported cables with one, two, or three insulated aluminum conductors and ACSR neutral shall be 300 V type NS-A or 600 V type NSF-2 and shall be according to CSA C22.2 No. 129.
The Contractor shall install cable runs as per wiring diagram and wiring chart as provided in the Contract.

Subsection 604.05.03 of OPSS 604 is deleted and replaced with the following:

Removal of Electrical Equipment and Materials

Subsection 610.07.09.03 of OPSS 610 is amended with the addition of the following:
The Contractor shall remove and dispose of all streetlighting conductors from existing conduits. All pole bases and handholes are to be removed in their entirety and disposed of. Equipment shall be returned to the Region Municipality of Niagara as shown on the contract drawings.

The Contractor must contact Niagara Region at the below phone number and make arrangements for delivery of salvaged materials.

Transportation Services
Traffic Operations
Public Works Service Centre
3547 Thorold Townline Road
Thorold, Ontario
Telephone: 905-685-1571 x2205 or x2206
The store hours are from 8:00 a.m. to 2:00 p.m., Monday to Friday.

All other excess materials, such as, Portland cement, concrete, natural wood, masonry, fabricated metal and plastic products, shall be managed as non-hazardous solid industrial or commercial waste, as specified in OPSS 180.

Payment for traffic signal removals will be at the contract price as outlined in the Schedule of Tender Unit Prices and include all equipment and labour to remove, salvage and transport to regional site, or dispose of at approved site. No additional payment will be made for

hazardous material disposal.

615.02 REFERENCES
CSA Standards:
CAN/CSA C22.2 No. 206-M1987(R2004) Lighting Poles

Subsection 615.07.04.03 of OPSS 615 is amended with the addition of the following:
615.07.04.03 Pole Erection
Base mounted lighting poles shall be supplied and installed as per the Contract Drawings and Niagara Region Standard Specification, and Standard Drawings.

The following outlines the specifications that must be satisfied when supplying and installing poles.

The height and location of each pole must be as outlined in the contract drawings unless otherwise directed by the contract administrator. Where poles are perforated for cables or cut for any reason, they must be treated with a zinc black rich compound and fitted with rubber grommets. Poles must be installed as per the manufacturer's specifications. Pole sections must be fastened to each section using zinc coated ¼" x 1 ¼" self-tapping screws. Poles should be installed in such a manner that the hand holes are facing away from the direction of traffic unless in such a manner that the hand holes are facing away from the direction of traffic unless otherwise noted or directed in the field.

Payment at the contract price for the above tender items shall be full compensation for all labour, equipment and materials required to do the work as described above.

Concrete Footings in Earth (OPSS 616)
The provisions of OPSS 616 and the Niagara Region's Traffic Signal Standards (NRTSS) apply except as amended or extended herein.

The location and type of pole base shall be confirmed by the Niagara Region's Manager Traffic Operations prior to construction. Bases shall be constructed in sonotubes with the top of concrete 50mm above finished grade on all sides. Poles constructed on slopes will require alteration to the adjacent grades to ensure 50mm clearance. the underground location of the conduit connecting to the pole base will be marked with a 50mm cut cross. Concrete for constructing the footing shall be 30Mpa of 28 days, except that a retarder supplement is added to prevent temporary set for a period of four hours.

Concrete pole bases must be constructed and installed as shown in NRS 2002.
Anchorage assembly studs shall be installed to provide maximum adjustment for pole. Studs or bolts shall have the exposed threads, above the ferrule, coated with Silver Neverseize. Anchorage assemblies used for concrete pole bases must be constructed and installed as shown in NRS 2001.

Wet burlap shall be applied to the top (unformed) surface of the footing immediately after completion of the finishing operation, without damaging or marring the surface of the concrete and maintained wet for the minimum curing period. the Contractor shall compact all backfill around footings and trenches.

Contractor shall note that caution should be exercised when excavating in the proximity of underground utilities. Hand digging and/or use of hydrovac equipment should be undertaken when warranted. Where bedrock is reached before full depth of pole base is attained the Niagara Region may allow the procedure called "Anchor base to bedrock". This procedure requires 2" holes to be drilled to a depth of 4 feet for all vertical rebar specified on the detail drawing. The (2") drill holes will be filled with "flow-rock" epoxy adhesive to anchor the rebar into the bedrock.

Existing Concrete pole bases may be adjusted 1" to 5" above grade before complete replacement is required.

Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and materials required to do the work as described above.

Roadway Lighting Luminaire and Bracket Assemblies (OPSS 617)

Subsection 617.05.01.01 of OPSS 617 is deleted and replaced with the following:

617.05.01.01 Roadway Lighting Type

Luminaires shall be 160Watt LED, prewired to operate at 120 Volts, C.S.A. approved, and shall be equipped with ground lug.

The following luminaires are approved for installation:

LED

a) I.E.S. Type III-MFCO photometric curve, 160Watt LED, for 120 Volt operation. All luminaires shall have a zero degree (0°) tilt.

   i) 160W48LED4K Philips Road Focus

Subsection 617.05.10 is amended by the addition of the following Holders and Fuses.

617.05.10 Fuses

The following fuses for roadway lighting are approved for installation:

KTK 15A

Subsection 617.05 is amended by the addition of the following:

617.05.11 Photo-electric Controls

Photoelectric control shall be rated as follows:

Control Relay:	120 V, 60 Hz (105-130V range).
Contacts:	SPST N.C. rated 1800 W HPS.

Enclosure:	Weatherproof case, complete with plug to fit EEI-NEMA three terminal twist lock receptacle.
Turn-on Level:	1.0 foot candle – normal; factory set.
Turn-off Level:	3.0 foot candles – average.
Lighting Arrester:	Open type – 2.5 kV spark over minimum 5000 Amp follow through.
Rated Life:	5000 Hours operation minimum at rated load.

Refer to Niagara Region 2016 approved material listing and Roadway lighting standards for approved photocells.

Subsection 617.05.06 of OPSS 617 is deleted and replaced with the following:

617.05.06 Brackets, Roadway Lighting

The Contractor shall supply and install the following type of aluminum tapered elliptical brackets or approved equivalent in quantities as outlined on the Form of Tender. The Contractor shall install the roadway lighting fixtures and brackets at the locations specified on the Contract Drawings, or as directed by the Contract Administrator or their representative. Aluminum tapered elliptical brackets shall be as detailed in OPSD 2420.01. The following aluminum tapered elliptical brackets is approved for installation:

a) 2.4 m Tapered Elliptical Bracket – Steel poles Aluminous RE8M

b) 2.4 m Tapered Elliptical Bracket – Wood poles – Aluminous ALP-WE8M

Subsection 617.07.05.01 is amended by the addition of the following:

617.07.05.01 Roadway Lighting Type

Installation of these brackets shall be per OPSD 2420.01 by use of 16 mm diameter galvanized machine bolt through the upper pole plate aperture. A 16 mm stainless steel band strap be installed around the lower portion of the pole plate. Pole apertures for steel poles shall be field drilled, deburred and touched up with zinc rich paint for this operation.

SSP50 SUPPLY AND PLACE HOT MIX ASPHALT

Niagara Peninsula Standard Contract Document (NPSCD) for asphalt shall not apply. The provisions of OPSS. MUNI 310 November, OPSS.MUNI 1101 November 2016 (as amended herein) and OPSS.MUNI 1151 November 2017 shall apply except as amended or extended herein.

For tendering purposes, the approximate driveway, boulevards and medians areas to be paved on each of the regional roads is as follows:

The pavers shall be equipped with automated grade controls and shall be operated at the same time within 50m of the next paver so that a hot joint is obtained between the lanes of hot mix asphalt being placed. Should one paver break down while placing the surface course, the contract administrator may permit the day's work to be completed with the remaining paver. However, the Contractor shall supply and have ready for use a back-up paver in the event of any extended break down.

The supply of asphalt to the site shall be such that the pavers shall operate continuously at a uniform speed necessary to match the output of the HMA plant. In no case shall the paver exceed 18m/min.

All traffic control required for this operation, including but not limited to control through the work zone and traffic control personnel at intersections shall be deemed to be included in the appropriate tender item.

The compaction train (rollers) shall meet the requirements of OPSS.MUNI 310 November 2017. **Each paver shall be accompanied by a rolling train for the purposes of production/compaction consistency. Back up equipment shall be on site prior to the start of paving in the event of breakdown.**

18.01 General

This specification covers Hot Mix Asphalt (HMA) to be used for the construction of roads, laneways, parking lots, and bikepaths and includes provisions for Quality Control (QC) and Quality Assurance (QA) testing. Unless otherwise amended herein, materials, production, and placement of HMA shall conform to Ontario Provincial Standard Specifications (OPSS). For the purposes of this specification, "Owner" means Niagara Region, which is the party to the contract for whom the work is being performed.

18.02 References

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Material

OPSS.MUNI 1003 November 2013 Material Specification for Aggregates - Hot Mix Asphalt
OPSS.MUNI 1101 November 2016 Material Specification for Performance Graded Asphalt Cement
OPSS.MUNI 1151 November 2017 Material Specification for Superpave and Stone Mastic Asphalt Mixtures

Ontario Provincial Standard Specifications, Construction

OPSS.MUNI 310 November 2017 Construction Specification for Hot Mix Asphalt

Ministry of Transportation (MTO) Laboratory Testing Manual, Relevant Bituminous and Aggregate Test Standards, with Revisions
MTO Designated Sources of Materials (DSM) List

18.03 Mix Classifications

The Superpave and Stone Mastic Asphalt (SMA) hot mix types and typical uses are provided in Table 1.

TABLE 1
SUMMARY OF ASPHALT MIX TYPES AND TYPICAL USES

HOT MIX ASPHALT TYPE	TYPICAL HOT MIX USE AND PROPERTIES
Superpave 4.75	Fine, surface and leveling mixes similar to the traditional sand mixes for miscellaneous applications.
Superpave 9.5	Fine, surface, padding, and leveling mixes for Traffic Category A and B roads and driveways.
Superpave 12.5	Surface mix for Traffic Category B and C roads. Superpave 12.5 is similar to the traditional HL 3, HL 3 Fine, and HL 4 mixes according to OPSS 1150
Superpave 12.5 FC1	Surface mix for use on Traffic Category C roads that provides superior rutting resistance and skid resistance through aggregate selection. Superpave 12.5 FC1 is similar to the traditional HL 1 mix according to OPSS 1150.
Superpave 12.5 FC2	Surface mix for use on Traffic Category D and E roads that provides superior rutting resistance and skid resistance through aggregate selection. Superpave 12.5 FC2 is similar to the traditional DFC mix according to OPSS 1150.
Superpave 19.0	Binder course mix for Traffic Category A, B, C, D and E roads. Superpave 19.0 is similar to the traditional HL 4, HL 8 and HDBC mixes according to OPSS 1150.
Superpave 25.0 and 37.5	Large stone binder course mixes for use when thicker binder lifts are required.
SMA 9.5 and 12.5	Gap-graded premium surface course mix with high frictional resistance, enhanced rutting resistance, water spray reduction, and potential noise reduction for Traffic Category D and E roads. 100% crushed aggregates from the DSM are used for both fine and coarse fraction.
SMA 19.0	Gap-graded premium binder course mix with enhanced rutting resistance for Traffic Category D and E roads. 100% crushed aggregates are used for both fine and coarse fraction.
Note: A. Traffic categories are according to Table 1 of OPSS.MUNI 1151 November 2017.	

18.04 Asphalt Cement

Asphalt cement shall conform to OPSS MUNI 1101 November 2016.

18.04.01 Asphalt Cement Grade

The asphalt cement grade for virgin aggregate mixes that do not contain Reclaimed Asphalt Pavement (RAP) shall be PG 58-28, unless otherwise specified. For mixes incorporating up to and including 20 % RAP, the asphalt cement grade shall be PG 58-28. Irrespective of the traffic loading conditions, mixes containing 21% RAP to

30% RAP shall incorporate PG 52-34 asphalt cement. A change in grade of asphalt binder may be considered if the request is submitted in writing to the Owner prior to paving, and only if the grade of asphalt is at least one grade higher than the original grade submitted with the approved mix design.

18.04.02 PG Grade Bumping

Bumping the grade of asphalt cement shall be carried out only by **polymer modification** if the sum of the upper grade and lower grade is equal to or greater than 92.

18.05 Aggregates

Asphalt aggregate physical properties shall conform to OPSS.MUNI 1003 November 2013, Tables 2, 4 and 5. Aggregate physical properties shall be reported on forms provided in OPSS.MUNI 1003 November 2013, Appendix E and F. Consensus properties listed in OPSS.MUNI 1151 November 2017 Table 3 shall be met and reported on the form provided in OPSS.MUNI 1151 November 2017 Appendix G. The consensus properties listed in Table 3 are for the aggregate blend as in the mix design and for the specified traffic category.

18.05.01 Gradation Properties

Hot mix asphalt aggregate gradation control points shall be as listed in Table 2 of OPSS.MUNI 1151 November 2017 for Superpave mixes and Table 3 for SMA mixes.

18.06 Reclaimed Asphalt Pavement

1151.04.01.01 of OPSS MUNI 1151 November 2017 is amended as follows:

Up to 15% by mass of RAP is permitted for Superpave 19 and 25 mixes. The amount of RAP added to the mixes shall be inspected by a representative of Niagara Region. If requested, the Contractor shall provide a print out from the asphalt plant production to verify the amount of added RAP.

RAP is not permitted in SMA 9.5, 12.5, 12.5FC1 and 12.5FC2 mixes.

18.07 Mix Designs

Superpave and SMA mixes design traffic categories (by ESAL's) are listed in Table 1 of OPSS.MUNI 1151 November 2017.

Mix designs shall be completed in accordance with OPSS.MUNI 1151 November 2017.04. 02.

Submission of mix designs for review, approval, or rejection, shall be contingent upon the information listed in OPSS.MUNI 1151 November 2017.04.05 being

submitted to the Owner. Submitted documentation should include a Superpave HMA Volumetric Properties verification and report by an independent CCIL certified laboratory.

The need for anti-stripping additives shall be determined in accordance with OPSS.MUNI 1151 November 2017.04.06.

The Owner reserves the right to make the mix design approval contingent upon the successful duplication of the mix design Superpave and SMA properties by the Owner's designated QA testing laboratory.

18.07.01 Design Properties

Table 9 of OPSS.MUNI 1151 November 2017 lists the Superpave compactive effort for each traffic category. Table 5 of OPSS.MUNI 1151 November 2017 lists the Superpave HMA Volumetric properties. They are summarized in Table 2 below.

TABLE 2
SUPERPAVE HMA VOLUMETRIC PROPERTIES

Ontario Traffic Category	% of Theoretical Maximum Specific Gravity			Voids in Mineral Aggregate (VMA) % minimum (Note 4)						Voids Filled With Asphalt (VFA) %	Dust to Binder Ratio (Note 1)
	N_{inital}	N_{design}	N_{max}	Nominal Maximum Aggregate Size mm							
				37.5	25	19	12.5	9.5	4.75		
A	≤91.5	96.0	≤98.0	11	12	13	14	15	16	70-80 (Note 2)	0.6-1.12
B	≤90.5									65-78	
C	≤89.0									65-75 (Note 3)	
D											
E											

Notes:
1. For Superpave 4.75 mixes, the dust-to-binder ratio shall be 0.9 to 2.0. Superpave mixes with gradations that pass beneath the PCS Control Point specified in Table 4, the dust-to-binder ratio shall be 0.8-1.6.

2. For Traffic Category A, Superpave 25.0 mixes shall have a VFA range of 67% to 80%.

3. Superpave 4.75 mixes shall have a VFA range of 75% to 78%.
Superpave 9.5 mixes shall have a VFA range of 73% to 76%.
Superpave 37.5 mixes shall have a VFA range of 64% to 75%.

4. Density testing of the coarse and fine aggregate shall be carried out in accordance with LS-604 and LS-605 respectively using the procedure for blended aggregates.

SMA mixes shall be designed in accordance with AASHTO MP 8 and AASHTO PP41. Table 6 of OPSS.MUNI 1151 November 2017 lists SMA HMA Volumetric Properties. They are listed in Table 3 below.

TABLE 3
SMA HMA VOLUMETRIC PROPERTIES

% Air Voids (Note 1)	Voids in Mineral Aggregate (VMA) % minimum			Voids in Coarse Aggregate (VCA) of the Compacted Mix (%)	Maximum Draindown at Production Temperature (Note 2) (%)
	Nominal Maximum Aggregate Size (mm)				
	19	12.5	9.5		
4	17			Less than the VCA in the dry rodded condition.	0.3

Notes:
1. SMA mixes shall be designed with 100 gyrations unless the mix aggregates have a LS-603 value greater than 30%, then the SMA mix shall be designed with 75 gyrations.

2. Tested according to AASHTO T 305.

18.07.02 Superpave and SMA Mix Verification

1151.04.02.02 of OPSS.MUNI 1151 November 2017 is amended by adding the following:

After receiving the asphalt mix design from the Contractor or asphalt supplier, the Contractor shall provide asphalt mix verification test results in accordance with the following criteria:

The tests must be performed by a laboratory independent from the firm producing the asphalt mix design.

The laboratory performing verification testing must have a valid "Certificate of Conformance" issued by the Canadian Council of Independent Laboratories (CCIL) Asphalt Laboratory Certification Program and be qualified under the following categories:

i) Asphalt Mix Design– Marshall and Superpave Methods (Type A)

ii) Asphalt Mix Compliance – Marshall and Superpave Methods (Type B)

All verification testing must be reviewed and accepted by the Niagara Region prior to the start of any paving operations.

The mix design shall be submitted for acceptance at least two weeks before construction. The mix design must be reviewed and approved by Niagara Region. **Before construction, a trial batch shall be submitted to the Contract Administrator for verification and approval.** The unit prices bid under the Hot Mix item shall be deemed to have made allowance for the required trial batches.

The submitted mix design shall include, besides JMF, the documents listed in Sections 1101.04.01 of OPSS.MUNI 1101 November 2016 and 1151.04.05 of the OPSS.MUNI 1151 November 2017 specifications. The mix design that does not include the required documents will not be reviewed and accepted.

A sample of Performance Graded asphalt cement(s) specified for the subject project shall be submitted with the mix design for future testing. Random sampling may also be undertaken during HMA production.

18.07.03 Minimum Asphalt Cement (AC) Content in HMA Mix Design

18.07.03.01 Mix Design Requirements

The asphalt cement content of mix designs for mix design shall be as shown in Table 4 below. The asphalt cement content of the JMF must be equal to or greater than those shown in the following table:

TABLE 4
Asphalt Cement Contents for Mix Design JMF

Mix Type	Minimum Asphalt Cement Content for Mix Design JMF (%)
Superpave 9.5	5.5
Superpave 12.5	5.1
Superpave 19mm	4.9
Superpave 25mm or greater	4.6

18.07.04 Engine Oil Residue (EOR)

The addition of Engine Oil Residue (EOR) or Re-refined Engine Oil Additive or Reclaimed Engine Oil Residue to any asphalt cement is not allowed.

As part of the Quality Control (QC) and Quality Assurance (QA) procedures samples of the asphalt cement will be obtained from the asphalt plant from asphalt tank(s) during asphalt production. One sample will be taken for the Contractor, one for the Region of Niagara and one for referee testing. The samples shall be 1 litre each and stored in glass containers.

If there is any concern about the quality of the asphalt cement in the mix, the samples of the asphalt cement will be tested using a Gas Chromatography Mass Spectrometer (GCMS) or other testing for the presence of deleterious components not anticipated in good quality asphalt cement.

18.07.05 Reclaimed Asphalt Pavement (RAP)

The percentage of RAP added to the asphalt base mixes (SP19 and 25) must not exceed 15% and/or project specification. A person designated by the Region of Niagara will inspect the asphalt plant during HMA production to check the amount of RAP added. Also, the Region of Niagara may request a record from the plant production where the added amount of RAP is identified.

Coarse and Fine RAP shall be properly processed and from certified stockpiles. For a RAP stockpile to be certified the following requirements shall be met:

- The source of RAP shall be clearly identified;
- The age of RAP shall be identified or at least the year the RAP material was obtained; and
- Quality control/assurance testing should be as for other asphalt aggregates

The Contractor/producer shall submit quality control report/testing prior to asphalt production

18.08 Construction of Hot-Mix Asphalt (HMA) Pavement

Construction of HMA pavement shall be carried out in accordance with OPSS.MUNI 310 November 2017 except as amended herein.

