Parks Canada Parcs Canada

Canada

PARKS CANADA AGENCY

SPECIFICATION

RE-ISSUED FOR TENDER

Georges Island NHS, Halifax NS
Pilot Project Phase 1 (Site Grading)

Project # 30037080

June 18, 2021

TABLE OF CONTENTS

Pages

Division 00 - Procurement and Contracting Requirements

Section 00 01 07 - SEALS PAGE....1

Division 01 - General Requirements

Section 01 11 00 - SUMMARY OF WORK....2
Section 01 14 00 - WORK RESTRICTIONS....2
Section 01 29 00 - PAYMENT PROCEDURES....6
Section 01 33 00 - SUBMITTAL PROCEDURES....4
Section 01 35 29.06 - HEALTH AND SAFETY REQUIREMENTS....5
Section 01 35 43 - ENVIRONMENTAL PROTECTION PROCEDURES....5
Section 01 41 00 - REGULATORY REQUIREMENTS....1
Section 01 45 00 - QUALITY CONTROL....2
Section 01 52 00 - CONSTRUCTION FACILITIES....3
Section 01 56 00 - TEMPORARY BARRIERS AND ENCLOSURES....2
Section 01 71 00 - EXAMINATION AND PREPARATION....3
Section 01 74 11 - CLEANING....2
Section 01 74 21 - CONSTRUCTION/DEMOLITION WASTE MANAGEMENT AND DISPOSAL....3
Section 01 77 00 - CLOSEOUT PROCEDURES....2
Section 01 78 00 - CLOSEOUT SUBMITTALS....4

Division 02 - Existing Conditions

Section 02 50 00.02 - SITE REMEDIATION....2

Division 03 - Concrete

Section 03 30 00.01 - CAST-IN-PLACE CONCRETE SHORT FORM....3

Division 31 - Earthwork

Section 31 23 33.01 - EXCAVATING, TRENCHING AND BACKFILLING....8
Section 31 32 19.01 - GEOTEXTILES....3
Section 31 32 19.13 - GEOGRID....3
Section 31 37 00 - RIP-RAP....1

Division 32 - Exterior Improvements

Section 32 11 23 - AGGREGATE BASE COURSES....3
Section 32 15 40 - CRUSHED STONE SURFACING....3
Section 32 91 19.13 - TOPSOIL PLACEMENT AND GRADING....3
Section 32 92 19.16 - HYDRAULIC SEEDING....5

Division 33 - Utilities

Section 33 05 16 - MAINTENANCE HOLES AND CATCH BASIN STRUCTURES 3
Section 33 41 00 - STORM UTILITY DRAINAGE PIPING 4
Section 33 46 13.02 - FRENCH DRAINS.....3

Appendices

Appendix A - SITE PHOTO LOG
Appendix B - ARCHAEOLOGICAL MITIGATION MEASURES

Drawings

C-1 - EXISTING SITE PLAN
C-2 - NEW SITE PLAN
C-3 - DETAILS AND NOTES

END OF TABLE

Discipline	**Seal**
James Cunningham **Civil**	

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises the construction of civil works (site grading) for the new National Historic Site (NHS) Pilot Project located on Georges Island in Halifax, NS; and further identified as the "Work".

1.2 WORK SEQUENCE

.1 This work is being constructed on Parks Canada Agency's (PCA), hereby referred to as the Owner, lands and water lot. Contractor to coordinate with PCA representative or another representative as designated by PCA, such as the Engineer or Consultant, for all construction activities as well as any design inquiries and submissions. This representative will hereby be referred to as the Departmental Representative.

1.3 CONTRACTOR USE OF PREMISES

.1 Unrestricted use within the Limit of Construction to perform the work.

.2 Co-ordinate use of premises under direction of Departmental Representative.

.3 Obtain and pay for use of additional storage or work areas if required for operations under this Contract.

.4 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

1.4 EXISTING SERVICES

.1 Contractor must notify Departmental Representative immediately if Human Remains, Archaeological Remains, and Items of Historical or Scientific Interest are discovered on the site to gain information on action to be taken before continuing with the work.

.2 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.3 Prior to beginning excavation Work, notify Departmental Representative or authorities having jurisdiction, to clearly mark such locations to prevent disturbance during Work.

.4 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.5 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.