18.08.01 Pre-pave Meeting

At least one (1) week prior to any scheduled milling or paving operation to occur, a mandatory pre-pave meeting shall be held. The Contractor shall ensure that all required documentation relating to the milling and paving operations has been submitted for review and approved prior to the meeting. The items shall include, but are not limited to, the following:

a) Notwithstanding the provisions of OPSS.MUNI 1101 November 2016, PGAC documentation, for each grade of PGAC specified in the contract documents, the Contractor shall supply the following additional items to the contract administrator prior to the commencement of HMA production:

    i) PGAC documentation from the asphalt cement supplier in the form of Bill of Lading and Certificate of Analysis, confirming the grade of PGAC. The Bill of Lading and Certificate of Analysis shall also be supplied for each subsequent delivery of PGAC that will be used for the HMA production.
    ii) Documentation identifying the PGAC storage tank that the PGAC will be supplied from for the HMA production. The Contractor shall notify the contract administrator and provide updated documentation prior to changing the storage tank that is being used to supply PGAC for the HMA production.

b) Approved mix designs and Job Mix Formulas;
c) Proposed milling and paving dates and paving equipment to be used;
d) Asphalt placement and compaction rolling patterns;
e) Roadway, lane closures and vehicle access restrictions;

f) Tack coat scheduling and application patterns.

Tack Coat

Prior to the application of any surface or binder course asphalt tack coat shall be applied unless otherwise directed by the Contract Administrator.

Binder and Surface Course Asphalt

Any type of asphalt having a thickness of 80mm or more shall be placed in a minimum of 2 lifts unless otherwise directed by the Project Manager.

The finished elevation of the surface course asphalt shall be placed so as to be flush with the lower edge of curb at the depressed portion of all wheelchair ramps. The surface course asphalt shall slope down and away from the curb to form a gutter line in front of the wheelchair ramp.

18.08.02 Commencement Of Paving

This section amends OPSS.MUNI 310 November 2017.07.06 with the following.

Unless otherwise approved by the Owner, asphalt surface course paving shall not be carried out after the end of the first full week of October.

Binder course asphalt paving shall not proceed after the third full week of November unless approved by the Owner.

18.08.03 Placement Of Asphalt Mixture

OPSS.MUNI 310 November 2017.07.06.01 is amended by the following:

The temperature of the HMA prior to placement shall be within the temperature range that corresponds to the PGAC manufacturer's recommended mix temperature.

The temperature of the HMA immediately after spreading and prior to initial rolling shall not be less than 120 °C.

An HMA course shall not be placed on a previously laid course until a minimum four (4) hours has elapsed, following final compaction of the previous course, and the temperature of the previous course is 50°C or less.

18.08.04 Binder Course Asphalt – Temporary Ramping

When the surface course asphalt is to be delayed or placed the following year, temporary asphalt ramps shall be placed at all wheelchair ramps and driveway approaches. The top of the temporary asphalt ramps shall be placed so as to be flush with the lower edge of curb at the depressed portion of all wheelchair ramps and driveway approaches. The temporary asphalt ramps shall be removed at the time of placement of the surface course asphalt at no additional cost.

18.08.05 Use of Paving Equipment – Paving in Echelon

OPSS.MUNI 310 November 2017.07.07 is amended with the addition of the following paragraph:
Paving in Echelon is mandatory for the placement of binder and surface course asphalt. The pavers shall be operated at the same time and maintain a distance of not more than 50 m from each other so that a hot joint is obtained between the lanes of mixtures being placed. The Contractor shall supply sufficient personnel to adequately control both spreading operations simultaneously.

Where the entire width of the proposed pavement platform cannot be paved in echelon with 2 pavers, one longitudinal construction joint is permitted. Each half of the road shall be paved in echelon resulting in only one longitudinal joint in the binder and surface courses located at the centerline of the road. The joint shall be located to ensure that it does not align with the wheel path of traffic.

18.08.06 Asphalt Material Transfer Vehicle

OPSS.MUNI 310 November 2017 Section 07.07 is amended with the addition of the following paragraph:

A Material Transfer Vehicle (MTV) is required for all paving operations, including paving using only one paver (side streets). The use of an MTV will be paid for by the tonne under the appropriate asphalt tender item.

18.08.07 Re-Heating and Compaction of Longitudinal Joints

OPSS.MUNI 310 November 2017 Section 07.07 is amended with the addition of the following paragraph:

For surface course, the Contractor shall use an approved method of re-heating and compacting all centerline longitudinal cold joints. Pricing shall be based on an infra-red heating system capable of maintaining a minimum temperature of 93° C to produce a welded joint, without scorching or burning the mix.

All re-heating methods shall be approved prior to the start of any asphalt placement.

The density of the mix at any longitudinal joint shall be within 1.5 percent of the mainline mat density. Compaction of longitudinal joint shall be measured within 0.3 m from the joint.

18.09 Quality Assurance

The hot mix asphalt quality will be determined on the basis of QA test data.

18.09.01 Field Adjustment

Field adjustments (changes to the Job-Mix Formula (JMF) and Mix Design) will be permitted but have to be carried out in accordance with OPSS.MUNI 1151 November 2017.04.02.04. Permitted field adjustments to a JMF are given in Table 10 of OPSS.MUNI 1151 November 2017. Only one field adjustment per mix type on a project will be permitted.

The hot mix asphalt compaction shall be assessed on the basis of nuclear density gauge testing. Nuclear density gauge data alone will not be used to reject asphalt mix compaction. Each nuclear density gauge used on a project shall be calibrated against a minimum of three cores of binder course and surface course mixes placed in the same project.

18.09.02 Compaction

Asphalt compaction testing during the placement and rolling stage shall be by nuclear density gauge. OPSS.MUNI 310 November R 2017 Table 10 is amended and the criteria for assessing mix compaction by nuclear density gauge is given in Table 5. The specified compaction is expressed as a percentage of the Maximum Relative Density (MRD), as established from the approved asphalt mix design for the project, and verified by QA testing and asphalt core correlation.

The frequency of nuclear gauge testing in OPSS.MUNI 310 November 2017.08.04.02 is amended such that compaction of a given area of pavement shall be assessed by a minimum of five nuclear density test readings. The pavement area to be assessed should be a maximum of 0.5 lane-km of pavement (i.e. 250 m of 2 lane pavement). The average of at least five nuclear readings for a given area shall not be less than the specified percent compaction given in Table 5, with no individual test results being more than 3 % below the specified percent compaction.

Nuclear density test results will be used as a guide to assessing in-place compaction and will not be used to reject the mix compaction. Where compaction results by nuclear gauge do not meet the specifications, the

Owner may elect to have cores (minimum 100 mm diameter) taken to assess the in-place mix density. The core density and compaction data shall be determined according to OPSS.MUNI 310 November 2017 article 310.08.06.03. Where compaction results from core densities do not meet specifications and are below the specified values of 93% MRD for Superpave 9.5, 12.5 and 12.5 FC1 and 92% MRD for Superpave 19 and 25, the coring and testing will be at the Contractor's expense.

TABLE 5
COMPACTION CRITERIA BY NUCLEAR GAUGE
FOR ACCEPTANCE OR REJECTION

MIX TYPE	AVERAGE OF COMPACTION RESULTS BASED ON NUCLEAR DENSITIES (% MRD)			
	MEETS SPECIFICATION	ACCEPTABLE	BORDERLINE	REJECTABLE
Surface Course: Superpave 9.5, 12.5, 12.5 FC1 and 12.5 FC2	≥ 93 %	< 93 % & ≥ 92 %	< 92 % & ≥ 91 %	< 91 %
Binder Course: Superpave 19 and 25	≥ 92 %	< 92 % & ≥ 91 %	< 91% & ≥ 90 %	< 90 %

18.09.03 Joint Compaction

The measured joint compaction using a nuclear density gauge should not be lower than that provided in Table 6. Joint compaction should be measured within 0.3 of the joint.

TABLE 6
MINIMUM REQUIRED JOINT COMPACTION

LAYER	MINIMUM LONGITUDINAL JOINT COMPACTION
Surface Course	91.5 %
Binder Course	90.5 %

18.09.04 QA Field Sampling

OPSS.MUNI 310 November 2017 article 310.08.01 is amended to include the following:

Field samples for QA testing shall be plate samples (minimum 300 mm x 300 mm) obtained during asphalt placement and compaction procedures. Samples obtained from the spreader hopper or truck box shall not be used

for QA testing.

Alternatively, samples can also be obtained from the Material Transfer Vehicle (MTV) during placement of HMA and prior to transferring the mix to the paver. For MTV sampling, the mix is dumped directly from the MTV into a specially designed funnel which splits the mix into four containers, each holding approximately 45kg of mix. The mix from one of the containers is then poured into a separate splitting apparatus (QuarterMaster), which is placed on a level surface. This apparatus splits the sample into four buckets, each with 11.3kg capacity. The split is repeated once or twice until a uniform sample is obtained. Sampled material is then transferred to carton boxes and then into bags for security sealing and shipment to the laboratory. The success of the sampling process depends primarily on the leveling of the sampling device and should be conducted while the MTV is under full operation (sampling should be avoided if the MTV is not thoroughly heated).

Samples shall be collected by the Contractor at locations generated by random numbers and/or as agreed with the Owner, for longitudinal chainage and transverse offset from edge of pavement. These samples shall be representative of the main lane paving operations. At each location, the Contractor shall take three samples (within a 3 m longitudinal length) and the samples shall be packed in separate cardboard boxes supplied by the Contractor. The box samples shall be numbered in sequence for a given contract, and shall be marked "A", "B", and "C" and include the following minimum identification: date; longitudinal chainage or municipal address opposite the sample location; offset in metres from edge of pavement; contract number, and street name. A typical sequence of samples would be identified as 1A, 1B, 1C, and 2A, 2B, and 2C.

Two of the samples from each sample location shall be the property of the Owner. The Contractor shall obtain and complete a Bituminous Sample Identifier Forms for each sample. The asphalt mix samples designated for the Owner shall be given directly to the Owner's representative at the paving site.

18.09.05 QA Sampling and Testing Frequency

OPSS.MUNI 310 November 2017, Table 6, is amended and replaced by Table 7 in this specification.

TABLE 7
CRITERIA FOR SAMPLING AND TESTING TO DETERMINE IN-PLACE ASPHALT CEMENT CONTENT

MIX TYPE	MINIMUM TEST SAMPLES BASED ON ASPHALT PLANT'S DAILY MIX PRODUCTION		
	≤ 500 tonnes/day	> 500 tonnes & < 1000 tonnes/day	≥ 1000 tonnes/day
Surface Course	3	3	2 per 500 tonnes
Binder Course	3	3	2 per 500 tonnes
HMA in Driveways, Boulevards and Pathways	Field decision by Owner's representative		

18.10 Tolerance for Asphalt Production

The tolerances for asphalt mix production compared with the Job Mix Formula gradation and asphalt cement content are as in Table 7 of OPSS.MUNI 310 November 2017 with the exception of the asphalt cement content. The tolerances are summarized in Table 8 below.

TABLE 8
TOLERANCES FOR THE JOB-MIX FORMULA
GRADATION AND ASPHALT CEMENT CONTENT

MIX	ATTRIBUTE	MINIMUM TEST SAMPLES BASED ON ASPHALT PLANT'S DAILY MIX PRODUCTION		
		Acceptable	Borderline	Rejectable
Surface Course	DLS, 4.75 mm Sieve Size	< 5.0	5.0 to 7.5	> 7.5
	600 µm Sieve Size	< 3.5	3.5 to 5.0	> 5.0
	75 µm Sieve Size	< 2.0	2.0 to 3.0	> 3.0
Binder and Levelling Courses	DLS, 4.75 mm Sieve Size	< 7.0	7.0 to 10.0	>10.0
	600 µm Sieve Size	< 4.5	4.5 to 6.0	> 6.0
	75 µm Sieve Size	< 2.0	2.0 to 3.0	> 3.0
All Mixes	Asphalt Cement Content	< 0.20	0.20 to 0.30	> 0.30

Note:
1. Tolerance on the job-mix formula apply as both plus and minus from the job-mix formula

18.11 Aggregate Gradation and Asphalt Cement Content Acceptance

OPSS.MUNI 310 November 2017 Article 310.08.04 is deleted and replaced by the following:

If the HMA is borderline for aggregate gradation or asphalt cement content specified in Table 8, the Contractor shall take immediate corrective action through process control at the HMA plant. A total of three consecutive borderline test results for any attribute representing up to 1,000 tonnes of HMA production shall result in the work being deemed rejectable and shall be removed and replaced with acceptable HMA.

Rejected HMA due to aggregate gradation, such as non-compliance on the DLS 4.75mm, 600 µm, or 75 µm sieve sizes, or non-compliance due to the asphalt cement content specified in Table 8, shall be removed and replaced with acceptable HMA.

18.13 Asphalt Cement Price Adjustment Based on Price Index

The Owner will adjust the payment to the Contractor based on changes to the Ministry of Transportation's performance graded asphalt cement Price Index, and as set out in OPSS.MUNI 310 November 2017, Appendix 310-B. The Price Index will be used to calculate the amount of the payment adjustment per tonne of asphalt cement accepted into the Work. Payment will be made based on the month the asphalt is laid.

Notes:

1. Contractors should bid the hot mix asphalt item using the cost of the PGAC in effect at the time of tender closing unless specified in the Contract Document. The asphalt cement Price Index is only a tool for qualifying hot mix prices and is not intended as a standard asphalt cement price to be incorporated into the contract bid.

2. The payment adjustment calculated is full compensation for any and all PGAC grades specified.

18.14 Payment For Asphalt Mix

Unless otherwise specified in the tender documents, payment for asphalt satisfactorily placed and compacted will be by the tonne. Where price adjustment provisions are invoked for the contract, the final payment shall reflect the adjustments for asphalt cement content and/or compaction. For all mixes the pay quantity by the tonne will be based on the weigh tickets for mix supplied to the job site and in accordance with OPSS 102.

18.15 Dispute Resolution

The following outlines the methodology for resolving disputes regarding testing and evaluation of mixes for price adjustment based on asphalt cement content, and compaction based on core densities.

18.15.01 Price Adjustment Based On Asphalt Cement Content

Where there is disagreement on the findings of the test results by the Owner's designated QA laboratory, the Contractor has the option of requesting the services of a referee laboratory. The referee laboratory shall have current CCIL Type A certification and the selection of the laboratory shall be mutually agreed upon by the Owner and the Contractor.

Samples for referee testing shall be from the triplicate plate samples taken during paving. The Owner shall arrange for transfer of referee samples to the designated referee laboratory.

The results of the referee laboratory will be binding on both the Owner and the Contractor. Payment for the costs of the referee testing and sample delivery will be the responsibility of the Contractor if the test results confirm that the mix material does not meet specification. If the referee laboratory test results indicate that the mix material satisfies the specifications with respect to asphalt cement content, the costs will be borne by the Owner.

18.15.02 Acceptance or Rejection Of Mix Compaction Based On Core Densities

Where there is disagreement on the compaction findings from the core test results by the Owner's designated QA laboratory, the Contractor has the option of requesting additional cores and using the services of a referee laboratory. The cores shall be taken at locations selected jointly by the Contractor and the Owner. At each core location, a parallel core shall be taken by the Contractor and provided to the Owner. The Contractor and the Owner shall agree on the CCIL certified laboratory to carry out the core testing.

The results of the referee laboratory will be binding on both the Owner and the Contractor. Payment for the costs of the coring, referee testing and core sample delivery will be the responsibility of the Contractor if the test results confirm that the mix material does not meet the compaction specification. If the referee laboratory test results indicate that the mix compaction satisfies the specifications, the costs will be borne by the Owner.

SSP51 TRAFFIC SIGNALS

TS1 - Traffic Signal Construction

As part of this contract the Niagara Region will be required to bring in their own forces to complete all or a portion of the traffic signal construction not included in the schedule of quantities. The Contractor is therefore required to give adequate notice (minimum 5 working days) to the Niagara Region, and co-ordinate the scheduling of this work following the completion of all preparatory work within the intersection. The Contractor shall at no cost ensure adequate separation of his work area and the traffic signal work area to satisfy the Ministry of Labour requirements and will not claim for mobilization or any lost time costs resulting from traffic signal construction. Niagara Regional forces shall have a maximum of 10 working days per intersection to construct the traffic signal installation. During this phase of the project traffic control at the intersection shall be undertaken by Regional Niagara but shall be organized in such a manner as to supplement the Contractor's traffic management plan.

All construction is to be in accordance with Niagara Region Traffic Signal Standards (NRTSS) manual. This manual can be viewed and downloaded from the Niagara Region website at:

http://niagararegion.ca/government/works/Traffic-Signals-Manual.aspx

The unit prices bid for schedule of quantities items shall include all labour, equipment and material

(not supplied by Niagara Region) for the complete installation of the traffic signal plant.

Traffic control is the responsibility of the Contractor including the coordination and cost of a point duty police officer (if required). The Niagara Peninsula Standard Contract Document, Special Provisions – Contract Items item A8; Construction Signs, Traffic Control, and Traffic Management Plan will apply. If there is no item for traffic control in the Schedule of Tender Unit Prices, it will be deemed to be included in other traffic signal items.

Temporary signal works may be required to reduce conflicts between existing traffic signal plant and the proposed road construction. The Contractor will organize and construct the temporary signal work and coordinate the cable connections by Regional Niagara forces as per contract documents. All temporary signal work will be subject to the related specifications in this document.

The Contractor shall contact the Niagara Region's Manager Traffic Operations following the traffic signal plant layout. Property and utility locations must also be identified. The exact locations for all traffic signal plant including but not limited to ducts, pole bases, junction boxes, controller base and loops will be verified in the field by the Niagara Region's Inspector prior to installation. The Niagara Region's Manager Traffic Operations or designate may change final location of signal plant. A traffic signal inspector from the Niagara Region must be on site at all times (or where determined by the Niagara Region's Manager Traffic Operations as necessary) when traffic signal work is being undertaken. The unit price bid shall be deemed to have made allowance for the co-ordination and time for layout inspection by the Niagara Region.

The Niagara Peninsula Standard Contract Document provides Special Provisions for construction items not addressed in this document.

Regional Niagara will supply the following materials:

- Junction boxes, Concrete Polymer.
- Anchor bolt cages: as required per NRS 2001
- Traffic Signal Cable: all sizes
- Interconnect communication cable (Wire or Fibre) including:
    - 12 Fiber Outdoor Single mode
    - 100 FT Gator patch Panel
    - Corning Splice Kit
    - 14 solid locate cable
- Sectional Steel Poles Direct Buried
- Sectional Steel Poles Base Mounted
- Signal Mast Arms and Signal Hangers.
- Double Arm Brackets
- Special Type Signal Heads
- Highway Type Signal Heads
- Pedestrian Type Signal Heads
- Traffic Signal Controller/Cabinet c/w skirt and anchor bolts
- Video Vehicle Detectors
- Radar Detection Cameras
- Audible Pedestrian Pushbuttons

- Emergency Vehicle Pre-Emption Equipment (if applicable)
- Power Supply Control Cabinet Assemblies
- Loop extension Extra Low Voltage Cable
- Roadway Lighting Luminaires and elliptical arms

The Contractor is to supply the following materials:

- 100mm and 50mm rigid PVC Sceptre-type conduit including sweeps, bends, couplings, end bells and cement for traffic signals and interconnect ducts
- 50mm rigid PVC Sceptre-type conduit including sweeps, bends, couplings, end bells and cement for streetlight ducts if applicable
- ground rods (ground plates are not allowed)
- 6.35mm (1/4") minimum diameter woven polypropylene rope fish in all the conduit work
- rebar, as specified in NRS 2002
- concrete, as specified in NRS 2002
- Concrete Footings and Pads
- Vehicle Detection Loops

All materials provided by the Contractor shall be approved by Regional Niagara before the Contractor is permitted to use on the work site.

All other electrical or signal materials required for this project, but not listed above, shall be supplied by Regional Niagara upon five (5) working-days notice by the Contractor.

Splice kits are required when the fibre cable is interrupted. Fibre cable should be interrupted as little as possible. A patch panel is required to interface with the signal cabinet.

- Fiber cable shall be continuous in between signal plants unless otherwise directed by the Niagara Region.
- Tracer cable is not to enter signal plant.
- Junction box before plant and in-between but not entering.
- 16m of extra cable in junction box for ever cable involved in a splice.
- Junction boxes used as pull points shall have 2-5m extra meters of cable.

The Contractor must provide an itemized list in writing by fax of all materials required to be supplied by the Niagara Region identifying the location to be used two working days prior to pick up. If the Contractor cannot pick up the material at the scheduled time he must contact the Niagara Region and resubmit the request and reschedule a pick up date. Materials provided by Regional Niagara are to be obtained by the Contractor from:

Transportation Services
Traffic Operations
Public Works Service Centre
3547 Thorold Townline Road Thorold, Ontario
Telephone: 905-980-6000, extension 2204
Fax: 905-227-0199

The store hours are 8:00 a.m. to 2:00 p.m., Monday to Friday.

Unless the Contractor has a secured storage area on the construction site, he shall be able to obtain only enough materials for one day's advance work at a time.

Measurement for payment will be per specified unit as indicated in the Schedule of Tender Prices. The Contractor will be back charged for excess wasted material supplied by the Niagara Region but not used on project.

TS2 - Traffic Signal Construction Layout

The provisions of OPS General Conditions of Contract GC7.02 apply except as amended or extended herein.

The Contract Administrator will provide the Contractor a construction drawing in AutoCAD format. Layout using coordinates from the drawing will be used to locate all traffic signal plant. Where road works or grade changes are included in the project the roadway construction drawings should be used to determine the finished grade at traffic signal plant locations.

The Contractor shall layout all pole, junction box, conduit, loops and controller locations prior to construction for review and approval by the Niagara Region's Manager Traffic Operations. The Contractor is responsible to have all utilities, watermain, storm and sanitary sewers and property lines located and marked in the field.

Payment for this item will be at lump sum and include all layout required for the project. Where there is no separate item for layout in the contract, layout will be included in the contract price for each item.

TS3 - Concrete Footings and Pads

The provisions of OPSS 616 and the Niagara Region's Traffic Signal Standards (NRTSS) apply except as amended or extended herein.

The location and type of pole base shall be confirmed by the Niagara Region's Manager Traffic Operations prior to construction. Bases shall be constructed in sonotubes with the top of concrete 50mm above finished grade on all sides. Poles constructed on slopes will require alteration to the adjacent grades to ensure 50mm clearance. The underground location of the conduit connecting to the pole base will be marked with a 50mm cut cross. Concrete for constructing the footing shall have a minimum 30 MPa strength after 28 days, except that a retarder supplement is added to prevent temporary set for a period of four hours.

Concrete pole bases must be constructed and installed as shown in NRS 2002.

Anchorage assembly studs shall be installed to provide maximum adjustment for pole. Studs or bolts shall have the exposed threads, above the ferrule, coated with Silver Neverseize. Anchorage assemblies used for concrete pole bases must be constructed and installed as shown in NRS 2001.

Wet burlap shall be applied to the top (unformed) surface of the footing immediately after completion of the finishing operation, without damaging or marring the surface of the concrete and maintained wet for the minimum curing period. The Contractor shall compact all backfill around footings and trenches.

Contractor shall note that caution should be exercised when excavating in the proximity of underground utilities. Hand digging and/or use of hydrovac equipment should be undertaken when warranted. Excavation by hydrovac method must be approved by Contract Administrator. The premium for each hydrovac excavation will be paid in addition to the unit price of the footing item.

Where bedrock is reached before full depth of pole base is attained the Niagara Region may allow the procedure called "Anchor Base to bedrock". This procedure requires 2" holes to be drilled to a depth of four feet for all vertical rebar specified on the detail drawing. The two inch (2") drill holes will be filled with "Flow-Rock" Epoxy adhesive to anchor the rebar into the bedrock.

Existing concrete pole bases may be adjusted 1" to 5" above grade before complete replacement is required.

Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and materials required to do the work as described above.

TS4 - Conduit

The provisions of OPSS 603 shall apply excepted as amended or extended herein. Conduit material to be used under this item is 100mm and 50mm rigid PVC sceptre-type or high density polyethylene (HDPE) conduit or equal and the appropriate fittings. All conduit connections are to be made by the glue method unless specified on drawings.

The conduit is to be installed between 0.75m and 1.0m below finished grade. Conduit in new road base is to be installed in a trench just below the roadway subgrade elevation to prevent damage during granular compaction. Conduit in existing roads should be placed as close as possible to subgrade elevation.

Backfill in the road shall be Granular 'A' and compacted to 100% standard Proctor density unless otherwise indicated. All asphalt pavements shall be reinstated by matching the existing depth, or a minimum of 180 mm in total, (120 mm of base course and 60 mm top course), in 60 mm lifts of HL8 HS and milled to a minimum 0.6 m beyond the saw cut limit and reinstated with 60 mm of HL3 HS surface course. The vertical edges and milled surfaces must be tack coated with a suitable asphalt emulsion prior to the replacement of the final surface layer of asphalt.

All conduits in junction boxes should extend up 100mm from the bottom of junction box. All conduits shall include End Bells on all open ends. Conduit intended for future use or as being spare shall be provided with a 6mm polypropylene fish line rope.

Marking tape shall be used to identify the location of all conduits. The location marking tape shall be placed horizontally along the centre of the conduit at a depth half the distance between the conduit and finished grade.

Conduit specified in contract documents as installed by directional bore method will be high density polyethylene (HDPE).

Payment for this item will be for all labour, material and equipment required to install the conduit, sweeps and appurtenances. **Measurement for payment will be by the meter of horizontal length plus one and a half meters (1.5m) for each riser section in the junction boxes and two and a half meters (2.5m) at signal poles and controller cabinet for the sweep riser sections.**

TS5 - Cable

The provisions of OPSS 604, OPSS 620 and the NRTSS apply except as amended or extended herein.

The Contractor shall utilize a Certificate of Qualification 309A Electrician to install/ draw cable in conduit as described in the Ontario Regulation 275/11; Scope of Practice – Trades In The Construction Sector.

All cable connections, splices and terminations shall be made by the Niagara Region's traffic signal personnel.

Traffic signal cable, supplied by the Niagara Region, must be used. The Niagara Region uses 25-conductor signal cable designed specifically for Regional Niagara's use. Signal cable runs must be continuous between poles. Signal cable splices must only be made at pole handholes. No signal cable splices are permitted below ground. Sufficient length (1.5m) of free cable must be left in pole handholes or junction boxes to allow a proper connection to be made with cable coming from signal and/or pedestrian heads.

Two ducts will be used for the traffic signal system, one for low voltage cable and the other for extra low voltage cable.

The Contractor must identify all cable as group 1 or 2 and upstream or downstream in accordance with Appendix D of the Traffic Signal Standards manual.

The Contractor shall inspect the cables prior to installation. The Contractor will pull the appropriate cables required to construct the traffic signal plant according to the traffic signal drawing. Any changes made to the signal plant at the time of layout approval that require cable location modification to different conduit will be updated by the Contractor at no additional cost.

Cable connecting to the controller will be protected by the cabinet base installed by the Contractor as part of the cable item.

Measurement for payment of cable items will be made by plan quantity at the contract item price for cable supplied by Niagara Region.

TS6 - Junction Boxes

The provisions of OPSS 602 (Junction Box referred to as Handhole) and NRS 2020 apply except as extended or amended herein. The installation work also includes junction boxes, large and

small (if necessary) of concrete polymer material, couplings, sweep bends, and wiring as shown in the wiring drawings and construction drawings. Junction boxes must be placed on bricks at each corner with 150mm of clear stone as shown in NRS 2020. Alterations or cuts into the sides of the junction box are not permitted.

Existing junction boxes may be adjusted by Contractor to match new sidewalk and curb elevations.

The location of junction boxes must be confirmed by the Niagara Region's inspector prior to placement.

TS7 - Sectional Steel Poles

The provisions of OPSS 615 apply except as extended or amended herein.

The following outlines the specifications that must be satisfied when installing traffic signal poles at a Niagara Region traffic signal installation.

Traffic signal poles, supplied by the Niagara Region, must be used. The height and location of each traffic signal pole must be as outlined in the contract drawings unless otherwise directed by the Niagara Region's traffic signal inspector. Heavy wall poles must be used to support arms greater than 5.5m. Where traffic signal poles are perforated for cables or cut for any reason, they must be treated with a zinc black rich compound and fitted with rubber grommets. Traffic signal poles must be installed as per the manufacturer's specifications. Pole sections must be fastened to each section using zinc coated ¼" x 1¼" self-tapping screws. Traffic signal poles should be installed in such a manner that the hand holes are facing away from the direction of traffic unless otherwise noted or directed in the field. Pole plates (mast arm brackets) should be installed at the location where pole sections overlap unless otherwise directed in the field.

Payment at the contract price for the above tender items shall be full compensation for all labour, equipment and materials required to do the work as described above.

TS8 - Signal Mast Arms

The provisions of OPSS 620 apply except as extended or amended herein. The following outlines the specification that must be satisfied when installing traffic signal arms for the Niagara Region.

Traffic signal arms, supplied by the Niagara Region, must be used. The length of each traffic signal arm required to place the traffic signal heads in the drawing location will be measured by the Contractor and approved by the Niagara Region. Traffic signal arms must be installed as per the manufacturer's specifications. Pole plate brackets must be fastened to traffic signal poles using two zinc coated self-tapping screws.

Payment at the contract price for the above tender items shall be full compensation for all labour, equipment and material required to do the work as described above.

TS9 - Vehicle Detection Loops

This item will include all labour, material (wire, sealing compound and flexible duct for under curb) and equipment to construct the vehicle detection loops as per OPSS 620, NRS 2520 and NRTSS. Loops shall be located 0.6 metres from the edge of lane being serviced and will be a maximum of 2.4 metres wide. The location of the loop must be confirmed by the Niagara Region's inspector. Inductive loop feeds crossing barrier curb must be installed in flexible 19mm conduit below the curb as shown in NRS 2520. Where inductive loops are used, loop feeders must be tagged and terminated at the controller cabinet. Loop leads must include 2.0 metres of slack coil at the base of the controller cabinet and at the junction box feeding the pavement loop cable. Loops will be duplex or simplex as specified in the contract documents and shall be constructed in upper most lift of base asphalt prior to the placement of the top surface. Measurement for payment will be per loop as specified in the Schedule of Quantities.

TS10 - Intersection Lighting Luminaies

The provisions of OPSS 617, NRS 2130 apply except as amended or extended herein. Intersection illumination will be part of the traffic signal system and connected at the traffic signals power pole. Luminaires will be placed as per the contract drawings and confirmed by the Niagara Region's Manager of Traffic Operations. This item will include the installation of the luminaire bracket and arm.

Payment for this item will include all labour to construct luminaire bracket and arm, and will be made at the contract price in the Schedule of Quantities. Payment for cable from the power supply to the pole handhole and the pole handhole to the lamp will be made at plan quantity under the specific cable items.

TS11 - Ground Wire and Ground Rods

Grounding wire and grounding rods shall be constructed as per OPSS 609 except as amended or extended herein.

The Contractor shall inspect the grounding cables, bonding jumpers, ground electrodes and connection components prior to and during installation to ensure that they meet the requirements of the contract. All poles will be grounded to a ground rod in the closest available junction box with connection hardware supplied by the Niagara Region. Two (2) ground rods shall be installed at the power supply pole a minimum of 3m apart.

Payment at the contract price for each rod shall be full compensation for all labour, equipment required to do the work as described above.

TS12 - Interconnect Duct

The provisions of OPSS.MUNI 603 and the Niagara Regional Standards (NRS) and Niagara Region Traffic Signal Standards apply except as amended or extended herein.

Interconnect duct to be 50mm PVC Sceptre-type conduit constructed 0.75m to 1.0m below finished grade. Junction boxes (Concrete Polymer 300mm x 300mm) to be spaced no more than

300m apart and whenever a road crossing is present or as directed by the Niagara Region. Dedicated conduit for interconnect shall be connected from one signal plant to another signal plant to allow for the placement of future fibre optic cable.

All ducts shall be provided with interconnect cable (supplied by Niagara Region) as specified in the Schedule of Quantities. Ducts for future use must be provided with 6mm polypropylene fishline rope.

Marking tape shall be installed along the centreline of the trench half the distance between the conduit and finished grade for duct protection.

Reinstatement of open cut tranches or daylight pits for trenchless installations shall be to existing condition and be included in the unit price for this item.

Measurement for payment will be based on the number of metres of conduit placed as measured in the field and shall be full compensation of all equipment, labour and materials required to do the work.

TS13 - Removal of Traffic Signal Equipment

The provisions of OPSS 610 apply except as extended or amended herein.

All luminaires, signal heads, internally illuminated signs, flashers, poles, arms, junction boxes, cable and cabinets identified for removal shall be salvage and transported to the Niagara Region's Public Works Service Centre. The Contractor must contact the Niagara Region at the below telephone number and make arrangements for delivery of salvaged materials.

Transportation Services
Traffic Operations
Public Works Service Centre
3547 Thorold Townline Road
Thorold, Ontario
Telephone: 905-980-6000, extension 2204
The store hours are from 8:00 a.m. to 2:00 p.m., Monday to Friday

All other excess materials, such as, Portland cement, concrete (including pole bases), natural wood, masonry, fabricated metal and plastic products, shall be managed as non-hazardous solid industrial or commercial waste, as specified in OPSS 180.

Payment for traffic signal removals will be at the contract price as outlined in the Schedule of Tender Unit Prices and shall include all equipment and labour to remove, salvage and transport to regional site, or dispose of at an approved site. No additional payment will be made for hazardous material disposal.

SSP52 RETAINING WALL STRUCTURES

52-1. Protection Systems

The provisions of OPSS 539 apply except as amended or extended herein. The work under this item shall include the design and installation of excavation and roadway protection measures for the construction of the new retaining wall structure.

The Contractor shall determine the extent and nature of the protection system.

The Contractor shall make allowance for designing, installing, construction, maintaining, removing and disposing of protection systems that do not exceed the vibration threshold levels to the existing structures as detailed in the Foundation Report.

Portions of the protection systems, 1.2m below finished grade may be left in place, if approved by the Contract Administrator.

All Earth Excavation necessary for installation of the protection systems will be incidental to this work. All Earth Excavations for Structures within the limits of the protection systems shall be in accordance with SSP52-2.

The Contractor shall submit shop drawings, schedules and other details of the protection systems to the Contract Administrator a minimum of four (4) weeks prior to commencement of work.

Permission to proceed with the above will be provided if the Contract Administrator determines that the Contractor's submission meets the requirements of the Contract. Whenever the proposals with which the Contractor was permitted to proceed with the work are found by the Contract Administrator to be ineffective, changes shall immediately be made.

The Contractor will be allowed to invoice seventy-five-per-cent (75%) of the lump sum price once the protection system is constructed and all protection measures are in place. The remaining balance will be paid once the protection system has been dismantled and all protection measures are no longer required.

52-2. Earth Excavation for Structure

The provisions of OPSS 902 apply except as amended or extended herein. The work of this item shall include excavation to permit construction of the following:

- Footing for the retaining wall;
- Curb on top of existing culvert

All as shown on the Contract Drawings.

No new granular material shall be placed on the sub-grade until the sub-grade has been checked and approved by the Geotechnical Engineer and Contract Administrator. The Contractor shall ensure that the excavations are kept dry and make the necessary arrangements for installing pumps and discharge points, if necessary.

Measurement of the excavation shall be based on the neat horizontal dimensions of the footing to the depth of the bottom of the footing, working slab, or granular pad.

Payment at the lump sum Contract price for this item shall be full compensation for all labour, equipment, and material necessary to complete the work. Excavation performed outside of the neat lines as shown on the Contract Drawings will not be paid as extra to the Contract. Subexcavation due to unsuitable soils shall only proceed at the Contract Administrator's acceptance and shall be paid under the provisional item of Subexcavation (Item 10.22).

52-3. Dewatering Structure Excavations

The provisions of OPSS 902 and OPSS 518 apply except as amended or extended herein. The work of this item shall include:

- Design and submission of shop drawing and a dewatering plan for excavation dewatering and the management and control of water from dewatering operations. Submissions shall be stamped by a Professional Engineer licensed in the province of Ontario

- Supply of all materials, equipment and labour required to construct, maintain and dismantle dewatering installations and water management installations for the dewatering of excavated areas.

The Contractor shall refer to the Foundation Report, with specific reference to groundwater levels, including acceptable methods of lowering the shallow groundwater level in accordance with the Foundation Report.

The Contractor shall submit shop drawings, schedules and other details of the dewatering systems to the Contract Administrator a minimum of four (4) weeks prior to the date that permission is requested to proceed with this work.

Permission to proceed with the above will be provided if the Contract Administrator determines that the Contractor's submission meets the requirements of the Contract. Whenever the proposals with which the Contractor was permitted to proceed with the work are found by the Contract Administrator to be ineffective, changes shall immediately be made.

Payment at the Contract Price shall include removal and disposal of all groundwater volumes where this is required for the duration of the groundwater lowering activities. The Contractor will be allowed to invoice fifty-per-cent of the lump sum Contract price once the Dewatering systems are constructed and all protection measures are in place. The remaining balance will be paid once the Dewatering systems have been dismantled and all Dewatering measures are no longer required.

52-4. Granular Bedding

The granular bedding will be installed after excavation of the retaining wall footing and prior to footing installation.

The provisions of OPSS 1010, apply except as amended or extended herein. The work of this item shall include:

- Supply, placement, and compaction of granular bedding.

All as shown on the Contract Drawings.

The granular bedding shall be either Granular A or Granular B Type II (crushed bedrock) and meet gradation requirements of OPSS 1002 (Aggregates – Concrete) compacted to 100% SPMDD.

Payment at the unit Contract price for this item shall be full compensation for all labour, equipment, and material necessary to complete the work.

52-5. Backfill to Structure

The provisions of OPSS 902 and OPSS 314 apply except as amended or extended herein. The work of this item shall include supply, placement, and compaction of the following:

- Granular 'B' Type II for the backfill of the retaining wall.

All as shown on the Contract Drawings.

Backfill to structure shall include all backfill required to reinstate the original ground.

Payment at the lump sum Contract price for this item shall be full compensation for all labour, equipment, and material necessary to complete the work.

52-6. Site Grading

The provisions of OPSS 902 apply except as amended or extended herein. The work of this item shall include:

- Supply, placement and compaction of select native material in front of the retaining wall

The Contractor shall provide additional backfill to ensure all footings have a 300 mm layer of coverage where the original ground level does not meet this coverage. All backfill shall then be graded at slopes no steeper than 2H:1V to match the original grade.

Measurement for payment will based upon the measured difference in volume of sections taken before construction and after construction based upon surveys of the grades within the area of work, with a deduction in volume for all new structures within the surveyed area.

Payment at the lump sum Contract price for this item shall be full compensation for all labour, equipment, and material necessary to complete the work.

52-7. Concrete - General

This Special Provision pertains to the items in which the Contractor shall form, supply, place, cure and finish concrete for the mass concrete, and retaining walls and footings.

The provisions of OPSS.MUNI 904, OPSS 919, and OPSS.MUNI 1350 apply except as amended or extended herein.

FORMWORK

Formwork and falsework shall be in accordance with OPSS 919. Installation of fabricated inserts required for the incorporation of other elements such as preset anchorages for posts, etc., shall be included in the bid price.

All dust and loose particles shall be removed from inside the forms using compressed air just prior to placing of concrete. No standing water shall be permitted in the formwork.

Concrete shall not be placed until all reinforcement and formwork is in place and has been inspected and approved by the Contract Administrator. Access for such inspection shall be provided by the Contractor.

The Contractor shall remove and dispose of off site, all formwork at the completion of the work.

CONSTRUCTION JOINTS

Construction joints other than those shown on the Contract Drawings or approved by the Contract Administrator in writing are not permitted.