.6 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

.7 Provide temporary services when directed by Departmental Representative to maintain critical building systems.

.8 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

.10 Record locations of maintained, re-routed and abandoned service lines.

1.5 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy of each document as follows:
- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 List of Outstanding Shop Drawings.
- .6 Change Orders.
- .7 Other Modifications to Contract.
- .8 Field Test Reports.
- .9 Copy of Approved Work Schedule.
- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Other documents as specified.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, ramps or ladders, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.

.2 Contractor to provide own washroom facilities and power as deemed necessary to complete the Work. Keep facilities clean. The existing onsite bathroom is not to be used.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Closures: protect work temporarily until permanent enclosures are completed.

1.3 EXISTING SERVICES

.1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

1.4 SPECIAL REQUIREMENTS

.1 Work Hours are Monday to Friday from 07:00 to 21:30 hours, to match HRM noise bylaw N-200. Departmental Representative to approve work on Saturdays, Sundays and Statutory Holidays. PCA will not be authorizing additional payment for overtime.

.2 Carry out noise generating work Monday to Friday from 07:00 to 20:00 hours. Departmental Representative to approve work on Saturdays, Sundays and Statutory Holidays.

.3 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, and security regulations.

.4 Keep within limits of work.

.5 Deliver materials to the Site Monday to Friday between 07:00 to 20:00 unless otherwise approved by Departmental Representative.

.6 Other construction with various contractors may be occurring concurrent with the construction of this phase of the project on Georges Island. Contractor to coordinate with Departmental Representative to ensure a corridor for other contractors is available on to and off of the wharf at all times, or as deemed necessary by the Departmental Representative.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS OF THE TENDER FORM

.1 Unit prices and Lump Sum prices bid are full compensation for the work necessary to complete each item in the Contract and in combination for all work necessary to complete the Work as a whole.

.2 All measurement shall be along a horizontal plane unless otherwise indicated.

.3 Any quantities listed in the associated Tender Form are approximate only and are for the purpose of tendering. Payment to the Contractor will be based on actual quantities of work completed in accordance with the drawings and specifications.

.4 The numbers of the items described below correspond to the items in the Tender Form.

1.2 MEASUREMENT AND PAYMENT

LUMP SUM ITEMS

.1 Item 1 – Division 1 Requirements

.1 Terms of Payment: Lump Sum

.2 This item includes: mobilization, demobilization, permits, insurance, etc. 50% of this item to be paid when mobilization to site is complete. The remainder to be paid when the Work is complete and all materials, equipment, and other facilities have been removed from site, site cleaned and left in condition to the satisfaction of the Departmental Representative. Note that this item **does not** include the transportation of individual materials described in the itemized sections below.

.2 Item 2 - Section 02 41 13 – Remove & Dispose Misc. Debris

.1 Unit of Measurement: Lump Sum.

.2 This item includes: Excavation, hauling, transportation, and disposal of miscellaneous construction debris offsite. This includes, but is not limited to, the following: scrap metal and wood, bricks, pieces of rubber, geotextile, etc.

.3 Items 3 & 4 - Section 31 37 00 – Rip-Rap

.1 Unit of Measurement: Lump Sum.

.2 This item includes: Supply of material including transportation to site, and placement of material to lines and elevations indicated.

MAIN LANDING AREA

.4 Item 5- Section 31 23 33.01 – Common Excavation

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method between cross sections taken after topsoil removal (if applicable) to lines and elevations indicated.

.3 This item includes: Excavation of suitable (common) material, stockpiling, and placement to lines and elevations indicated, as well as any shoring, bracing, cofferdams, underpinning and de-watering of excavation required.

.5 Item 6- Section 31 23 33.01 – Imported Common

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Supply of suitable (common) material including transportation to site, and placement of material to lines and elevations indicated, as well as any shoring, bracing, cofferdams, underpinning and de-watering of excavation required.

.6 Item 7 - Section 31 32 19.01 – Non-woven Geotextile

.1 Unit of Measurement: Square Meters (m^2).

.2 Method of Measurement: Two-dimensional measure of indicated area.

.3 This item includes: Supply, transportation, and placement of material as indicated.

.7 Item 8 - Section 31 32 19.13 – High-performance Tri-Axial Geogrid

.1 Unit of Measurement: Each (Ea.)

.2 Method of Measurement: Per roll.