Construction joints shall be as per OPSS.MUNI 904, and the following:

- Joints shall be neat and properly formed and well bonded
- The exposed face of the concrete at construction joints shall be formed and prepared as shown on the Contract Drawings, a 20 mm vee groove shall be formed that is straight and true to line and grade.
- All joint faces shall be cleaned prior to placing concrete or cement paste so that all dirt, grease, dust or debris is removed. An excessively rough concrete surface shall not be permitted.
- The surface film laitance and mortar shall be completely removed from the joint face of the hardened concrete to present a clear, sound concrete face that has the aggregate particles exposed.
- After completion of the above preparation, the joint face of the hardened concrete shall be thoroughly wetted (freestanding water will not be permitted) and covered with a 1 mm thick brush coating of neat cement paste (1 part cement, 1 part sand and water) immediately before placing fresh concrete.

If directed by the Contract Administrator, reinforcing steel shall be cleaned prior to placing of the concrete. Steel shall be cleaned using "low free silica" sand for sandblasting. All rust shall be removed from reinforcing steel to expose bare metal. No additional payment will be made for this cleaning.

MIX CRITERIA

The Contractor shall be responsible for the concrete mix design. The Contractor shall supply the Contract Administrator, a minimum of eight (8) weeks before the first use of the mix, with details of the proposed mix, test results of trial batches of the proposed mix, and bagged samples of the mix constituents for testing and acceptance by the Contract Administrator. No concrete shall be placed until the proposed mix has been proven by test results and written authorization to proceed has been issued by the Contract Administrator.

The mix criteria shall be amended as follows:

Type of Cement	Type GU
28 day Compressive Strength as per CSA A23.1	30 MPa
Water/Cement Ratio	0.40 maximum
Max. Nominal Size of Coarse Aggregate	19 mm
Air Content (measured at end of pump)	6-8%
Air Void System	See requirements below.

Actual cementitious content proposed by the supplier shall be that which produces a concrete meeting all specification requirements. It is intended that slag cement shall be included in order to meet these requirements.

Testing of the concrete for the above criteria shall be as per OPSS.MUNI 904 and CSA A23.1.

This item includes all concrete additives required to provide sufficient plasticity for the Contractor's proposed method, sequence and rate of concrete placement for the particular part of the structure to be placed.

Contractors should note that the site transportation and placing of high workability mixes, particularly when pumps are used, can degrade the air void system of the concrete. Contractors should ensure that the potential effects of the site transportation and placing system proposed by them is taken into account by them and their concrete supplier when designing mixes for this project.

One redose of superplasticizer is allowed. The concrete shall not segregate after addition of the superplasticizer.

AIR VOID SYSTEM PARAMETERS OF HARDENED CONCRETE

The air void system parameters shall be in accordance with OPSS.MUNI 1350. The Contractor shall achieve an air void system in the hardened concrete with the following parameters:

- Minimum 3% air content
- Average spacing factor of no more than 230 μm maximum with no individual test result greater than 260 μm.

The air void system in the hardened concrete shall be performed on cast cylinder specimens. Concrete samples shall be taken periodically during placement from the end of pump to be used for the cylinder specimens.

Air void analysis results obtained by the Contractor shall be forwarded to the Contract Administrator within 30 days of the casting of cylinders. Air void cylinders shall be retained by the Contractor for a period of one year from the date of testing and shall be provided to the Contract Administrator on request.

Acceptability of air void system parameters shall be based on individual cylinder results for air content, and on the average result from each pair of cylinders for spacing factor. Concrete which fails to meet the requirements for air void system parameters listed above will be considered unacceptable. Concrete which is unacceptable shall be removed and replaced at the Contractor's expense; the Contractor may elect to submit a proposal for remedial action to the Contract Administrator.

CURING

Curing shall be in the form of wet burlap applied as soon as possible. The Contractor shall make the necessary precautions to avoid rapid evaporation in the concrete.

Burlap shall be presoaked by immersing in water for a period of 24 hours prior to placing. The burlap shall be located within easy reach of the concreting operation so that it may be promptly applied at all times. Two layers of burlap shall be applied to the complete surface of the concrete. Strips shall be overlapped 150 mm and shall be held down without marring the surface of the concrete.

The burlap shall be maintained in a continuously wet condition throughout the seven (7) day curing period.

The burlap shall be covered with a layer of white plastic moisture vapour barrier in a manner which will prevent deformation of the surface concrete. In no case shall the moisture vapour barrier be placed later than six (6) hours following the placement of the concrete.

COLD WEATHER

Cold weather concrete shall be in accordance with OPSS.MUNI 904. The Contractor shall allow for completing the work in winter conditions. No additional payment will be made for cold weather concrete operations. All concrete in the structure must be kept above 10°C for a minimum of seven days following placing. The use of protective housing and heating equipment of sufficient capacity to establish and maintain the specified curing conditions shall be used throughout the curing period.

The Contractor shall supply and install a minimum of two thermal couple wires per concrete pour or location or as otherwise directed by the Contract Administrator. The Contractor shall ensure that the ends of the thermal couple wires are accessible by the Contract Administrator. Temporary platforms and/or scaffolding may be required to ensure access.

OPERATIONAL CONSTRAINTS

The time of batching shall be stamped by mechanical means on the material delivery ticket.

The volume of concrete delivered by any truck mixer shall be 1 m^3 less than the mixing capacity of the truck mixer.

The temperature of the concrete at the time of discharge from the ready mix truck shall be 25 degrees C or less.

Note that the site is particularly prone to the conditions which cause plastic shrinkage cracking. The Contractor shall present a plan to the Contract Administrator within four weeks of award as to how he will deal with this potential problem if ambient conditions on the day of a pour are such that plastic shrinkage cracking may occur. CSA A23.1 clause 21.2.2.3 and Appendix D provide some guidance. The Contractor is advised to strongly consider the use of night pours, windshields, and shading.

The air temperature shall be below 30 degrees C at the start of the pour and shall not be expected to rise to above 30 degrees C during the pour. The Contractor shall be cognizant of the weather conditions and shall note that excessive wind and/or heat can seriously affect the workability and finishability of the concrete as well as cause severe plastic shrinkage cracking. CSA A23.1 clause 21.2.2.3 and Appendix D provide guidance to the Contractor in this matter.

CONCRETE ON-SITE TESTING AND SAMPLING

The Contractor shall be responsible for arranging and carrying out all on-site testing and sampling of concrete. Cylinders shall be delivered by the Contractor to an approved laboratory as directed by the Contract Administrator. The selected laboratory will be located within 50 km of the site. All laboratory costs will be borne by the Contract Administrator. Testing and sampling shall be done in accordance with OPSS.MUNI 904, modified as follows:

Concrete Field Testing Technicians

Field testing and sampling of concrete shall be done by a person certified as a concrete field testing technician by the Canadian Standards Association (CSA), or by the American Concrete Institute (ACI). This person shall:

1. Have successfully completed, as part of the certification requirements, written and practical examinations within the last five years verifying his/her competence to carry out field testing of concrete (slump, air content, temperature and casting of cylinders), and

2. Have in his/her possession, at all time field testing is to be performed, a card issued by the certifying agency verifying the currency of the individual's certification.

MEASUREMENT FOR PAYMENT

The payment of these items will include all labour, material and equipment necessary to complete the work as described in this specification.

Formwork and falsework will not be measured for payment.

Upon satisfactory placing of the concrete, payment will be made at 80% of the total bid price. The remaining 20% will be made when curing and finishing have been carried out in accordance with this specification.

52-8. Mass Concrete (for working slabs)

The provisions of OPSS.MUNI 904 and Concrete - General (SSP52-7) apply except as amended or extended herein. The work of this item shall include:

- Supply and placement of 15 MPa (strength at 28 days) mass concrete for working slabs.

All as shown on the Contract Drawings.

No concrete shall be placed on the sub-grade until the sub-grade has been checked and approved by the Geotechnical Engineer and Contract Administrator. The Contractor shall ensure that the excavations are kept dry and make the necessary arrangements for installing pumps and discharge points, if necessary.

Payment at the lump sum Contract price shall be payment in full for all labour, equipment, and materials necessary to complete the work.

52-9. Concrete in Retaining Walls

The provisions of OPSS.MUNI 904 apply except as amended or extended herein. The work of this item shall include:

- Supply and placement of concrete in the retaining wall footings.
- Supply and placement of concrete in the retaining walls.

All as shown on the Contract Drawings.

The cement in the mix for the retaining wall footings shall be Type MS cement, but may be waived and Type GU cement used provided 30% of cement content is replaced with slag cement per CSA A23.1, Tables 6 and 7.

Payment at the lump sum Contract price shall be payment in full for all labour, equipment, and materials necessary to complete the work.

52-10. Pedestrian Railing

The provisions of OPSS 908 apply except as amended or extended herein. The work of this item

shall include:

- Supply and fabrication of hot-dipped galvanized anchorage inserts.
- Supply, fabrication, and installation of aluminum railing, including all finishes.

All as shown on the Contract Drawings.

Payment will be made at the lump sum Contract price and shall be full compensation for all labour, equipment, materials, and tools necessary to complete the work.

52-11. Reinforcing Steel Bar

The provisions of OPSS 905 apply except as amended or extended herein. The work under this item shall include supply and installation of reinforcing steel in the following locations:

- Retaining Walls and Footings

All as shown on the Contract Drawings.

Reinforcing steel shall be grade 400W. The material shall be supplied by a company on the Ministry of Transportation of Ontario's Designated Sources List, shall comply with OPSS 905 and shall be in conformance with the requirements shown on the contract drawings.

Reinforcing steel shall be installed in accordance with OPSS 905. No epoxy-coated steel shall be used in this contract.

For the placing of reinforcing steel in the deck 905.07.02.03, Placing, is amended by the addition of the following: The reinforcing steel shall be placed for the entire structure before any concrete is placed.

The Contractor shall prepare detailed bar schedules (lists) and placing drawings that clearly indicate the intended locations and details of splices and shall be in conformance with the requirements shown on the contract drawings. Shop drawings for the reinforcing steel shall be submitted to the Contract Administrator for review at least two (2) weeks prior to fabrication. Reinforcing steel chairs shall be used as required by the Contract Administrator.

Payment at the lump sum Contract price for this item shall be full compensation for all labour, equipment, and material necessary to complete the work.

52-12. Dowels into Concrete

The provisions of CDED Special Provision 999F29 apply except as amended or extended herein. The work under this item shall include the drilling, epoxy grouting, and placing of stainless steel dowels into the concrete at the following locations:

- Over the culvert for the installation of the parapet wall.

The epoxy grout shall be as per MTO DSM # 9.10.25.

All as shown on the Contract Drawings.

Payment at the lump sum Contract price for this item shall be full compensation for all labour, equipment, and material necessary to complete the work.

52-13. Subexcavation (Provisional)

The work of this item shall include:

- Additional subexcavation below the required depth of structure on account of the presence of unacceptable materials as determined and agreed to by the Contract Administrator.

Payment at the unit Contract price for this item shall be full compensation for all labour, equipment and material necessary to complete the work.

SCHEDULE OF DRAWINGS

(Refer to Contract Drawing Package)

STANDARD DRAWINGS

(Refer to Niagara Peninsula Standard Contract Document)

SUPPLEMENTARY GENERAL CONDITIONS OF CONTRACT

(Refer to Niagara Peninsula Standard Contract Documents)

OPS GENERAL CONDITIONS OF CONTRACT

(Refer to Niagara Peninsula Standard Contract Documents)

APPENDIX

APPENDIX A

GEOTECHNICAL INVESTIGATION

Soil-Mat Engineers & Consultants Ltd.

October 12, 2016; October 18, 2017

SOIL-MAT ENGINEERS & CONSULTANTS LTD.

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PROJECT NO.: SM 166764-G

October 12, 2016

PARSONS
4342 Queen Street – Unit 407
Niagara Falls, Ontario
L2E 7J7

Attention: Noris Bot, P.Eng.
Senior Project Manager – Road and Highway Division

GEOTECHNICAL INVESTIGATION
PROPOSED ROADWAY RECONSTRUCTION
MONTROSE ROAD
NIAGARA FALLS, ONTARIO

Dear Mr. Bot,

Further to your authorisation, SOIL-MAT ENGINEERS & CONSULTANTS LTD. has completed the fieldwork, laboratory testing, and report preparation in connection with the above noted project. The investigation and reporting were undertaken in general accordance with our proposal P6039, dated January 22, 2016. Our comments and recommendations, based on our findings at the fourteen borehole locations are presented herein.

1. INTRODUCTION

We understand that the project will involve the urbanization of the existing asphalt paved roadway on Montrose Road between McLeod Road and Charnwood Avenue in Niagara Falls, Ontario. This will involve widening of the existing roadway, reconstruction of the existing asphalt pavement, possible reconstruction of sewers and watermains, and possible reconstruction of the existing culvert crossing just north of McLeod Road. The purpose of this geotechnical investigation work was to assess the existing pavement structure and subsurface soil conditions, and to provide our comments and recommendations with respect to the proposed roadway reconstruction and related earthworks, from a geotechnical point of view. This report is based on the above summarised project description and on the assumption that the design and construction will be performed in accordance with applicable codes and standards. Any significant deviations from the proposed project may void the recommendations given in this report.

2. PROCEDURE

A total of eleven [11] boreholes were advanced at the locations illustrated in the attached Drawing No. 1, Borehole Location Plan. At each of the six locations, a second shallow borehole was advanced through the road shoulder. The borings were advanced using solid stem continuous flight auger equipment on July 26, 2016 under the direction and supervision of a staff member of SOIL-MAT ENGINEERS & CONSULTANTS LTD. The boreholes were advanced using truck-mounted drill equipment to termination at depths of between approximately 0.5 and 5.0 metres below the existing pavement surface. It is noted that due to the presence of underground utilities, overhead clearance, and restrictions associated with lane closures close to an intersection, SOIL-MAT was unable to advance a borehole near the existing culvert north of McLeod Road. Upon completion of drilling the boreholes were backfilled in general accordance with Ontario Regulation 903 and the pavement surface reinstated with a pre-mixed asphaltic concrete product.

Representative samples of the subsoils were recovered from the borings at selected depth intervals using split barrel sampling equipment driven in accordance with the requirements of the ASTM test specification D1586, Standard Penetration Resistance Testing. After undergoing a general field examination, the soil samples were preserved and transported to the SOIL-MAT laboratory for visual, tactile, and olfactory classifications. Routine moisture content tests were performed on all soil samples recovered from the borings.

In addition, six [6] representative samples of the subsurface soil recovered from the boreholes were submitted to AGAT Laboratories, an independent Canadian accredited analytical laboratory, for background environmental testing consisting of a standard panel of metal and inorganic parameters. Two [2] samples from Borehole No. 4were submitted for testing for the presence of petroleum hydrocarbons ['PHC'], based on olfactory evidence noted during the fieldwork.

The boreholes were located in the field by representatives of SOIL-MAT ENGINEERS. The ground surface elevation at each borehole location has been referenced to the existing roadway surface.

Details of the conditions encountered in the boreholes, together with the results of the field and laboratory tests, are presented in the attached Borehole Log Nos. 1 through 6, inclusive, and the following paragraphs of this report. It is noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design and therefore should not be construed as the exact planes of geological change.

3. SITE DESCRIPTION AND SUBSURFACE CONDITIONS

The project area consists of the section of Montrose Road between McLeod Road and Charnwood Avenue in Niagara Falls, Ontario. The roadway is an asphalt paved rural cross section with gravelled shoulders and side ditches, surrounded by some low-density residential lands as well as commercial properties. The pavement structure was noted to be in relatively fair to poor condition, exhibiting frequent longitudinal and lateral cracking, occasional alligator cracking, as well as a significant amount of crack sealing and repair patches.

The subsurface conditions encountered at the borehole locations are summarised as follows:

Pavement Structure

Borehole Nos. 1 to 6 were advanced through the pavement structure of the existing roadway. The pavement structure encountered at each borehole location has been summarised as follows:

The pavement structure at the borehole locations has summarised in the following Table No. 1:

Borehole No.	1	2	3	4	5	6
Asphaltic Concrete (mm)	150	175	175	225	175	175
Granular Base (mm)	250	300	300	300	350	500

Sand and Gravel Fill

At each borehole location a second shallower borehole was advanced through the shoulder, with the exception of Borehole No. 1, due to restrictions with utility locates. These are noted as Borehole Nos. 2S to 6S. The surficial sand and gravel fill material encountered at the surface of the shallower boreholes advanced through the shoulder have been summarised in the following table. It is noted that due to the presence of existing unlocatable underground utilities, the depth of these boreholes were limited.

Borehole No.	2S	3S	4S	5S	6S
Granular Material (mm)	>600	500	650	650	575

Clayey Silt/Sandy Silt Fill

Clayey silt/sandy silt fill was encountered beneath the pavement structure and/or surficial sand and gravel fill material in Borehole Nos. 1, 4, 4S, 5, 5S, and 6. The clayey silt/sandy silt fill material contained trace to some gravel, occasional organic inclusions, and occasional construction debris. The fill material encountered was generally soft to stiff in consistency, and was proven to depths of up to approximately 1.5 to 3.8 metres beneath the existing ground surface.

Clayey Silt/Sandy Silt

Native clayey silt/sandy silt was encountered beneath the pavement structure and/or fill material at all borehole locations with the exception of Borehole Nos. 2S, 4S, 5S, which were terminated in the upper fill. The native soil encountered was reddish brown in colour, contained traces of gravel, and was generally firm to very stiff in consistency. The native clayey silt/sandy silt was proven to termination where encountered.

Groundwater Observations

All of the boreholes were recorded as 'dry' upon completion of drilling, with the exception of Borehole Nos. 3 and 4, which were recorded as 'wet' at depths of approximately 4.3 metres beneath the existing ground surface. It is noted that insufficient time would have passed for the static groundwater level to stabilise in the open boreholes during drilling. In fine grained to cohesive soils such as the clayey silt/sandy silt encountered, the static groundwater level generally coincides with the transition in colour from brown to grey. As such, based on our experience in the area and observations during drilling, the static groundwater level is estimated at depths of between approximately 4 and 5 metres, below the anticipated depths of construction.

4. EXCAVATIONS

Excavations for the potential reconstruction of sewers and watermains are expected to extend to depths of up to about 2 to 4 metres below the existing road surface. Excavations to depths above the static groundwater level are anticipated to be relatively straightforward. The sides of excavations in the clayey silt / sandy silt soils are expected to remain stable for the short construction period at 45 degrees to the horizontal, or steeper. Where excavations extend near to below the static groundwater elevation, where wet seams are encountered, or due to surface runoff, the sides of excavations in the granular soils may have a tendency to "slough in" to slopes as flat as 3 horizontal to 1 vertical, or flatter. Notwithstanding the above, all excavations must comply with the

current Occupational Health and Safety Act and Regulations for Construction Projects. Excavation slopes steeper than those required in the Safety Act must be supported or a trench box must be provided, and a senior geotechnical engineer from this office should supervise the work.

As noted above the static groundwater level is anticipated to be at a depth of approximately 4 to 5 metres, likely near or below the depths of construction. Some infiltration of groundwater through more permeable seams and from surface runoff should be anticipated. the rate of infiltration within the overburden soils should be relatively slow, even for excavations extending to or a short distance below the estimated groundwater level, such that it should be possible to adequately control groundwater in the short term using convention construction dewatering methods, pumping from sumps in the base of excavation. Additional pumping, and possibly more sophisticated groundwater controls, may be required for deeper excavations. Where a greater rate of groundwater infiltration is encountered the contractor should be prepared to undertake works 'in the wet', possibly resulting in wider excavations, requiring additional ballast stone, etc.

The base of excavations in the existing fill and native soils are generally expected to remain firm and stable. However, in deeper excavations, or isolated areas within 'softer' fill or native deposits, some localised base instability would be anticipated. Any such base instability would be addressed by stabilisation with coarse aggregate [i.e. 50mm clear stone, 'rip-rap' stone] 'punched' into the base of excavation, the use of additional bedding material, etc. Additional sumps will also likely be required to control groundwater infiltration.

Any utility poles, light poles, etc. located within 3 metres (horizontally) of the top of an excavation slope should be braced to ensure their stability. Likewise, temporary support might be required for other existing above and below ground structures, including existing underground services, depending on their proximity to the trench excavations. Special attention must be made to ensure that the existing roadway is not undermined during excavation of the sandy soils.

5. BACKFILL CONSIDERATIONS

The majority of excavated material will consist of the clayey silt/sandy silt encountered in the boreholes as described above. These soils are generally considered suitable for use as trench backfill, provided that they are free of organic or otherwise deleterious materials, and the moisture content can be controlled to within about 3 to 4 percent of optimum. Some selective sorting of portions of the existing fill materials may be

necessary. Proper handling of the soils based on the material's moisture content and prevailing weather conditions during construction will be important in achieving a successful compaction operation. The clayey silt/sandy silt soils are generally considered to be near to slightly 'wet' of the standard Proctor optimum moisture content. Some moisture conditioning may be required depending upon weather conditions at the time of construction.

The clayey silt/sandy silt soils encountered are sensitive to moisture absorption, and will become difficult to compact when they become wet due to weather or proximity to the groundwater level. Any 'wet' soils should be spread out and allowed to air dry until suitable for compaction. Where the fill materials are 'wet' of optimum, they will become increasingly difficult to compact, with the material becoming more unstable with continued vibration from compaction efforts. The contractor should be prepared to undertake remedial measures in the event of such conditions, such as allowing material to air dry, stabilisation with the placement of coarse crushed stone material ['rip-rap', 50-millimetre clear stone, OPSS Granular 'B', Type II, etc.], limited use of vibration, thinner lifts, etc. The need for such remedial measures will be generally less in the dry summer months, and greater in the wet spring and fall months of the year.

We note that where backfill material is placed near or slightly above its optimum moisture content, the potential for long-term settlements due to the ingress of groundwater and collapse of the fill structure is reduced. It is therefore very important that the placement moisture content of the backfill soils be within 3 per cent of its standard Proctor optimum moisture content during placement and compaction to minimise long term subsidence [settlement] of the fill mass. Any imported fill required in service trenches or to raise the subgrade elevation should have its moisture content within 3 per cent of its optimum moisture content and meet the necessary environmental guidelines.

The backfilling and compaction operations should be monitored by a representative of SOIL-MAT to confirm uniform compaction of the backfill material to project specification requirements. We recommend that the lower layers of service trench backfill should be compacted to a minimum of 95 per cent of the material's standard Proctor maximum dry density [SPMDD], and the upper one metre of backfill compacted to 100 per cent of its SPMDD. The backfill should be placed in loose lifts not exceeding 300 millimetres, and should be compacted with the heaviest possible equipment that will not damage the pipe installation. The appropriate compaction equipment should be employed based on soil type, i.e. pad-toe for cohesive soils and smooth drum/vibratory plate for granular soils. Close supervision is prudent in areas that are not readily accessible to compaction equipment, for instance near the end of compaction 'runs', and around manholes. A

method should be developed to assess compaction efficiency employing the on-site compaction equipment and backfill materials during construction.

6. MANHOLES, CATCH BASINS AND THRUST BLOCKS

In the event that the manholes, catchbasins, valve chambers, etc. are founded on the native clayey silt or suitably engineered fill, stabilised where required, the bearing surfaces will be practically non-yielding under the anticipated loads. Where such below grade structures are to be supported in fill soils the need for additional base stabilisation measures should be anticipated. In addition, the pavement surfaces may rise around precast structures under frost action. To alleviate the potential for these types of differential movements, free-draining, non-frost susceptible material should be employed as backfill around the structures located within the paved roadway limits, and compacted to 100 per cent of its SPMDD.

The thrust blocks in the clayey silt/sandy silt may be conservatively sized as recommended by the applicable Ontario Provincial Standard Specification using a horizontal allowable bearing pressure of 150 kPa [~3,000 psf]. Any backfill required behind the blocks should be granular and should be compacted to 100 per cent of its standard Proctor maximum dry density.

7. CULVERT DESIGN CONSIDERATIONS

As noted above it is anticipated that the existing culvert crossing just north of McLeod Road may be reconstructed as part of the project. It was not feasible, based on road access permit with municipal staff not allowing for lane closure close to the intersection, to advance a borehole close to the culvert location.

The existing culvert structure is a concrete box section. It is anticipated that the reconstruction would involve a similar section, or perhaps a simple extension of the existing structure to accommodate road widening. It is recommended that the new box culvert sections may be designed on the basis of conservative bearing pressures of 100 kPa [~2,000 psf] SLS and 150 kPa [~3,000 psf] ULS. It is noted that it may be necessary to undertake some level of remedial measures to prepare a suitable bearing surface, depending on the presence of fill and/or 'soft' deposits. Such measures would involve removal of unsuitable material and replacement with quality crushed granular fill compacted to 100 per cent SPMDD.

8. PAVEMENT RECONSTRUCTION CONSIDERATIONS

As noted above, the existing pavement structure encountered at the borehole locations was found to consist of approximately 150 to 225 millimetres of asphaltic concrete overlying 250 to 550 millimetres of compact granular base. Given the relatively poor condition of the existing roadway, a full depth reconstruction is recommended as the preferred approach to achieve the longest lifespan and least maintenance requirements. A partial depth reconstruction with the provision of additional granular materials may be possible, however, it is noted that a partial depth reconstruction would have a reduced lifespan and increased maintenance costs.

PARTIAL DEPTH RECONSTRUCTION

As noted a partial depth reconstruction may be considered, however given the relatively limited thickness of the existing pavement structure this approach would require the finished grade of the roadway to be raised to accommodate the placement of additional granular base material.

Partial depth reconstruction of the pavement structure would typically consist of a 'peel and pave' method. This would involve the removal of the surficial asphalt, re-grading and compaction of the existing granular base material, and placement of additional granular material as required, then placement of new asphaltic concrete. Such a partial depth reconstruction would be expected to have a reduced lifespan and increased maintenance requirements, as noted above.

It is recommended that, after the existing asphalt layers have been removed, the existing granular base material graded and re-compacted, and evaluated via proof roll using a fully-loaded dump truck or in the presence of a representative of our office. Any areas of distress should be sub-excavated and replaced with quality granular material, compacted to 100 per cent of its standard Proctor maximum dry density.

Alternatively, the existing asphalt may be pulverised into the existing granular material in order to create a useable granular base material. It may be necessary to supplement the pulverised material with some new crushed aggregate [OPSS Granular A or B Type II] to achieve a suitable gradation and depth of granular base material. Laboratory sieve analyses would be required to assess the suitability of the pulverised/existing granular materials.

Where feasible, the existing grades should be raised as much as possible to accommodate additional granular materials and asphalt layers consistent with the pavement structure recommended below. The provision of additional depth of granular

base materials would serve to extend the lifespan of the pavement structure. The existing and any new granular base materials should be compacted to 100 per cent SPMDD. The new asphalt layers should conform to those outlined in the full depth reconstruction recommendations presented below. In the event that raising the grade via the addition of granular materials is not feasible, a full depth reconstruction may be warranted.

FULL DEPTH RECONSTRUCTION

Full depth reconstruction of the pavement structure would involve the removal of the existing asphaltic concrete mat and granular base materials to the design subgrade elevation. The existing asphaltic concrete mat could be pulverised into the existing granular base material, possibly mixed in with new imported granular fill material, to create a well-graded granular product that could be re-used on the project either as trench backfill or sub-base course material depending on the material gradation. Laboratory sieve analyses would be required to assess the suitability of the pulverised/existing granular materials. The subgrade level would then be lowered to accommodate the required depths of the new pavement structure and the exposed subgrade surface proof rolled.

The exposed subgrade should be proofrolled with 3 to 4 passes of a loaded tandem truck [over the same wheel path] in the presence of a representative of SOIL-MAT, immediately prior to the placement of the sub-base material. Any areas of distress revealed by this or other means should be sub-excavated and replaced with suitable backfill material, such as with suitable on-site granular materials or imported OPSS Granular 'B', Type II, compacted to 100 percent of standard Proctor maximum dry density. Alternatively, the soft areas may be repaired by 'punching' coarse aggregate, such as a 50 millimetre clear crushed stone, into the soft areas. The need for sub-excavation of softened subgrade materials will be reduced if construction is undertaken during the dry summer months of the year and careful attention is paid to the compaction operations.

Good drainage provisions will optimise the long-term performance of the pavement structure. The subgrade must be properly crowned and shaped to promote drainage to the subdrain system. Subdrains should be installed to intercept excess subsurface water and to prevent softening of the subgrade material. Surface water should not be allowed to pond adjacent to the outer limits of the paved areas.

The most severe loading conditions on the subgrade typically occur during the course of construction. Therefore, precautionary measures may have to be taken to ensure that the subgrade is not unduly disturbed by construction traffic. SOIL-MAT should be given

the opportunity to review the final pavement structure design and subdrain scheme prior to construction to ensure that they are consistent with the recommendations of this report.

The new pavement structure should conform to the applicable Region of Niagara section. A typical pavement structure to support cars, large trucks, emergency vehicles, etc. for a rural or local semi-urban roadway would consist of a minimum of:

HL3 asphalt surface course	40 millimetres
HL8 asphalt binder course	80 millimetres
Base course granular [OPSS Granular 'A']	150 millimetres
Sub-base course granular [OPSS Granular 'B', Type II]	350 millimetres

It is our opinion, that this design is suitable for use on the subject roadway, provided that the subgrade has been prepared as detailed above before the sub-base course material is placed. If the subgrade is soft, remedial measures as discussed above may have to be implemented and/or the sub-base thickness may have to be increased. The granular sub-base and base courses should be compacted to 100 per cent of their SPMDD, and asphaltic concrete layers should be compacted to a minimum of 92 per cent of their Marshall maximum relative density [MRD], or Region of Niagara requirements. A program of in-place density testing must be carried out to monitor that compaction requirements are being met.

The outlined full depth pavement reconstruction may be expected to have an approximate 20 to 25 year service life, assuming that regular maintenance is performed. Should a more detailed pavement structure design be required, site specific traffic information would be needed, together with detailed laboratory testing of the subgrade soils.

GENERAL ASPHALT PLACEMENT CONSIDERATIONS

To minimise segregation of the finished asphalt mat, the asphalt temperature must be maintained uniform throughout the mat during placement and compaction. All too often, significant temperature gradients exist in the delivered and placed asphalt with the cooler portions of the mat resisting compaction and presenting a honey combed surface. As the spreader moves forward, a responsible member of the paving crew should monitor the pavement surface, to ensure a smooth uniform surface. Surface segregation can be mitigated by 'back-casting' or scattering shovels of the full mix material over the segregated areas and raking out the coarse particles during compaction operations. Of course, the above assumes that the asphalt mix is sufficiently hot to allow the 'back-casting' to be performed.

ROAD WIDENING CONSIDERATIONS

Where the roadway section is to be widened the areas should be cleared of all organic or unsuitable material, and quality engineered fill placed and compacted as required to the design subgrade level. The fill placement and compaction should be consistent with the Backfill Considerations section above. The new pavement structure should be consistent with the full depth reconstruction recommendations noted above.

9. ENVIRONMENTAL RESULTS

As noted above, a total of eight [8] selected samples were submitted for background analytical testing in order to assess the background environmental characteristics of the on-site soils and provide comments with respect to handling of surplus material for off-site disposal. The soil samples were submitted to AGAT Laboratories, a Canadian accredited independent testing laboratory, for background chemical analysis. The testing program consisted of a standard panel of Metals and Inorganic parameters for six [6] of the collected samples. Field screening of the recovered soil samples yielded evidence of potential impact (i.e. staining, petroleum odour, etc.) in Borehole No. 4. As such, two [2] samples from Borehole No. 4 were submitted for testing for petroleum hydrocarbons [PHCs].

The laboratory test results received were compared to the applicable standard from the Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*, as follows:

- **Table 1**: Full Depth Background Site Condition Standards Residential/Parkland/Institutional and Industrial/Commercial/Community land use.
- **Table 2**: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for a Residential/ Parkland/ Institutional property use, [RPI], as well as for an Industrial/ Commercial/ Community [ICC] property use.
- **Table 3**: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for a Residential/ Parkland/ Institutional property use, [RPI], as well as for an Industrial/ Commercial/ Community [ICC] property use.

The results of this laboratory testing are presented in the attached AGAT Certificate of Analysis [16H124085].

Based on SOIL-MAT'S field observations and the analytical test results from AGAT, SOIL-MAT offers the following comments:

1. Samples BH1 SS2, BH2 SS1, BH3 SS2, BH4 SS1, BH5 SS2, and BH6 SS1 were found to be within the Table 1 [ALL] Standards for the tested metal and inorganic parameters with the exception of Sodium Absorption Ratio [SAR] and Electrical Conductivity [EC].
2. Samples BH1 SS2, BH2 SS1, BH3 SS2, BH4 SS1, BH5 SS2, and BH6 SS1 were found to be within the Table 2 and 3 [RPI] Standards for the tested metal and inorganic parameters with the exception of Sodium Absorption Ratio [SAR] and/or Electrical Conductivity [EC].
3. Samples BH1 SS2, BH2 SS1, BH3 SS2, BH4 SS1, and BH5 SS2 were found to be within the Table 2 and 3 [ICC] Standards for the tested metal and inorganic parameters with the exception of Sodium Absorption Ratio [SAR] and/or Electrical Conductivity [EC].
4. It is noted that the presence of elevated levels of EC and SAR is often observed in the area of municipal roadways and parking lots and is largely the result of the use of salt for winter de-icing operations. EC and SAR are essentially aesthetic parameters that do not present a hazard to human or animal life. Rather they tend to render the soil environment un-supportive of plant growth and corrosive to buried grey or cast iron pipe.
5. Samples BH4 SS3 and BH4 SS4 were found to exceed the Table 1 [ALL] Standards for multiple tested petroleum hydrocarbon parameters including Benzene, Toluene, Ethylbenzene, Xylene Mixture, F2 (C10 to C16), and F3 (C16 to C36).
6. Samples BH4 SS3 and BH4 SS4 were found to exceed the Table 2 [RPI] Standards for multiple tested petroleum hydrocarbon parameters including Ethylbenzene, Xylene Mixture, and F3 (C16 to C36).
7. Samples BH4 SS3 and BH4 SS4 were found to exceed the Table 2 [ICC] Standards for multiple tested petroleum hydrocarbon parameters including Ethylbenzene and F3 (C16 to C36).
8. Samples BH4 SS3 and BH4 SS4 were found to exceed the Table 3 [RPI] Standards for multiple tested petroleum hydrocarbon parameters including Ethylbenzene, Xylene Mixture, and F3 (C16 to C36).
9. Samples BH4 SS4 was found to exceed the Table 3 [ICC] Standards for the petroleum hydrocarbon parameter F3 (C16 to C36).
10. The soil samples secured for analytical testing are believed to be representative of the soil conditions at the borehole locations only. If any significant changes are

noted, i.e., additional odours, staining etc., SOIL-MAT ENGINEERS & CONSULTANTS LTD. should be contacted to reassess the environmental characteristics of the soil.

Given the above test results the following disposal options are applicable under Regulation 153/04 [amended by Regulation 511/09 effective July 1, 2011].

- As the tested material has been shown to exceed the Table 1 Standards for one or more parameter, surplus material may not be accepted at an off-site property subject to a Record of Site Condition of MOE Certificate of Authorisation.
- As the tested material from the upper levels of the boreholes was shown to exceed the Table 2 and 3 [RPI and ICC] Standards for metal and inorganic parameters, strictly speaking, the material may not be accepted at an off-site RPI or ICC property. However, given the nature of the EC and SAR parameters, it may be reasonable to accept surplus material at an off-site RPI or ICC property, not subject to a Record of Site Condition, under the 'beneficial use' concept. Such a use would require assessment of the receiving property and approval of the receiving property owner, and depending on the location and nature of the property consultation with the local MOE District Engineer.
- As samples BH4 SS2 and/or BH4 SS3 were found to exceed the Table 2 and 3 RPI and ICC Standards for multiple hydrocarbon parameters, material from the area of Borehole No. 4 should not be accepted at an off-site RPI or ICC property in a potable or non-potable groundwater condition. The extent of the hydrocarbon impact within this area may be delineated through addition sampling either conducted through additional boreholes or over the course of construction. At present, based on field screening, the impact does not appear to extend to adjacent boreholes. Where required to be disposed off-site, surplus material from this area, exceeding for PHC parameters, would be required to be disposed of at a registered waste receiving facility. It would be necessary to conduct TCLP leachate toxicity testing to confirm the material as non-hazardous waste prior to acceptance by a registered facility.
- Excavated soil may be reused on the subject property.

10. GENERAL COMMENTS

The comments provided in this document are intended only for the guidance of the design team. The subsoil descriptions and borehole information are intended to describe conditions at the borehole locations only. It is the contractors' responsibility to determine how these conditions will affect the scheduling and methods of construction for the project.

We trust that this geotechnical report is sufficient for your present requirements. Should you require any additional information or clarification as to the contents of this document, please do not hesitate to contact the undersigned.

Yours very truly,
SOIL-MAT ENGINEERS & CONSULTANTS LTD.



Kyle Richardson, P.Eng.
Project Engineer

Ian Shaw, P. Eng.
Senior Engineer

Enclosures: Drawing No. 1, Borehole Location Plan
Borehole Logs 1 to 6, inclusive
AGAT Certificate of Analysis [16H124085]

Distribution: Parsons [3, plus pdf]



Soil-Mat

Engineers & Consultants Ltd.

LEGEND

BH-# Borehole

NOTES:

1. This drawing should be read in conjunction with Soil-Mat Engineers & Consultants Ltd. report number SM 166764-G
2. Soil samples will be discarded after 3 months unless directed otherwise by client.
3. Borehole locations are approximate.