.3 This item includes: Supply, transportation, and placement of material as indicated.

.8 Item 9 - Section 32 11 23 – 100mm Type 1 Gravel

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Supply of approved Type 1 gravel material including transportation to site, and placement of material to lines and elevations indicated, as well as compaction as indicated.

.9 Item 9 - Section 32 15 14 – 100mm Crusher Dust

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Supply of approved crusher dust material including transportation to site, and placement of material to lines and elevations indicated, as well as compaction as indicated.

.10 Item 11 - Section 33 41 00 – 150mm dia. PVC Pipe

.1 Unit of Measurement: Meter (m).

.2 Method of Measurement: Along centreline of new pipe.

.3 Payment for this item includes:

.1 Excavation of trench.

.2 Supply including transportation to site, placement and compaction of bedding and backfill material.

.3 Supply including transportation to site, and placement of new pipe and any required appurtenances.

.4 Shoring, bracing, cofferdams, underpinning and de-watering of excavation if required.

.5 Pipe testing as indicated.

.11 Item 12 - Section 33 46 13.02 – French Drain c/w 150 dia. Perforated PVC Pipe

.1 Unit of Measurement: Meter (m).

.2 Method of Measurement: Along centreline of new pipe.

.3 Payment for this item includes:

.1 Excavation of trench.

.2 Supply including transportation to site, placement and compaction of bedding and backfill material.

.3 Supply including transportation to site, and placement of new pipe and any required appurtenances, including new end of pipe cleanout.

.4 Supply including transportation to site, and placement of trench geotextile material.

.5 Shoring, bracing, cofferdams, underpinning and de-watering of excavation if required.

.6 Pipe testing as indicated.

.12 Item 13 - Section 32 91 19.13 & 32 92 19.16 – 100mm Topsoil and Hydro-seed

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Supply including transportation to site, placement and compaction of topsoil, fine grading, hydroseeding, and any required lime and fertilizer as indicated.

BATHROOM AREA AND STORM SYSTEM UPGRADES

.13 Item 14 - Section 03 30 00.01 - Repair Portion of Existing Concrete Swale

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Supply of suitable concrete material and any associated reinforcing and formwork that may be required, including transportation to site, and placement of material to lines and elevations indicated.

.14 Item 15 - Section 31 23 33.01 – Imported Common

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Supply of suitable (common) material including transportation to site, and placement of material to lines and elevations indicated, as well as any shoring, bracing, cofferdams, underpinning and de-watering of excavation required.

.15 Item 16 - Section 31 32 19.01 – Non-woven Geotextile

.1 Unit of Measurement: Square Meters (m^2)

.2 Method of Measurement: Two-dimensional measure of indicated area.

.3 This item includes: Supply, transportation, and placement of material as indicated.

.16 Item 17 - Section 32 11 23 – 100mm Type 1 Gravel

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Supply of approved Type 1 gravel material including transportation to site, and placement of material to lines and elevations indicated, as well as compaction as indicated.

.17 Item 18 - Section 32 15 14 – 100mm Crusher Dust

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Supply of approved crusher dust material including transportation to site, and placement of material to lines and elevations indicated, as well as compaction as indicated.

.18 Item 19 - Section 32 91 19.13 & 32 92 19.16 – 100mm Topsoil and Hydro-seed

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Supply including transportation to site, placement and compaction of topsoil, fine grading, hydroseeding, and any required lime and fertilizer as indicated.

.19 Item 20 - Section 33 05 16 – 750mm dia. Concrete Pipe Catch Basin

.1 Unit of Measurement: Each (Ea.).

.2 Method of Measurement: Per unit.

.3 This item includes:

.1 Excavation for catch basin placement.

.2 Supply including transportation to site, placement and compaction of bedding and backfill material.

.3 Supply of suitable concrete base material and associated reinforcing and formwork, including transportation to site, and placement of material to lines and elevations indicated.

.4 Supply including transportation to site, and placement of new catch basin, grate, and any required appurtenances.

.5 Shoring, bracing, cofferdams, underpinning and de-watering of excavation if required.

.6 Catch basin testing as indicated.

.20 Item 21 - Section 33 41 00 – 250mm dia. PVC Pipe

.1 Unit of Measurement: Meter (m).

.2 Method of Measurement: Along centreline of new pipe.

.3 Payment for this item includes:

.1 Excavation of trench.