CLIENT

Parsons

PROJECT TITLE

Geotechnical Investigation
Proposed Road Reconstruction
Montrose Road
Niagara Falls, Ontario

DRAWING TITLE

Borehole
Location Plan

DRAWING No. 1

PROJECT No.	SM 166764-G
SCALE	NTS
DATE	September 2016
DRAWN	IS
CHECKED	-
FILENAME	SM 166764-G Borehole Location Plan.kcw

Project No: SM 166764-G

Project: Proposed Road Reconstruction

Location: Montrose Road, Niagara Falls

Client: Parsons

Log of Borehole No. 1

Project Manager: Ian Shaw, P.Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	0.00	Ground Surface
		-0.40	***Pavement Structure*** Approximately 150 millimetres of asphaltic concrete over 250 millimetres of compact granular base.
4		-1.50	***Clayey Silt/Silty Sand Fill*** Brown, trace organics, stiff.
6	2		***Clayey Silt/Sandy Silt*** Reddish brown, trace gravel, very stiff,
16		-5.00	End of Borehole

NOTES:

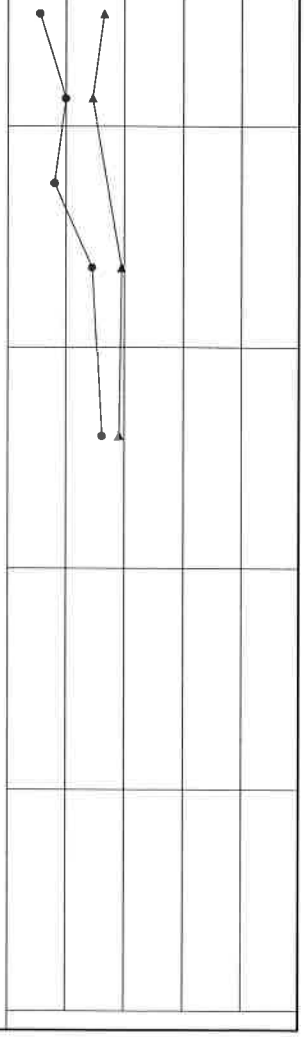
1. Borehole was advanced using solid stem auger equipment on July 26, 2016 to termination at a depth of 5.0 metres.
2. Borehole was recorded as 'dry' upon completion of drilling and was backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	5,5,6	11			
SS	2	8,9,11	20			
SS	3	5,6,10	16			
SS	4	9,13,16	29			
SS	5	12,14,18	32			

Moisture Content w% (10, 20, 30, 40)

Standard Penetration Test blows/300mm (20, 40, 60, 80)



Drill Method: Solid-Stem Auger
Drill Date: July 26, 2016
Hole Size: 150mm
Drill Contractor: Elite Drilling

SOIL-MAT ENGINEERS & CONSULTANTS LTD.
130 Lancing Drive, Hamilton, ON L8W 3A1
Phone: (905) 318-7440 Fax: (905) 318-7455
e-mail: info@soil-mat.on.ca

Datum: Existing Road Surface
Field Logged by: M. Brown
Checked by: I. Shaw
Sheet: 1 of 1

Project No: SM 166764-G

Project: Proposed Road Reconstruction

Location: Montrose Road, Niagara Falls

Client: Parsons

Log of Borehole No. 2

Project Manager: Ian Shaw, P.Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Symbol	Description	Well Data
0	0	0.00		Ground Surface	
		-0.47		***Pavement Structure*** Approximately 175 millimetres of asphaltic concrete over 300 millimetres of compact granular base.	
2		-0.70		***Clayey Silt/Sandy Silt*** Brown, reworked appearance.	
4				End of Borehole	
6	2				
8					
10					
12					
14	4				
16					
18					
20	6				
22					
24					
26	8				
28					
30					
32					

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)

Moisture Content
w%
10 20 30 40

Standard Penetration Test
blows/300mm
20 40 60 80

NOTES:

1. Borehole was advanced using solid stem auger equipment on July 26, 2016 to termination at a depth of 5.0 metres.

2. Borehole was recorded as 'dry' upon completion of drilling and was backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid-Stem Auger
Drill Date: July 26, 2016
Hole Size: 150mm
Drill Contractor: Elite Drilling

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Phone: (905) 318-7440 Fax: (905) 318-7455
e-mail: info@soil-mat.on.ca

Datum: Existing Road Surface
Field Logged by: M. Brown
Checked by: I. Shaw
Sheet: 1 of 1

Project No: SM 166764-G

Project: Proposed Road Reconstruction

Location: Montrose Road, Niagara Falls

Client: Parsons

Log of Borehole No. 2S

Project Manager: Ian Shaw, P.Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Symbol	Description	Well Data
0	0	0.00		Ground Surface	
2		-0.60		***Sand and Gravel Fill*** Grey, compact to dense.	
				End of Borehole	

NOTES:

1. Borehole was advanced using solid stem auger equipment on July 26, 2016 to termination at a depth of 0.6 metres.

2. Borehole was recorded as 'dry' upon completion of drilling and was backfilled as per Ontario Regulation 903.

3. Borehole was terminated at shallow depths due to potential conflict with existing utilities.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	9,19,14,6	33			

Moisture Content w% (10 20 30 40)

Standard Penetration Test • blows/300mm • (20 40 60 80)

Drill Method: Solid-Stem Auger
Drill Date: July 26, 2016
Hole Size: 150mm
Drill Contractor: Elite Drilling

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Field Logged by: M. Brown
Checked by: I. Shaw
Sheet: 1 of 1

Project No: SM 166764-G

Project: Proposed Road Reconstruction

Location: Montrose Road, Niagara Falls

Client: Parsons

Log of Borehole No. 3

Project Manager: Ian Shaw, P.Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

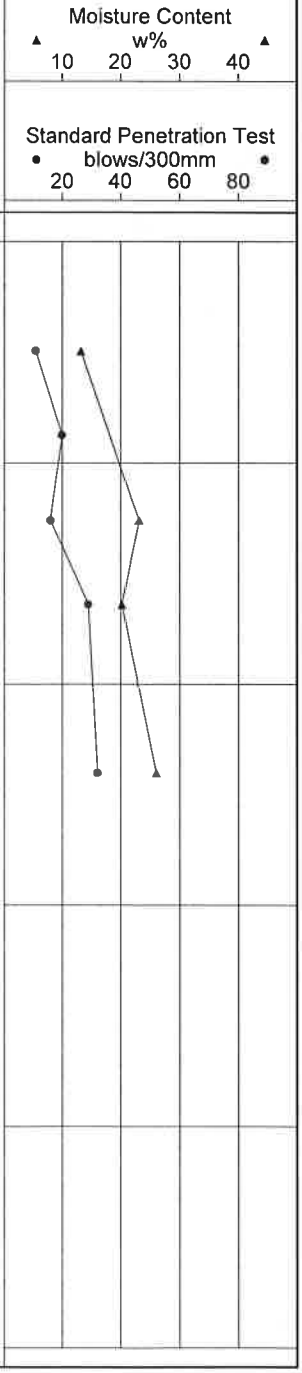
Depth (ft)	Depth (m)	Elevation [m]	Symbol	Description	Well Data
0	0	0.00		Ground Surface	
		-0.47		***Pavement Structure*** Approximately 175 millimetres of asphaltic concrete over 300 millimetres of compact granular base	
				Clayey Silt/Sandy Silt Reddish brown, trace gravel, stiff to firm.	
		-5.00		End of Borehole	

NOTES:

1. Borehole was advanced using solid stem auger equipment on July 26, 2016 to termination at a depth of 5.0 metres.
2. Free groundwater was encountered at a depth of approximately 4.3 metres upon completion of drilling. Borehole was backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	4,4,5	9			
SS	2	2,3,5	8			
SS	3	2,3,5	8			
SS	4	3,2,3	5			
SS	5	2,2,1 Wet Spoon	3			



Drill Method: Solid-Stem Auger
Drill Date: July 26, 2016
Hole Size: 150mm
Drill Contractor: Elite Drilling

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Field Logged by: M. Brown
Checked by: I. Shaw
Sheet: 1 of 1

Project No: SM 166764-G

Project: Proposed Road Reconstruction

Location: Montrose Road, Niagara Falls

Client: Parsons

Log of Borehole No. 3S

Project Manager: Ian Shaw, P.Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft / m)	Elevation [m]	Symbol	Description	Well Data
0 / 0	0.00		Ground Surface	
			Sand and Gravel Fill	
2	-0.50		Grey, compact to dense.	
			Clayey Silt/Sandy Silt	
4			Reddish brown, trace gravel, compact.	
6 / 2	-2.00		End of Borehole	
8				
10				
12 / 4				
14				
16				
18				
20 / 6				
22				
24				
26 / 8				
28				
30				
32				

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt. (kN/m3)
SS	1	6,6,7	13			
SS	2	5,5,5	10			

Moisture Content w% (10 20 30 40)

Standard Penetration Test • blows/300mm • (20 40 60 80)

NOTES:

1. Borehole was advanced using solid stem auger equipment on July 26, 2016 to termination at a depth of 2.0 metres.
2. Borehole was recorded as 'dry' upon completion of drilling and was backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid-Stem Auger
Drill Date: July 26, 2016
Hole Size: 150mm
Drill Contractor: Elite Drilling

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Sheet: 1 of 1

Project No: SM 166764-G

Project: Proposed Road Reconstruction

Location: Montrose Road, Niagara Falls

Client: Parsons

Log of Borehole No. 4

Project Manager: Ian Shaw, P.Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

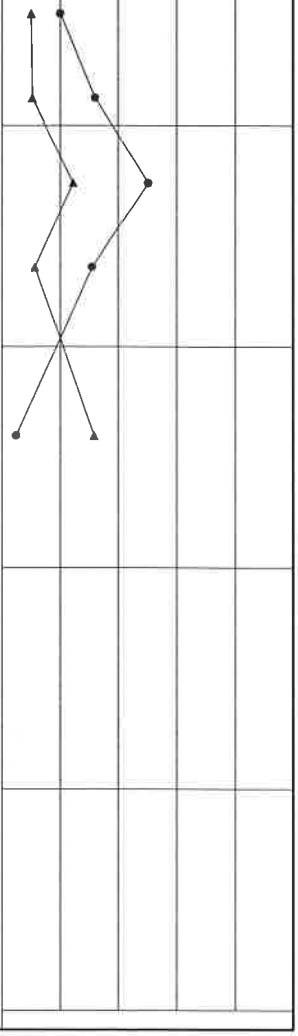
Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	0.00	Ground Surface
		-0.53	***Pavement Structure*** Approximately 225 millimetres of asphaltic concrete over 300 millimetres of compact granular base.
2			***Clayey Silt and Gravel Fill*** Brown, some sand, petroleum odour and staining below 2.2 metres, very stiff to hard
4			
6	2		
8			
10			
12		-3.80	
14	4		***Clayey Silt/Sandy Silt*** Reddish brown, trace gravel, firm.
16		-5.00	
18			End of Borehole
20	6		
22			
24			
26	8		
28			
30			
32			

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	2,8,12	20			
SS	2	22,18,14	32			
SS	3	6,30,20 Wet Spoon	50			
SS	4	11,12,19 Wet Spoon	31			
SS	5	1,2,3 Wet Spoon	5			

Moisture Content w% (10, 20, 30, 40)

Standard Penetration Test blows/300mm (20, 40, 60, 80)



NOTES:

1. Borehole was advanced using solid stem auger equipment on July 26, 2016 to termination at a depth of 5.0 metres.
2. Free groundwater was encountered at a depth of approximately 4.3 metres upon completion of drilling. Borehole was backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid-Stem Auger
Drill Date: July 26, 2016
Hole Size: 150mm
Drill Contractor: Elite Drilling

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Datum: Existing Road Surface
Field Logged by: M. Brown
Checked by: I. Shaw
Sheet: 1 of 1

Project No: SM 166764-G

Project: Proposed Road Reconstruction

Location: Montrose Road, Niagara Falls

Client: Parsons

Log of Borehole No. 4S

Project Manager: Ian Shaw, P.Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft / m)	Elevation [m]	Symbol	Description	Well Data
0 / 0	0.00		Ground Surface	
0 / 0			***Sand and Gravel Fill*** Grey, compact to dense.	
2	-0.65		***Clayey Silt/Sandy Silt Fill*** Brown, some gravel, occasional debris in the upper level, very stiff to hard	
4				
6 / 2	-2.00		End of Borehole	
8				
10				
12				
14 / 4				
16				
18				
20 / 6				
22				
24				
26 / 8				
28				
30				
32				

NOTES:

1. Borehole was advanced using solid stem auger equipment on July 26, 2016 to termination at a depth of 2.0 metres.
2. Borehole was recorded as 'dry' upon completion of drilling and was backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	10,12,18	30			
SS	2	15,18,22	40			

Moisture Content w% (10, 20, 30, 40)

Standard Penetration Test blows/300mm (20, 40, 60, 80)

Drill Method: Solid-Stem Auger
Drill Date: July 26, 2016
Hole Size: 150mm
Drill Contractor: Elite Drilling

SOIL-MAT ENGINEERS & CONSULTANTS LTD.
130 Lancing Drive, Hamilton, ON L8W 3A1
Phone: (905) 318-7440 Fax: (905) 318-7455
e-mail: info@soil-mat.on.ca

Datum: Existing Road Surface
Field Logged by: M. Brown
Checked by: I. Shaw
Sheet: 1 of 1

Project No: SM 166764-G

Project: Proposed Road Reconstruction

Location: Montrose Road, Niagara Falls

Client: Parsons

Log of Borehole No. 5

Project Manager: Ian Shaw, P.Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Description	Well Data
0	0	0.00	Ground Surface	
		-0.53	***Pavement Structure*** Approximately 175 millimetres of asphaltic concrete over 350 millimetres of compact granular base.	
2			***Clayey Silt and Gravel Fill*** Brown, some sand, trace rootlets, very stiff to stiff.	
4				
6	2	-2.20		
8			***Clayey Silt/Sandy Silt*** Reddish brown, trace gravel, loose	
10				
12	4			
14				
16		-5.00		
18			End of Borehole	
20	6			
22				
24				
26	8			
28				
30				
32				

NOTES:

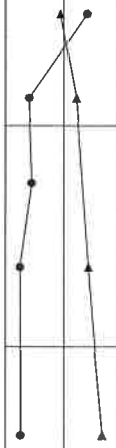
1. Borehole was advanced using solid stem auger equipment on July 26, 2016 to termination at a depth of 5.0 metres.
2. Borehole was recorded as 'dry' upon completion of drilling and was backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	12,14,14	28			
SS	2	3,4,4	8			
SS	3	2,4,5	9			
SS	4	1,2,3	5			
SS	5	1,2,3	5			

Moisture Content w% (10 20 30 40)

Standard Penetration Test • blows/300mm • (20 40 60 80)



Drill Method: Solid-Stem Auger
Drill Date: July 26, 2016
Hole Size: 150mm
Drill Contractor: Elite Drilling

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e-mail: info@soil-mat.on.ca

Datum: Existing Road Surface
Field Logged by: M. Brown
Checked by: I. Shaw
Sheet: 1 of 1

Project No: SM 166764-G

Project: Proposed Road Reconstruction

Location: Montrose Road, Niagara Falls

Client: Parsons

Log of Borehole No. 5S

Project Manager: Ian Shaw, P.Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Symbol	Description	Well Data
0	0	0.00		Ground Surface	
				Sand and Gravel Fill Grey, compact to dense.	
2		-0.65		***Clayey Silt/Sandy Silt Fill*** Brown to reddish brown, some gravel, occasional debris in the upper level, trace organics, stiff to hard.	
6	2	-2.00		End of Borehole	

NOTES:

1. Borehole was advanced using solid stem auger equipment on July 26, 2016 to termination at a depth of 2.0 metres.
2. Borehole was recorded as 'dry' upon completion of drilling and was backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	5,50/3"	100			
SS	2	3,4,5	9			

Moisture Content w% (10, 20, 30, 40)

Standard Penetration Test blows/300mm (20, 40, 60, 80)

Drill Method: Solid-Stem Auger
Drill Date: July 26, 2016
Hole Size: 150mm
Drill Contractor: Elite Drilling

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Phone: (905) 318-7440 Fax: (905) 318-7455
e-mail: info@soil-mat.on.ca

Datum: Existing Road Surface
Field Logged by: M. Brown
Checked by: I. Shaw
Sheet: 1 of 1

Project No: SM 166764-G

Project: Proposed Road Reconstruction

Location: Montrose Road, Niagara Falls

Client: Parsons

Log of Borehole No. 6

Project Manager: Ian Shaw, P.Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	0.00	Ground Surface
		-0.53	***Pavement Structure*** Approximately 175 millimetres of asphaltic concrete over 500 millimetres of compact granular base.
			Clayey Silt/Sandy Silt Fill Brown, some sand, trace rootlets, loose to compact.
	2	-2.20	
			Clayey Silt/Sandy Silt Reddish brown, trace gravel,trace organics in the upper level, very loose to compact.
		-5.00	
			End of Borehole

NOTES:

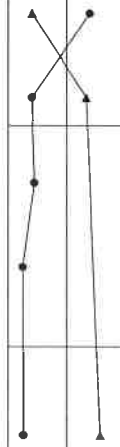
1. Borehole was advanced using solid stem auger equipment on July 26, 2016 to termination at a depth of 5.0 metres.
2. Borehole was recorded as 'dry' upon completion of drilling and was backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	12,14,14	9			
SS	2	3,4,4	11			
SS	3	2,4,5	2			
SS	4	1,2,3	5			
SS	5	1,2,3	28			

Moisture Content w% (10, 20, 30, 40)

Standard Penetration Test blows/300mm (20, 40, 60, 80)



Drill Method: Solid-Stem Auger
Drill Date: July 26, 2016
Hole Size: 150mm
Drill Contractor: Elite Drilling

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Datum: Existing Road Surface
Field Logged by: M. Brown
Checked by: I. Shaw
Sheet: 1 of 1

Project No: SM 166764-G

Project: Proposed Road Reconstruction

Location: Montrose Road, Niagara Falls

Client: Parsons

Log of Borehole No. 6S

Project Manager: Ian Shaw, P.Eng.

Borehole Location: See Drawing No. 1

Soil-Mat

SUBSURFACE PROFILE

Depth (ft / m)	Elevation [m]	Symbol	Description	Well Data
0 / 0	0.00		Ground Surface	
			Sand and Gravel Fill	
	-0.57		Grey, compact to dense.	
2			***Clayey Silt/Sandy Silt***	
4			Reddish brown, trace to some gravel, stiff.	
6 / 2	-2.00		End of Borehole	
8				
10				
12 / 4				
14				
16				
18				
20 / 6				
22				
24				
26 / 8				
28				
30				
32				

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	2,4,7	11			
SS	2	3,4,6	10			

Moisture Content w%: 10 20 30 40

Standard Penetration Test • blows/300mm •: 20 40 60 80

NOTES:

1. Borehole was advanced using solid stem auger equipment on July 26, 2016 to termination at a depth of 2.0 metres.

2. Borehole was recorded as 'dry' upon completion of drilling and was backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid-Stem Auger
Drill Date: July 26, 2016
Hole Size: 150mm
Drill Contractor: Elite Drilling

SOIL-MAT ENGINEERS & CONSULTANTS LTD.
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Datum: Existing Road Surface
Field Logged by: M. Brown
Checked by: I. Shaw
Sheet: 1 of 1

AGAT Laboratories

5835 COOPERS AVENUE
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CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT
130 LANCING DRIVE
HAMILTON, ON L8W3A1
(905) 318-7440

ATTENTION TO: Ian Shaw

PROJECT: 166764

AGAT WORK ORDER: 16H124085

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Gyulhan Yalamova, Report Reviewer

DATE REPORTED: Aug 15, 2016

PAGES (INCLUDING COVER): 8

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request

AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16H124085

PROJECT: 166764

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2016-08-08

DATE REPORTED: 2016-08-15

SAMPLE DESCRIPTION:				BH1 SS2	BH2S SS1	BH3 SS2	BH4 SS1	BH5 SS2	BH6 SS1
SAMPLE TYPE:				Soil	Soil	Soil	Soil	Soil	Soil
DATE SAMPLED:				7/26/2016	7/26/2016	7/26/2016	7/26/2016	7/26/2016	7/26/2016
Parameter	Unit	G / S	RDL	7757685	7757686	7757687	7757690	7757697	7757698
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	4	7	4	5	5	5
Barium	µg/g	220	2	104	24	96	72	109	131
Beryllium	µg/g	2.5	0.5	<0.5	<0.5	0.6	<0.5	0.6	0.6
Boron	µg/g	36	5	7	9	8	14	10	12
Boron (Hot Water Soluble)	µg/g	NA	0.10	0.16	0.49	0.27	0.72	0.57	0.46
Cadmium	µg/g	1.2	0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	70	2	17	10	20	15	22	22
Cobalt	µg/g	21	0.5	9.2	2.9	10.0	7.7	12.6	12.2
Copper	µg/g	92	1	14	10	17	20	22	18
Lead	µg/g	120	1	7	31	8	56	8	9
Molybdenum	µg/g	2	0.5	0.5	<0.5	<0.5	0.6	<0.5	0.6
Nickel	µg/g	82	1	19	7	22	17	26	26
Selenium	µg/g	1.5	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Silver	µg/g	0.5	0.2	<0.2	0.2	<0.2	0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	0.6	<0.5	0.5	0.5	0.6	0.6
Vanadium	µg/g	86	1	23	7	29	19	30	27
Zinc	µg/g	290	5	42	167	51	164	59	62
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10	0.14	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	2.22	2.34	4.95	2.66	4.13	0.791
Sodium Adsorption Ratio	NA	2.4	NA	6.98	20.0	21.8	43.8	22.7	4.40
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.99	8.15	7.94	8.00	7.99	8.03

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

7757685-7757698 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. Please note that samples were received and analyzed past hold time for Cyanide analysis.

Certified By: Amanjot Bhela

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 16H124085
PROJECT: 166764

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT
SAMPLING SITE:

ATTENTION TO: Ian Shaw
SAMPLED BY:

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2016-08-08

DATE REPORTED: 2016-08-15

		SAMPLE DESCRIPTION:		BH4 SS3	BH4 SS4
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		7/26/2016	7/26/2016
Parameter	Unit	G / S	RDL	7757691	7757694
Benzene	µg/g	0.02	0.02	<0.02	0.03
Toluene	µg/g	0.2	0.08	0.28	0.35
Ethylbenzene	µg/g	0.05	0.05	3.3	3.8
Xylene Mixture	µg/g	0.05	0.05	17	15
F1 (C6 to C10)	µg/g		5	23	43
F1 (C6 to C10) minus BTEX	µg/g	25	5	<5	24
F2 (C10 to C16)	µg/g	10	10	<10	22
F3 (C16 to C34)	µg/g	240	50	440	4100
F4 (C34 to C50)	µg/g	120	50	<50	120
Gravimetric Heavy Hydrocarbons	µg/g	120	50	NA	NA
Moisture Content	%		0.1	12.2	14.5
Surrogate	Unit	Acceptable Limits			
Terphenyl	%	60-140		63	90

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

7757691-7757694 Results are based on sample dry weight.
The C6-C10 fraction is calculated using Toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Certified By:

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Guideline Violation

AGAT WORK ORDER: 16H124085

PROJECT: 166764

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
7757685	BH1 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	0.57	2.22
7757685	BH1 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	6.98
7757686	BH2S SS1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	0.57	2.34
7757686	BH2S SS1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	20.0
7757687	BH3 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	0.57	4.95
7757687	BH3 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	21.8
7757690	BH4 SS1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	0.57	2.66
7757690	BH4 SS1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	43.8
7757691	BH4 SS3	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	Ethylbenzene	0.05	3.3
7757691	BH4 SS3	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	F3 (C16 to C34)	240	440
7757691	BH4 SS3	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	Toluene	0.2	0.28
7757691	BH4 SS3	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	Xylene Mixture	0.05	17
7757694	BH4 SS4	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	Benzene	0.02	0.03
7757694	BH4 SS4	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	Ethylbenzene	0.05	3.8
7757694	BH4 SS4	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	F2 (C10 to C16)	10	22
7757694	BH4 SS4	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	F3 (C16 to C34)	240	4100
7757694	BH4 SS4	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	Toluene	0.2	0.35
7757694	BH4 SS4	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil)	Xylene Mixture	0.05	15
7757697	BH5 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	0.57	4.13
7757697	BH5 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	22.7
7757698	BH6 SS1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	0.57	0.791
7757698	BH6 SS1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	4.40

Results relate only to the items tested and to all the items tested

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http://www.agatlabs.com

Quality Assurance

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT
PROJECT: 166764
SAMPLING SITE:

AGAT WORK ORDER: 16H124085
ATTENTION TO: Ian Shaw
SAMPLED BY:

Soil Analysis

RPT Date: Aug 15, 2016

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	7758240		<0.8	<0.8	NA	< 0.8	103%	70%	130%	97%	80%	120%	91%	70%	130%
Arsenic	7758240		2	2	NA	< 1	105%	70%	130%	100%	80%	120%	96%	70%	130%
Barium	7758240		106	115	8.1%	< 2	99%	70%	130%	102%	80%	120%	94%	70%	130%
Beryllium	7758240		<0.5	<0.5	NA	< 0.5	81%	70%	130%	101%	80%	120%	94%	70%	130%
Boron	7758240		6	6	NA	< 5	100%	70%	130%	107%	80%	120%	94%	70%	130%
Boron (Hot Water Soluble)	7758240		0.10	<0.10	NA	< 0.10	84%	60%	140%	101%	70%	130%	97%	60%	140%
Cadmium	7758240		<0.5	<0.5	NA	< 0.5	99%	70%	130%	104%	80%	120%	99%	70%	130%
Chromium	7758240		19	20	5.1%	< 2	91%	70%	130%	108%	80%	120%	90%	70%	130%
Cobalt	7758240		7.1	7.1	0.0%	< 0.5	97%	70%	130%	98%	80%	120%	94%	70%	130%
Copper	7758240		14	14	0.0%	< 1	89%	70%	130%	98%	80%	120%	91%	70%	130%
Lead	7758240		5	6	18.2%	< 1	121%	70%	130%	104%	80%	120%	95%	70%	130%
Molybdenum	7758240		<0.5	<0.5	NA	< 0.5	102%	70%	130%	100%	80%	120%	96%	70%	130%
Nickel	7758240		14	15	6.9%	< 1	92%	70%	130%	99%	80%	120%	97%	70%	130%
Selenium	7758240		<0.4	<0.4	NA	< 0.4	90%	70%	130%	103%	80%	120%	104%	70%	130%
Silver	7758240		<0.2	<0.2	NA	< 0.2	108%	70%	130%	110%	80%	120%	104%	70%	130%
Thallium	7758240		<0.4	<0.4	NA	< 0.4	82%	70%	130%	110%	80%	120%	100%	70%	130%
Uranium	7758240		<0.5	<0.5	NA	< 0.5	84%	70%	130%	87%	80%	120%	81%	70%	130%
Vanadium	7758240		28	28	0.0%	< 1	89%	70%	130%	105%	80%	120%	91%	70%	130%
Zinc	7758240		41	40	2.5%	< 5	98%	70%	130%	103%	80%	120%	102%	70%	130%
Chromium VI	7759370		<0.2	<0.2	NA	< 0.2	98%	70%	130%	96%	80%	120%	103%	70%	130%
Cyanide	7762942		<0.040	<0.040	NA	< 0.040	99%	70%	130%	97%	80%	120%	103%	70%	130%
Mercury	7758240		<0.10	<0.10	NA	< 0.10	109%	70%	130%	95%	80%	120%	88%	70%	130%
Electrical Conductivity	7762942		0.406	0.406	0.0%	< 0.005	99%	90%	110%	NA			NA		
Sodium Adsorption Ratio	7758240		0.166	0.156	6.2%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	7764550		11.8	11.9	0.8%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 16H124085

PROJECT: 166764

ATTENTION TO: Ian Shaw

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Aug 15, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (Soil)															
Benzene	7756576		< 0.02	< 0.02	NA	< 0.02	107%	60%	130%	90%	60%	130%	114%	60%	130%
Toluene	7756576		< 0.08	< 0.08	NA	< 0.08	99%	60%	130%	80%	60%	130%	100%	60%	130%
Ethylbenzene	7756576		< 0.05	< 0.05	NA	< 0.05	97%	60%	130%	81%	60%	130%	96%	60%	130%
Xylene Mixture	7756576		< 0.05	< 0.05	NA	< 0.05	98%	60%	130%	80%	60%	130%	98%	60%	130%
F1 (C6 to C10)	7756576		< 5	< 5	NA	< 5	76%	60%	130%	89%	85%	115%	87%	70%	130%
F2 (C10 to C16)	7752081		<10	<10	NA	< 10	100%	60%	130%	86%	80%	120%	71%	70%	130%
F3 (C16 to C34)	7752081		<50	<50	NA	< 50	103%	60%	130%	85%	80%	120%	70%	70%	130%
F4 (C34 to C50)	7752081		< 50	< 50	NA	< 50	88%	60%	130%	99%	80%	120%	100%	70%	130%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 16H124085

PROJECT: 166764

ATTENTION TO: Ian Shaw

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Trace Organics Analysis			
Benzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Toluene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Ethylbenzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Xylene Mixture	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009		GC/FID

Results relate only to the items tested and to all the items tested

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Laboratory Use Only

Work Order #: 1641240 85

Cooler Quantity: sm cooler

Arrival Temperatures: 10.4 | 10.6 | 10.8
9C | 8.9 | 9C

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes: OW TCE

Report Information:

Company: Soil-Mat Engineers
Contact: Ian Shaw
Address: 138 Lancing Dr. Hamilton, ON
Phone: 905-318-7440 Fax:
Reports to be sent to:
1. Email: Mike Brown
2. Email: Ian Shaw

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table (Indicate One): ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One): ☐ Coarse ☑ Fine

☐ Sewer Use
☐ Sanitary ☐ Storm
Region (Indicate One)

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Project Information:

Project: 16167164
Site Location: Montrose Rd., Niagara Falls
Sampled By: M. Brown
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Please Circle) Y / N	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ NO_3/NO_2 ☐ Total N ☐ Hg ☐ pH ☐ SAR	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3/NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use
BH1 SS2	July 26/16		1	S			X														
BH2S SS1			1				X														
BH3 SS2			1				X														
BH4 SS1			1				X														
BH4 SS3			2											X							
BH4 SS4			2											X							
BH5 SS2			1				X														
BH6 SS1			1				X														

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Marshall Jr Brown	Aug. 8/16	1:30pm	Daniella Jale	8/8/16	1:30pm
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1

No: T 027635

SOIL-MAT ENGINEERS & CONSULTANTS LTD.

www.soil-mat.com info@soil-mat.on.ca TF: 800.243.1922

Hamilton: 130 Lancing Drive L8W 3A1 T: 905.318.7440 F: 905.318.7455
Milton: 20 - 348 Bronte Street South L9T 5B6 T: 905.875.3228 F: 905.875.4426

PROJECT NO.: SM 177726-G

October 18, 2017

PARSONS
4342 Queen Street – Unit 407
Niagara Falls, Ontario
L2E 7J7

Attention: Yonghui Weng, M.A.Sc., P.Eng.
Senior Municipal Engineer

SUPPLEMENTAL GEOTECHNICAL INVESTIGATION
PROPOSED MONTROSE ROAD RECONSTRUCTION
NIAGARA FALLS, ONTARIO

Dear Mr. Weng,

Further to your authorisation, SOIL-MAT ENGINEERS & CONSULTANTS LTD. has completed the fieldwork, laboratory testing, and report preparation in connection with the above noted project. The investigation and reporting were undertaken in general accordance with our proposal P6884, dated June 26, 2017. Our comments and recommendations, based on our findings at the six [6] borehole locations are presented herein.

1. INTRODUCTION

We understand that the project will involve the urbanisation of the existing section of Montrose Road between McLeod Road and Charnwood Avenue in Niagara Falls, Ontario, including reconstruction/installation of sewers and watermains. The purpose of this geotechnical investigation work was to assess the existing pavement structure and subsurface soil conditions, and to provide our comments and recommendations with respect to the proposed roadway reconstruction and related earthworks, from a geotechnical point of view. This report is based on the above summarised project description and on the assumption that the design and construction will be performed in accordance with applicable codes and standards. Any significant deviations from the proposed project may void the recommendations given in this report.

It is noted that SOIL-MAT ENGINEERS undertook a geotechnical investigation along the subject roadway section in 2016, which has been reported under a separate cover [SM 166764-G, dated October 12, 2016]. This report should be read in conjunction with the findings of our initial geotechnical investigation.

2. PROCEDURE

A total of six [6] sampled boreholes were advanced at the locations illustrated in the attached Drawing No. 1, Borehole Location Plan. The boreholes were advanced using continuous flight power auger equipment on August 28 and 29, 2016 under the direction of a representative of SOIL-MAT ENGINEERS to depths of approximately 5 to 8 metres below the existing road surface. It is noted that Borehole No. 104 was initially attempted on the west side of Montrose, however encountered auger refusal at a depth of approximately 1.8 metres at multiple locations. As such, borehole No. 104 was located on the east side of Montrose Road. Upon completion of drilling the boreholes were backfilled in general accordance with Ontario Regulation 903, and the surface reinstated using a premixed asphaltic concrete product level with the existing road surface.

Representative samples of the subsoils were recovered from the borings at selected depth intervals using split barrel sampling equipment driven in accordance with the requirements of the ASTM test specification D1586, Standard Penetration Resistance Testing. After undergoing a general field examination, the soil samples were preserved and transported to the SOIL-MAT laboratory for visual, tactile, and olfactory classifications. Routine moisture content tests and hand penetrometer testing were performed on all soil samples recovered from the borings, with unit weight determinations conducted on selected cohesive samples.

In addition, a selected sample from each borehole was submitted for background analytical testing. The samples were submitted to AGAT Laboratories Limited, an accredited Canadian Environmental Laboratory for analytical testing for Inorganic and Metal Scans for comparison to the Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*. The results of this testing can be found appended to the end of this report.

The boreholes were located in the field by representatives of SOIL-MAT ENGINEERS, in general accordance with the drawing provided to our office. The ground surface elevation the borehole locations has been referenced to the existing roadway surface.

Details of the conditions encountered in the boreholes, together with the results of the field and laboratory tests, are presented in the attached Borehole Log Nos. 101 through 106, inclusive. It is noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design and therefore should not be construed as the exact planes of geological change.

3. SITE DESCRIPTION AND SUBSURFACE CONDITIONS

The project area consists of the section of Montrose Road between McLeod Road and Charnwood Avenue in Niagara Falls, Ontario. The roadway is an asphalt paved rural cross section with gravelled shoulders and side ditches, surrounded by some low-density residential lands as well as commercial properties. The pavement structure was noted to be in relatively fair to poor condition, exhibiting frequent longitudinal and lateral cracking, occasional alligator cracking, as well as a significant amount of crack sealing and repair patches.

The subsurface conditions encountered at the borehole locations are summarised as follows:

Pavement Structure

Borehole Nos. 101 to 106 were advanced through the pavement structure of the existing roadway. The pavement structure encountered at each borehole location has been summarised as follows:

The pavement structure at the borehole locations has summarised as follows:

Borehole No.	101	102	103	104	105	106
Asphaltic Concrete (mm)	60	200	230	260	230	230
Granular Base (mm)	420	400	400	470	360	280

Clayey Silt/Sandy Silt Fill

Clayey silt/sandy silt fill was encountered beneath the pavement structure in Borehole Nos. 102 and 104. The clayey silt/sandy silt fill material contained trace to some gravel, occasional organic inclusions, and occasional construction debris. The fill material encountered was generally soft to very stiff in consistency, and was proven to depths of up to approximately 2.2 to 3.5 metres beneath the existing ground surface in Borehole Nos. 102 and 104, respectively.

Clayey Silt/Sandy Silt

Native clayey silt/sandy silt was encountered beneath the pavement structure and/or fill material in Borehole Nos. 101, 102, and 104. The native soil encountered was brown to reddish brown in colour, contained traces of gravel, and was generally stiff to very stiff in

consistency in Borehole Nos. 101 and 102, and soft to firm in Borehole No. 104. The native clayey silt/sandy silt was proven to termination where encountered.

Sandy Silt

Native sandy silt was encountered beneath the pavement structure in Borehole No. 103. The native sandy silt was reddish brown in colour, contained trace clay, and was generally in a loose state. The sandy silt encountered was noted to be moist to wet below a depth of approximately 3 metres. It is noted that the fine grained sandy silt is sensitive to disturbance during drilling activities, and as such may have yielded artificially low 'N' values (blows per foot) during drilling. Native sandy silt was proven to termination in Borehole No. 104.

Clayey Silt/Silty Clay

Native clayey silt/silty clay was encountered in Borehole Nos. 105 and 106. The native clayey silt/silty clay was brown to reddish brown in colour, contained trace gravel, and was generally soft to very stiff in consistency. A silt seam was noted at a depth of approximately 4.9 metres in Borehole No. 105. Native clayey silt/silty clay was proven to termination in Borehole Nos. 105 and 106.

A review of available published information [Quaternary Geology of Ontario, Southern Sheet Map 2556] indicates the subsurface soils to consist of clay to silt-textured till. These conditions are consistent with our experience in the area and observations during drilling.

Groundwater Observations

All boreholes were recorded as 'dry', with the exception of Borehole Nos. 102 and 103 which were recorded as 'wet' at depths of approximately 5.6 and 4.1 metres upon completion of drilling, respectively. It is noted that insufficient time would have passed for the static groundwater level to stabilise in the open boreholes during drilling. In fine grained to cohesive soils such as the silty soils encountered, the static groundwater level typically coincides with the transition in colour from brown to grey. Based on our experience during drilling, the static groundwater level is estimated at depths of between approximately 3 and 5 metres, however some fluctuation between seasons should be anticipated.

4. DISCUSSION

The subsurface conditions encountered in the boreholes during this supplemental investigation work were generally consistent with the conditions encountered during our initial investigation work conducted in 2016. Conditions encountered during our investigation work suggest groundwater at depths of approximately 3 to 5 metres in some locations, likely due to seasonal fluctuations and weather conditions prior to drilling. In addition, the soils encountered have been noted to range from a clayey silt/silty clay, clayey silt/sandy silt, to sandy silt, rather than strictly clayey silt/sandy silt as indicated in our initial geotechnical report. As such, areas of more sandy material, as well as more clayey material, should be anticipated. In general, the comments and recommendations provided in our referenced initial geotechnical report would still be considered valid, and should be adhered to.

5. ENVIRONMENTAL RESULTS

As noted above, a total of four [4] selected samples were submitted for background analytical testing in order to assess the environmental characteristics of the on-site soil. The soil samples were submitted to AGAT Laboratories, a Canadian accredited independent testing laboratory, for a standard panel of metal and inorganic parameters. Field screening of the recovered soil samples yielded no evidence of potential hydrocarbon impact (i.e. staining, petroleum odour, etc.). The laboratory test results received were compared to the applicable standard from the Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*, as follows:

- **Table 1**: Full Depth Background Site Condition Standards Residential/Parkland/Institutional and Industrial/Commercial/Community land use.
- **Table 2**: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for a Residential/ Parkland/ Institutional property use, [RPI], as well as for an Industrial/ Commercial/ Community [ICC] property use.
- **Table 3**: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for a Residential/ Parkland/ Institutional property use, [RPI], as well as for an Industrial/ Commercial/ Community [ICC] property use.

The results of this laboratory testing are presented in the attached AGAT Certificate of Analysis [17H255807].

Based on SOIL-MAT'S field observations and the analytical test results from AGAT, SOIL-MAT offers the following comments:

1. The tested samples were found to meet the Table 1 [ALL] Standards for the parameters tested, with the exception of Samples BH102/SS2, BH105/SS2, and BH106/SS2, which were found to exceed the Standard for Electrical Conductivity [EC] and/or Sodium Absorption Ration [SAR].
2. The tested samples were found to meet the Table 2 and 3 [RPI] Standards for the parameters tested, with the exception of Samples BH102/SS2, BH105/SS2, and BH106/SS2, which were found to exceed the Standard for EC and/or SAR.
3. The tested samples were found to meet the Table 2 and 3 [RPI] Standards for the parameters tested, with the exception of Samples BH105/SS2 and BH106/SS2, which were found to exceed the Standard for EC.
4. It is noted that the presence of elevated levels of EC and SAR is often observed in the area of municipal roadways and parking lots and is largely the result of the use of salt for winter de-icing operations. EC and SAR are essentially aesthetic parameters that do not present a hazard to human or animal life. Rather they tend to render the soil environment un-supportive of plant growth and corrosive to buried grey or cast iron pipe.
5. The soil samples secured for analytical testing are believed to be representative of the soil conditions at the borehole locations only. If any significant changes are noted, i.e., additional odours, staining etc., SOIL-MAT ENGINEERS & CONSULTANTS LTD. should be contacted to reassess the environmental characteristics of the soil.

Given the above test results the following disposal options are applicable under Regulation 153/04 [amended by Regulation 511/09 effective July 1, 2011].

- As the tested material has been shown to exceed the Table 1 Standards for one or more parameter, surplus material may not be accepted at an off-site property subject to a Record of Site Condition of MOE Certificate of Authorisation.
- As the tested material was shown to exceed the Table 2 and 3 [RPI and ICC] Standards for EC and/or SAR, strictly speaking, the material may not be accepted at an off-site RPI or ICC property. However, given the nature of the EC and SAR parameters, it may be reasonable to accept surplus material at an off-site RPI or ICC property, not subject to a Record of Site Condition, under the 'beneficial use' concept. Such a use would require assessment of the receiving property and approval of the receiving property owner, and depending on the location and nature of the property consultation with the local MOE District Engineer.
- Excavated soil may be reused on the subject site.

6. GENERAL COMMENTS

The comments provided in this document are intended only for the guidance of the design team. The subsoil descriptions and borehole information are intended to describe conditions at the borehole locations only. It is the contractors' responsibility to determine how these conditions will affect the scheduling and methods of construction for the project.

We trust that this geotechnical report is sufficient for your present requirements. Should you require any additional information or clarification as to the contents of this document, please do not hesitate to contact the undersigned.

Yours very truly,
SOIL-MAT ENGINEERS & CONSULTANTS LTD.