.2 Supply including transportation to site, placement and compaction of bedding and backfill material.

.3 Supply including transportation to site, and placement of new pipe and any required appurtenances.

.4 Connection to new catch basin.

.5 Shoring, bracing, cofferdams, underpinning and de-watering of excavation if required.

.6 Pipe testing as indicated.

MISCELLANEOUS ITEMS

.21 Item 22 - 02 50 00.02 - Disposal of Contaminated Common Offsite

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Removal, transportation, and disposal of excavated and/or stockpiled contaminated common material from site to an approved facility.

.22 Item 23 - Section 03 30 00.01 - New Portion of Concrete Swale

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Supply of suitable concrete material and associated reinforcing and formwork including transportation to site, and placement of material to lines and elevations indicated.

.23 Item 24 - Section 03 30 00.01 - Repair Historical Catch Basin to Design Grade (Optional Item)

.1 Unit of Measurement: Cubic Meters (m^3).

.2 Method of Measurement: Average end area method.

.3 This item includes: Supply of suitable concrete material and any associated reinforcing and formwork required including transportation to site, and placement of material to lines and elevations indicated. It may also include repairs to the existing grate if it is damaged.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 Submit to the Departmental Representative the submittals listed for review. Submit promptly and in orderly sequence to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings and product data in SI Metric units.

.4 Where items or information is not produced in SI Metric units, converted values are acceptable.

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are co-ordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative’s review of submittals.

.9 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada as required.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 14 days for the Departmental Representative's review of each submission.

.5 Adjustments made on shop drawings by the Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Departmental Representative prior to proceeding with Work.

.6 Make changes in shop drawings as the Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify the Departmental Representative in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing and product data.
- .5 Other pertinent data.

.8 Submissions include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.9 After the Departmental Representative's review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as the Departmental Representative may reasonably request.

.11 Submit electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by the Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copy of test reports for requirements requested in specification Sections and as requested by the Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
.2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copy of certificates for requirements requested in specification Sections and as requested by the Departmental Representative.
.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
.2 Certificates must be dated after award of project contract complete with project name.

.14 Submit electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by the Departmental Representative.
.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by the Departmental Representative.

.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.17 Submit electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by the Departmental Representative.

.18 Delete information not applicable to project.

.19 Supplement standard information to provide details applicable to project.

.20 If upon review by the Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, reviewed electronic copy will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.21 The review of shop drawings by the Departmental Representative is for sole purpose of ascertaining conformance with general concept.
.1 This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 DIGITAL COPY

.1 Provide digital copies in PDF format of all reviewed submittals.

1.4 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

.2 Submit transcription of insurance immediately after award of Contract.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Canada Occupational Health and Safety Regulations (1986). Amended.

.2 Provincial legislation – Nova Scotia Occupational Health and Safety Act (1996). Amended.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
- .1 Results of site specific safety hazard assessment.
- .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.

.3 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.4 Submit copies of incident and accident reports.

.5 Submit WHMIS SDS - Safety Data Sheets.

.6 The Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor.

.7 The Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to the Departmental Representative.

.9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

.1 File Notice of Project with Provincial authorities prior to beginning of Work. Provide the Departmental Representative with a copy of the filed Notice(s) prior to commencement of the work.

1.4 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

1.5 REGULATORY REQUIREMENTS

.1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

1.6 GENERAL REQUIREMENTS

.1 Contractors are required under Nova Scotia Occupational Health and Safety Act, and the Regulations made pursuant to the Act to have in place a Health and Safety Program. Compliance requirements for the content, detail and implementation of the program resides with the provincial authority. For the purpose of this contract the Health and Safety Program shall include a site-specific Health and Safety Plan (the "Plan") that acknowledges, assesses and addresses hazardous substances and/or hazardous conditions known and identified and on-going hazard assessments performed during the progress of work identifying and documenting new or potential health risks and safety hazards not previously known and identified.

.2 Provide one copy of the Health and Safety Program to the Departmental Representative prior to commencement of work on the work site. The copy provided to the Departmental Representative is for the purpose of review against the contract requirements related to the known hazardous substances and/or hazardous conditions. The review is not to be construed to imply approval by the Departmental Representative that the program is complete, accurate and legislatively compliant with the Nova Scotia Occupational Health and Safety Act, and the Regulations made pursuant to the Act, and shall not relieve the Contractor of their legal obligations under such legislation.

.3 The Health and Safety Program shall include no texting or cell phone use permitted when driving or operating heavy equipment.

.4 The Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

.5 Contractor shall ensure that all site personnel are familiar with the contents of the Plan and maintain records for proof.

.6 Contractor shall employ measures to ensure all personnel entering the site are advised to abide by the Plan.

.7 The Departmental Representative reserves the right to demand the removal of any persons not complying with the Plan. Any persons removed from the site shall not be permitted re-entry unless authorized by the Departmental Representative.

1.7 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Contractor will be responsible and assume the role Constructor as described in the Occupational Health and Safety Act and Regulations for Construction Projects.

.3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.8 COMPLIANCE REQUIREMENTS

.1 Comply with the latest edition of the Occupational Health and Safety Act, and the Regulations made pursuant to the Act.

.2 Observe and enforce construction safety measures required by:
- .1 National Building Code of Canada (latest edition).
- .2 Nova Scotia Health and Safety Act.
- .3 Provincial Worker’s Compensation Board.
- .4 Municipal statutes and ordinances.
- .5 In event of conflict between any provisions of above authorities the most stringent provision shall apply.

.3 Provide and maintain Worker's Compensation Board coverage for all employees for the duration of the contract. Prior to commencement of the work, at the time of Interim Completion and prior to final payment, provide to the Departmental Representative a letter of Clearance from the Workers' Compensation Board indicating that the Contractor's account is in good standing.

1.9 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise the Departmental Representative verbally and in writing.

.2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise the Departmental Representative verbally and in writing.

1.10 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, a competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
- .1 Have site-related experience specific to activities performed under this Contract.
- .2 Have working knowledge of occupational safety and health regulations.
- .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
- .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .5 Be on site during execution of Work and report directly to site supervisor.

1.11 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with the Departmental Representative.

1.12 ACCIDENT REPORTING

.1 Investigate and report incidents and accidents as required by the Nova Scotia Occupational Safety and Health Act, and the Regulations made pursuant to the Act.

.2 For the purpose of this contract, immediately investigate and provide a report to the Departmental Representative on incidents and accidents that involve:

- .1 A resulting injury that may or may not require medical aid but involves lost time at work by the injured person(s).
- .2 Exposure to toxic chemicals or substances.
- .3 Property damage.
- .4 Interruption to adjacent and/or integral infrastructure operations with potential loss implications.

.3 In the investigation and reporting of incidents and accidents, the Contractor is required to respond in a timely fashion to correct the action that was deemed to have caused the incident and/or accident and advise in writing on the action taken to prevent a re-occurrence of the incident and/or accident.

1.13 SITE CONTROL AND ACCESS

.1 Control all work site access points and work site activities. Delineate and isolate the work site from adjacent and surrounding areas by use of appropriate means of maintain control of all work site access points.

.2 Make provisions for granting permission to access onto work site to all persons who require access. Procedures for granting permission to access are to be in accordance with the Nova Scotia Occupational Health and Safety Act, and the Regulations made pursuant to the Act and the Contractor's Health and Safety Program.

.3 Ensure persons granted access to the work site are in possession of and wear the minimum personal protective equipment (PPE) designated by the Contractor's Health and Safety Program. Ensure persons granted access to the work site are provided with, trained in the use of, and wear, appropriate PPE that are required above and beyond the designated minimums previously noted and as specifically related to the work site activity that they are involved in. Be responsible for the efficacy of the PPE that is provided above and beyond the designated minimums.

.4 Erect signage at access points and at other strategic locations around the work site clearly identifying the work site area(s) as being "off-limits" to non-authorized persons. Signage must be professionally made with well understood graphic symbols and is not to be used as advertising but for the specific use as related to site safety and key contact information.

.5 Secure the work site at all times to protect against un-authorized access.

1.14 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by the Departmental Representative.

.2 Provide the Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 The Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.15 BLASTING

.1 Blasting or other use of explosives is not permitted.

1.16 WORK STOPPAGE

.1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Environmental Protection Act (1999) and relevant regulations. Amended.

.2 Fisheries Act, 1985, and relevant regulations. Amended.

.3 Migratory Birds Convention Act, 1994 and relevant regulations. Amended.

.4 Species at Risk Act (SARA), 2002 and relevant regulations. Amended.

.5 Canadian Environmental Assessment Act, 2012.

.6 Federal Policy on Wetland Conservation, 1991.

.7 Canada Occupational Health and Safety Regulations (1986). Amended.

.8 Provincial legislation – Nova Scotia Endangered Species Act (1998). Amended.

.9 Provincial legislation – Nova Scotia Water Act (1989). Amended.

1.2 GENERAL

.1 Comply with all federal, provincial, and municipal regulatory requirements and guidelines for environmental protection and natural resource conservation.

.2 Failure to comply with environmental requirements may result in a stop work order or assessment of damages commensurate with repair of damage.

.3 The Contractor will include in the bid all necessary costs to meet the environmental requirements. Request for extras will not be entertained.

1.3 CONTRACTOR'S RESPONSIBILITIES

.1 It is the Contractor's responsibility to be aware of environmental requirements and the best management practices and pollution control measures necessary to meet them.

.2 The Contractor is responsible to provide awareness training to site personnel with respect to spill response and sediment and erosion control.

.3 The Contractor is required to furnish all materials, labour, tools and equipment and perform all operations necessary to meet regulatory requirements and the environmental protection requirements of this project.

.4 The Contractor must comply with federal, provincial and local laws, ordinances, codes and regulations when handling, removing or disposing of impacted soil, water, waste materials, debris and rubbish.

.5 Provide and maintain for the duration of the contract the control features as laid out in this contract. During the course of the work, evaluation of the control features may

indicate a requirement for additional features or modifications to existing control features. The Contractor will be required to implement changes as necessary to meet the environmental protection objectives. Do not remove the control features unless authorized by the Departmental Representative.

1.4 MITIGATION PROCEDURES

.1 The Contractor shall ENSURE the following Mitigation procedures are followed:

- .1 Petrolium, Oils and Lubricants
  - .1 Do not refuel equipment within 100 meters of any watercourse, wetland or storm water catchbasin unless protection against spills is in place and location is approved by the Departmental Representative.
  - .2 Use petroleum containers approved for products with no spill fill spouts for dispensing fuels. Ensure pour nozzle has a self closing valve; prevent any flow of fuel until the nozzle is inserted into the receiving container. On removal from the receiving container, the slide valve closes to eliminate any fuel spill. Nozzles are to be equipped with automatic vent eliminating the need for the user to open or close air inlets on the pouring container.
  - .3 Nozzle must support the weight of the pouring container. Use Nozzles that automatically stop the flow when the receiving container becomes full.
  - .4 All spills of hydrocarbon-based products such as gasoline, kerosene, naptha, lubricating oils, engine oils, greases and de-icing fluids or antifreeze no matter how small must reported to the Departmental Representative.
- .2 Clearing and Grubbing
  - .1 Minimize stripping of topsoil and vegetation to prevent erosion and sedimentation of watercourses.
  - .2 Protect trees and plants on site and adjacent properties where required.
  - .3 Protect roots of trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .3 Waste Management
  - .1 Do not bury rubbish and waste materials on site.
  - .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers. Ensure proper disposal procedures in accordance with CEPA, TDGA, all applicable provincial regulations.
  - .3 Fires and burning of rubbish on site not permitted.
- .4 Surface Water Management
  - .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
  - .2 Do not pump water containing suspended materials or sediment into waterways, sewer or drainage systems.
  - .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- .5 Equipment Movement & Maintenance

.1 Park equipment on level ground in locations away from watercourses/wetlands and as approved by Departmental Representative. Equipment with leaks must be removed from site.
.2 When parking equipment on site, the equipment is to be secured from entry, inspected for leaks and the ground protected from leaks.
.3 Oil changes or equipment repairs is not permitted on site.
.4 Refuelling to be performed on level surfaces, PCC Portland cement concrete or HMAC surfaces when approved by the Departmental Representative.

.6 Erosion & Sediment Control
.1 Exposed soil must be stabilized as soon as possible through compaction, spreading Hay and/or seeding/sodding.
.2 Place hay bales between stockpiles and catch basins to minimize sediment transport.
.3 All perimeter control structures (e.g. silt fencing) must to be installed prior to any land disturbance.
.4 Erosion control structures need to be maintained and shall not be removed until the area is stabilized after construction activities are complete.

.7 Other Controls
.1 Ensure construction work does not adversely affect adjacent watercourses, wetlands, groundwater and wildlife.
.2 Maintain temporary erosion and pollution control features installed under this contract.
.3 Control emissions from equipment and plant to local authorities emission requirements.
.4 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
.5 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
.6 Ensure construction work does not contribute to excess air noise pollution exceeding municipal or any other applicable standards.
.7 Employ reasonable means necessary which has been approved by the Departmental Representative to protect salvaged materials from vandalism, theft, adverse weather, or inadvertent damage by heavy machinery.
.8 Use natural lighting to do Work where possible. Shut off lighting except those required for security purposes at end of each day.
.9 The Contractor shall remove all temporary structures at completion of work.

1.5 EMERGENCY & CONTINGENCY PLANNING

.1 The Contractor is responsible for emergency preparedness and contingency planning for all Environmental Incidences.
.1 The Contractor must have adequate supplies on site for clean up of any potential hazardous materials used for the completion of the work ie. fuel, oil, lubricants, etc.
.2 In the event of a spill the Contractor will immediately take corrective action to stop, contain and clean up the material.

.3 All spills are to be reported immediately to the Departmental Representative. In the event of a spill of over one (1) litre of a hazardous material, the Contractor will immediately inform proper authorities.

.4 Contractor employees to be trained in the use of the spill control kit and the equipment they contain.

.5 Contractor is to protect all wells, catch basins, drywells, drains, wetlands and watercourses from contamination in event of a spill.

.6 If a spill occurs, the Contractor must take necessary remedial action at no cost to the Owner and immediately remove as much of the contaminated soils as possible. Any remaining clean-up is to be performed at no cost to Owner. Clean-up shall be to the Departmental Representative's satisfaction.

.7 Disposal of spilled materials is to be off-site at approved locations for the materials to be disposed of. Contaminated soils/materials are to be placed in containers compatible to the contaminants.

1.6 KEY CONTACT LIST

.1 Prior to commencing construction activities or delivery of materials to site, the contractor shall provide:

.1 Names of persons responsible for ensuring adherence to Environmental Protection requirements.

.2 Names and qualifications of personsresponsible for training site personnel.

.3 Descriptions of environmental protection personnel training program.

1.7 HISTORICAL ARCHAEOLOGICAL CONTROL

.1 If during construction, historical, archaeological, cultural resources, biological resources and/or wetlands are discovered, the Contractor will give immediate notice to the Departmental Representative and await written instructions before proceeding with work.

1.8 NOTIFICATION

.1 The Departmental Representative will notify the Contractor in writing of observed noncompliance with Federal, Provincial or Municipal Environmental laws or regulations, permits, and this contract document. Most stringent shall apply.

.2 Contractor: after receipt of such notice, inform the Departmental Representative of proposed corrective action and take such action for approval by the Departmental Representative.

.3 The Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions will be granted or equitable adjustments allowed to Contractor for such suspensions.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 PERMITS

.1 Contractor shall apply for and obtain all construction related permits as required to complete the Work.

1.2 REFERENCES AND CODES

.1 Perform Work in accordance with National Building Code of Canada (latest edition) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Meet or exceed requirements of:
- .1 Contract documents.
- .2 Specified standards, codes and referenced documents.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

1.2 INSPECTION

.1 Allow the Departmental Representative and Engineer access to Work. This will include transportation to and from Georges Island to inspect the work, as deemed required by the Departmental Representative. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by the Departmental Representative instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 The Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, the Departmental Representative shall pay cost of examination and replacement.

1.3 TESTING AGENCIES

.1 Contractor shall engage a third-party materials testing agency for purpose of testing portions of Work as normally required under each Section.

.2 If defects are revealed during inspection and/or testing, the Departmental Representative will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by the Departmental Representative at no cost to Owner. Pay for costs of re-testing and re-inspection.

1.4 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.5 PROCEDURES

.1 Notify appropriate agency and the Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.6 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by the Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of the Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, the Departmental Representative will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by the Departmental Representative.

1.7 REPORTS

.1 Submit inspection and test reports in PDF format to the Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested.

1.8 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.2 INSTALLATION AND REMOVAL

.1 Indicate use of supplemental or other staging area.

.2 Provide construction facilities in order to execute work expeditiously.

.3 Remove from site all such work after use.

1.3 HOISTING

.1 Provide, operate and maintain hoists required for moving of workers, materials and equipment.

.2 Hoists to be operated by qualified operator.

1.4 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.5 CONSTRUCTION PARKING

.1 Parking will not be required on site as work is taking place on an island. However, storage of construction vehicles will be permitted for the duration of the work.

.2 Provide and maintain adequate access to project site.

1.6 SECURITY

.1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays as deemed necessary by Contractor.

1.7 OFFICES

.1 Not required under this contract and at the discretion of the Contractor.

1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials if deemed necessary to perform the Work.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.9 TEMPORARY WATER AND SEWER

.1 Provide any temporary water and sanitary facilities for work force in accordance with governing regulations and ordinances.

1.10 TEMPORARY COMMUNICATIONS FACILITIES

.1 Provide any temporary telephone, fax, data hook up lines and equipment as required to complete the work.

1.11 CONSTRUCTION SIGNAGE

.1 No other signs or advertisements, other than warning signs, are permitted on site unless approved or instructed by the Departmental Representative.

.2 Signs and notices for safety and instruction in both official languages. Graphic symbols to CAN/CSA-Z321.

.3 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by the Departmental Representative.

1.12 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material not in construction facilities.

.5 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Canadian General Standards Board (CGSB)
- .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)
- .1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.3 HOARDING

.1 Temporary construction site fencing is not required.

.2 Protect existing trees and landscaping elements from damage by equipment and construction procedures.

1.4 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

.2 Provide as required by governing authorities.

1.5 DUST TIGHT SCREENS

.1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

.2 Maintain and relocate protection until such work is complete.

1.6 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, and ramps as may be required for access to Work.

1.7 FIRE ROUTES

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.8 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.9 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Be responsible for damage incurred due to lack of or improper protection.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 QUALIFICATIONS OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to the Departmental Representative.

1.2 SURVEY REFERENCE POINTS

.1 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.2 Make no changes or relocations without prior written notice to the Departmental Representative.

.3 Report to the Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.4 Require surveyor to replace control points in accordance with original survey control.

1.3 SURVEY REQUIREMENTS

.1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and landscaping features.

.4 Stake slopes and berms.

1.4 EXISTING SERVICES

.1 Before commencing work, establish location and extent of service lines in area of Work and notify the Departmental Representative of findings.

.2 Remove abandoned service lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by the Departmental Representative.

1.5 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform the Departmental Representative of impending installation and obtain approval

for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by the Departmental Representative.

1.6 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of foundations and major site improvements, prepare a survey showing dimensions, locations, angles and elevations of Work. Record survey must be provided in both of the following formats:

.1 NAD83 UTM Zone 20 with CGVD2013 for vertical datum.

.2 NAD83(CSRS) Zone 5 with chart vertical datum.

.3 Record locations of maintained, re-routed and abandoned service lines.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

.1 On request of the Departmental Representative, submit documentation to verify accuracy of field engineering work.

.2 Submit certificate signed certifying those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.8 SUBSURFACE CONDITIONS

.1 Promptly notify the Departmental Representative in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should the Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by the Departmental Representative.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.6 Dispose of waste materials and debris off site.

.7 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.2 FINAL CLEANING

.1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris including that caused by Owner or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by the Departmental Representative.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.8 Remove dirt and other disfiguration from exterior surfaces.

.9 Sweep and wash clean paved areas.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 78 00 – Closeout Submittals.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:
- .1 Contractor's Inspection: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
  - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
  - .2 Request the Departmental Representative's inspection.
- .2 Departmental Representative's Inspection:
  - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
  - .2 Contractor to correct Work as directed.
- .3 Completion Tasks: submit written certificates in that tasks have been performed as follows:
  - .1 Work: completed and inspected for compliance with Contract Documents.
  - .2 Defects: corrected and deficiencies completed.
  - .3 Equipment and systems: tested, adjusted, balanced and fully operational.
  - .4 Operation of systems: demonstrated to Owner's personnel.
  - .5 Work: complete and ready for final inspection.
- .4 Final Inspection:
  - .1 When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.
  - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
- .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment:
  - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
  - .2 When Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

.8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.3 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.
.1 Remove surplus materials, excess materials, rubbish, tools, and equipment.

.2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 77 00 – Closeout Procedures.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.3 