Kyle Richardson, P.Eng.
Project Engineer

Ian Shaw, P. Eng.
Senior Engineer

Enclosures: Drawing No. 1, Borehole Location Plan
Borehole Logs 101 to 106, inclusive
AGAT Certificate of Analysis [17H255807]

Distribution: Parsons [2, plus pdf]



LEGEND

2017 Borehole Location
BH#

2016 Borehole Location
BH#

NOTES

1. This drawing should be read in conjunction with Soil-Mat Engineers & Consultants Ltd. Report No. SM 177726-G.

2. Borehole locations are approximate.

SOIL-MAT
ENGINEERS & CONSULTANTS LTD.

Geotechnical Investigation
Montrose Road
Reconstruction
Niagara Falls, Ontario

Borehole Location Plan A

Project No. SM 177726-G

Date: September 2017

Drawn: KR	Checked: IS

SM 177726-G Borehole Location Plan A

Drawing No. 1



LEGEND

2017 Borehole Location
BH#

2016 Borehole Location
BH#

NOTES

1. This drawing should be read in conjunction with Soil-Mat Engineers & Consultants Ltd. Report No. SM 177726-G.

2. Borehole locations are approximate.

SOIL-MAT

ENGINEERS & CONSULTANTS LTD.

Geotechnical Investigation
Montrose Road
Reconstruction
Niagara Falls, Ontario

Borehole Location Plan B

Project No. SM 177726-G

Date: September 2017

Drawn: KR | Checked: IS

SM 177726-G Borehole Location Plan B

Drawing No. 2

Log of Borehole No. 106

Project No: SM 177726-G
Project: Proposed Montrose Rd. Reconstruction
Location: Montrose Road, Niagara Falls, ON
Client: Parsons

Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N:
E:

Soil-Mat

Depth (ft / m)	Elevation (m)	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	0.00	Ground Surface								
0 / 0	0.00	**Pavement Structure** Approximately 230 millimetres of asphaltic concrete over 280 millimetres of compact granular base.								
1 /	-0.51	**Clayey Silt/Silty Clay** Brown to reddish brown, trace sand and gravel, stiff to very soft.		SS	1	1,2,5,5	7			
2 /				SS	2	2,6,9,11	15			
3 / 1				SS	3	4,6,6,7	12			
4 /				SS	4	2,3,4,4	7			
5 /				SS	5	0,0,1,3	1			
6 / 2				SS	6	0,0,1,3	1			
7 /				SS	7	0,2,3,5	5			
8 / 3	-8.20	End of Borehole								

Moisture Content w% (10 20 30 40)
Standard Penetration Test • blows/300mm • (20 40 60 80)

NOTES:

1. Borehole was advanced using solid stem auger equipment on August 28, 2017 to termination at a depth of 8.2 metres.
2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: August 28, 2017
Hole Size: 200 millimetres
Drilling Contractor: DDSI

Soil-Mat Engineers & Consultants Ltd.
130 Lancing Drive, Hamilton, ON L8W 3A1
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E: info@soil-mat.ca

Datum: Existing Road Surface
Field Logged by: SO
Checked by: KR
Sheet: 1 of 1

Log of Borehole No. 105

Project No: SM 177726-G
Project: Proposed Montrose Rd. Reconstruction
Location: Montrose Road, Niagara Falls, ON
Client: Parsons

Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N:
E:

Soil-Mat

Depth (ft / m)	Elevation (m)	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	0.00	Ground Surface								
	-0.59	**Pavement Structure** Approximately 230 millimetres of asphaltic concrete over 360 millimetres of compact granular base.								
3 / 1		**Clayey Silt/Silty Clay** Reddish brown, trace gravel, very stiff to stiff.		SS	1	0,3,4,5	7			
6 / 2				SS	2	4,5,8,12	13			
9 / 3				SS	3	4,8,13,18	21			
11 / 4				SS	4	5,11,12,15	23			
	-4.90	Silt seam		SS	5	6,9,8,7	17			
21 / 6				SS	6	0,0,0,5	0			
	-6.71	End of Borehole								

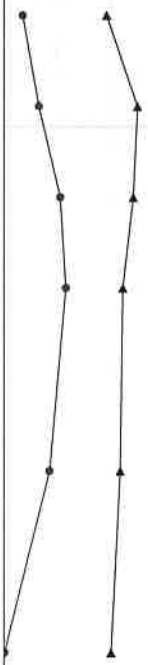
NOTES:

1. Borehole was advanced using solid stem auger equipment on August 28, 2017 to termination at a depth of 6.7 metres.

2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Moisture Content w%: 10 20 30 40
Standard Penetration Test • blows/300mm •: 20 40 60 80



Drill Method: Solid Stem Augers
Drill Date: August 28, 2017
Hole Size: 200 millimetres
Drilling Contractor: DDSI

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Datum: Existing Road Surface
Field Logged by: SO
Checked by: KR
Sheet: 1 of 1

Log of Borehole No. 104

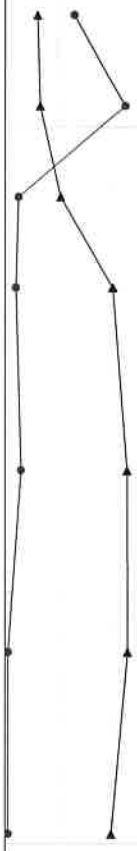
Project No: SM 177726-G
Project: Proposed Montrose Rd. Reconstruction
Location: Montrose Road, Niagara Falls, ON
Client: Parsons

Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N:
E:

Soil-Mat

Depth (ft / m)	Elevation (m)	Symbol	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	0.00		Ground Surface								
0–2 / 0–1			**Pavement Structure** Approximately 260 millimetres of asphaltic concrete over 470 millimetres of compact granular base.								
2–11 / 1–3	-0.73		**Clayey Silt/Sandy Silt Fill** Brown, trace to some gravel, very stiff to soft.		SS	1	11,11,15,26	26			
					SS	2	16,24,21,18	45			
					SS	3	3,3,2,4	5			
	-3.50				SS	4	3,2,2,2	4			
11–27 / 3–8			**Clayey Silt/Sandy Silt** Reddish brown, trace gravel, firm to very soft.		SS	5	0,2,4,4	6			
					SS	6	0,0,1,2	1			
					SS	7	1,0,1,0	1			
	-8.23		End of Borehole								

Moisture Content w% (10 20 30 40)
Standard Penetration Test • blows/300mm • (20 40 60 80)



NOTES:

1. Borehole was advanced using solid stem auger equipment on August 28, 2017 to termination at a depth of 8.2 metres.
2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: August 28, 2017
Hole Size: 200 millimetres
Drilling Contractor: DDSI

Soil-Mat Engineers & Consultants Ltd.
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Datum: Existing Road Surface
Field Logged by: SO
Checked by: KR
Sheet: 1 of 1

Log of Borehole No. 103

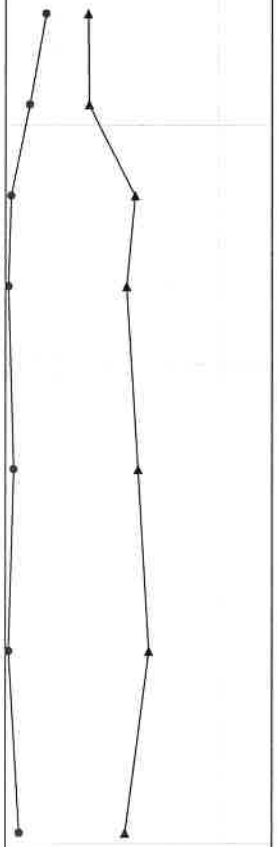
Project No: SM 177726-G
Project: Proposed Montrose Rd. Reconstruction
Location: Montrose Road, Niagara Falls, ON
Client: Parsons

Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N:
E:

Soil-Mat

Depth (ft / m)	Elevation (m)	Symbol	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	0.00		Ground Surface								
0–2 / 0–1	-0.63		**Pavemnet Structure** Approximately 230 millimetres of asphaltic concrete over 400 millimetres of compact granular base.								
3–10 / 1–3			**Sandy Silt** Reddish brown, trace clay, loose.		SS	1	5,7,8,5	15			
					SS	2	4,4,5,4	9			
					SS	3	1,1,1,1	2			
					SS	4	1,0,1,2	1			
16–20 / 5–6					SS	5	0,1,2,1	3			
21–23 / 6–7					SS	6	0,0,1,0	1			
26–27 / 8	-8.23				SS	7	2,2,3,7	5			
			End of Borehole								

Moisture Content w% (10 20 30 40)
Standard Penetration Test • blows/300mm • (20 40 60 80)



NOTES:

1. Borehole was advanced using solid stem auger equipment on August 29, 2017 to termination at a depth of 8.2 metres.
2. Borehole was recorded as open and 'wet' at a depth 4.1 metres upon completion, and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: August 29, 2017
Hole Size: 200 millimetres
Drilling Contractor: DDSI

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Datum: Existing Road Surface
Field Logged by: SO
Checked by: KR
Sheet: 1 of 1

Log of Borehole No. 102

Project No: SM 177726-G
Project: Proposed Montrose Rd. Reconstruction
Location: Montrose Road, Niagara Falls, ON
Client: Parsons

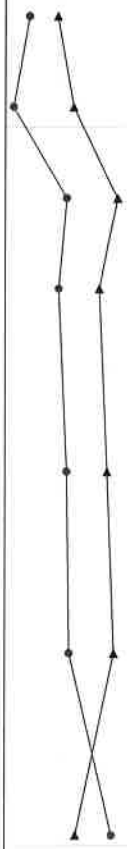
Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N:
E:

Soil-Mat

Depth (ft / m)	Elevation (m)	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	0.00	Ground Surface								
	-0.60	**Pavement Structure** Approximately 200 millimetres of asphaltic concrete over 400 millimetres of compact granular base.								
1 / 2		**Clayey Silt/Sandy Silt Fill** Brown, trace gravel, stiff to soft.		SS	1	6,4,5,7	9			
				SS	2	0,0,3,7	3			
	-2.20	**Clayey Silt/Sandy Silt** Reddish brown, trace gravel, occasional sandy seam, very stiff to hard.		SS	3	5,10,13,16	23			
3 / 4				SS	4	7,9,11,13	20			
5 / 6				SS	5	12,12,11,13	23			
6 / 8				SS	6	9,10,14,14	24			
7 / 9				SS	7	8,18,22,17	40			
	-8.23	End of Borehole								

Moisture Content w% (10 20 30 40)

Standard Penetration Test blows/300mm (20 40 60 80)



NOTES:

1. Borehole was advanced using solid stem auger equipment on August 29, 2017 to termination at a depth of 8.2 metres.
2. Borehole was recorded as open and 'wet' at a depth of 5.6 metres upon completion, and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: August 29, 2017
Hole Size: 200 millimetres
Drilling Contractor: DDSI

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Sheet: 1 of 1

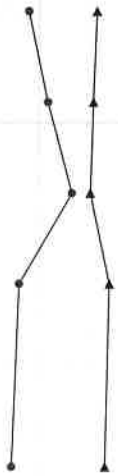
Log of Borehole No. 101

Project No: SM 177726-G
Project: Proposed Montrose Rd. Reconstruction
Location: Montrose Road, Niagara Falls, ON
Client: Parsons

Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N:
E:

Soil-Mat

Depth (ft / m)	Elevation (m)	Description	Well Data	SAMPLE Type	SAMPLE Number	SAMPLE Blow Counts	SAMPLE Blows/300mm	SAMPLE Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)	Moisture Content w% (10 20 30 40) / Standard Penetration Test blows/300mm (20 40 60 80)
0 / 0	0.00	Ground Surface									
	-0.48	**Pavement Structure** Approximately 60 millimetres of asphaltic concrete over 420 millimetres of compact granular base.									
1 / 1		**Clayey Silt/Sandy Silt** Reddish brown, trace gravel, very stiff to stiff.		SS	1	3,8,8,7	16				
2				SS	2	8,11,12,16	23				
3				SS	3	16,15,17,18	32				
4				SS	4	5,8,4,4	12				
5	-5.18			SS	5	3,3,6,9	9				
6		End of Borehole									
7											
8											
9											



NOTES:

1. Borehole was advanced using solid stem auger equipment on August 29, 2017 to termination at a depth of 5.2 metres.

2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers
Drill Date: August 29, 2017
Hole Size: 200 millimetres
Drilling Contractor: DDSI

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Datum: Existing Road Surface
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Checked by: KR
Sheet: 1 of 1

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT
130 LANCING DRIVE
HAMILTON, ON L8W3A1
(905) 318-7440

ATTENTION TO: Kyle Richardson

PROJECT: SM 177726

AGAT WORK ORDER: 17H255807

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

DATE REPORTED: Sep 08, 2017

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request

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Certificate of Analysis

AGAT WORK ORDER: 17H255807

PROJECT: SM 177726

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

SAMPLING SITE:Montrose Road

ATTENTION TO: Kyle Richardson

SAMPLED BY:SO

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-09-01

DATE REPORTED: 2017-09-08

		SAMPLE DESCRIPTION:		BH106/SS2	BH105/SS2	BH102/SS2	BH101/SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		2017-08-30	2017-08-30	2017-08-30	2017-08-30
Parameter	Unit	G / S	RDL	8684375	8684377	8684378	8684379
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	5	4	5	3
Barium	µg/g	220	2	163	178	92	105
Beryllium	µg/g	2.5	0.5	1.0	1.0	0.8	<0.5
Boron	µg/g	36	5	17	18	16	6
Boron (Hot Water Soluble)	µg/g	NA	0.10	0.14	0.16	0.17	<0.10
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	70	2	33	31	26	11
Cobalt	µg/g	21	0.5	15.3	13.2	11.7	6.2
Copper	µg/g	92	1	29	20	20	8
Lead	µg/g	120	1	9	9	10	3
Molybdenum	µg/g	2	0.5	0.6	<0.5	0.6	0.7
Nickel	µg/g	82	1	31	28	26	12
Selenium	µg/g	1.5	0.4	0.4	0.4	0.5	<0.4
Silver	µg/g	0.5	0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	0.8	0.7	0.9	<0.5
Vanadium	µg/g	86	1	46	44	38	16
Zinc	µg/g	290	5	62	53	63	28
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	**1.72**	**3.76**	**0.773**	0.303
Sodium Adsorption Ratio	NA	2.4	NA	**3.03**	**9.56**	2.26	1.61
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.69	7.70	7.87	7.88

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8684375-8684379 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Amanjot Bhela

Results relate only to the items tested and to all the items tested

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Guideline Violation

AGAT WORK ORDER: 17H255807

PROJECT: SM 177726

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Kyle Richardson

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8684375	BH106/SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	0.57	1.72
8684375	BH106/SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	2.4	3.03
8684377	BH105/SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	0.57	3.76
8684377	BH105/SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	2.4	9.56
8684378	BH102/SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	0.57	0.773

Results relate only to the items tested and to all the items tested

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Quality Assurance

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

PROJECT: SM 177726

SAMPLING SITE:Montrose Road

AGAT WORK ORDER: 17H255807

ATTENTION TO: Kyle Richardson

SAMPLED BY:SO

Soil Analysis

RPT Date: Sep 08, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8689794		<0.8	<0.8	NA	< 0.8	100%	70%	130%	92%	80%	120%	88%	70%	130%
Arsenic	8689794		3	3	NA	< 1	99%	70%	130%	98%	80%	120%	93%	70%	130%
Barium	8689794		115	115	0.0%	< 2	105%	70%	130%	103%	80%	120%	99%	70%	130%
Beryllium	8689794		0.7	0.7	NA	< 0.5	103%	70%	130%	101%	80%	120%	107%	70%	130%
Boron	8689794		9	10	NA	< 5	90%	70%	130%	113%	80%	120%	92%	70%	130%
Boron (Hot Water Soluble)	8687580		0.48	0.48	NA	< 0.10	97%	60%	140%	97%	70%	130%	97%	60%	140%
Cadmium	8689794		<0.5	<0.5	NA	< 0.5	97%	70%	130%	109%	80%	120%	101%	70%	130%
Chromium	8689794		24	24	0.0%	< 2	109%	70%	130%	103%	80%	120%	104%	70%	130%
Cobalt	8689794		7.8	7.5	3.9%	< 0.5	98%	70%	130%	103%	80%	120%	102%	70%	130%
Copper	8689794		16	15	6.5%	< 1	101%	70%	130%	120%	80%	120%	100%	70%	130%
Lead	8689794		18	17	5.7%	< 1	98%	70%	130%	105%	80%	120%	99%	70%	130%
Molybdenum	8689794		<0.5	<0.5	NA	< 0.5	101%	70%	130%	107%	80%	120%	102%	70%	130%
Nickel	8689794		15	14	6.9%	< 1	97%	70%	130%	102%	80%	120%	99%	70%	130%
Selenium	8689794		0.9	0.7	NA	< 0.4	98%	70%	130%	98%	80%	120%	104%	70%	130%
Silver	8689794		<0.2	<0.2	NA	< 0.2	97%	70%	130%	108%	80%	120%	87%	70%	130%
Thallium	8689794		<0.4	<0.4	NA	< 0.4	97%	70%	130%	100%	80%	120%	98%	70%	130%
Uranium	8689794		0.6	0.6	NA	< 0.5	107%	70%	130%	110%	80%	120%	102%	70%	130%
Vanadium	8689794		35	35	0.0%	< 1	103%	70%	130%	101%	80%	120%	101%	70%	130%
Zinc	8689794		66	64	3.1%	< 5	100%	70%	130%	119%	80%	120%	109%	70%	130%
Chromium VI	8693097		<0.2	<0.2	NA	< 0.2	101%	70%	130%	98%	80%	120%	101%	70%	130%
Cyanide	8682222		<0.040	<0.040	NA	< 0.040	90%	70%	130%	103%	80%	120%	102%	70%	130%
Mercury	8689794		<0.10	<0.10	NA	< 0.10	99%	70%	130%	89%	80%	120%	88%	70%	130%
Electrical Conductivity	8690866		1.14	1.17	2.6%	< 0.005	95%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8689794		1.59	1.60	0.6%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8689930		7.99	8.11	1.5%	NA	100%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Method Summary

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 17H255807

PROJECT: SM 177726

ATTENTION TO: Kyle Richardson

SAMPLING SITE:Montrose Road

SAMPLED BY:SO

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

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www.agatlabs.com webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Laboratory Use Only
Work Order #: 17H255507
Cooler Quantity: 1 BAG
Arrival Temperatures: 9.8 9.7 9.6
9.1 9.1 9.1
Custody Seal Intact: ☐Yes ☐No ☐N/A
Notes:

Report Information:
Company: Soil-Mat Engineers
Contact: Kyle Richardson
Address: 130 Lancing Drive, Hamilton, ON
Phone: 905-318-7440 Fax:
Reports to be sent to:
1. Email: Krichardson@soil-mat.ca, sergiu.onisoru@gmail.com
2. Email: ishaw@soil-mat.ca

Regulatory Requirements: ☐ No Regulatory Requirement
(Please check all applicable boxes)

☑ Regulation 153/04 Table 1 (Indicate One)
☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use ☐ Sanitary ☐ Storm
Region (Indicate One)

☐ Regulation 558 ☐ CCME ☐ Prov. Water Quality Objectives (PWQO) ☐ Other (Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:
Regular TAT ☑ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day
OR Date Required (Rush Surcharges May Apply): 5 days
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Project Information:
Project: SM 177726
Site Location: Montrose Road
Sampled By: Sergiu Onisoru
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information: Bill To Same: Yes ☑ No ☐
Company:
Contact:
Address:
Email:

Sample Matrix Legend
B Blota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	(Check Applicable) ORPs: ☐B-HWS ☐Cr ☐CN ☐Cr6+ ☐EC ☐ROC ☐NO_3/NO_2 ☐Total N ☐Hg ☐pH ☐SAR	Nutrients: ☐TP ☐NH_3 ☐TKN ☐NO_3 ☐NO_2 ☐NO_3/NO_2	Volatiles: ☐VOC ☐BTEX ☐THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use
BH1/SS2	30/08/17	PM	1			☑														
BH2/SS2	30/08/17	PM	1			☑														
BH5/SS2	30/08/17	PM	1			☑														
NH6/SS2	30/08/17	PM	1			☑														

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Ross Keller	31/8/17	2:45	Danielle Jaic	9/1/17	2:05pm
Danielle Jaic	9/1/17	2:30pm		9/1/17	2:40

Page 1 of 1
N°:

Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT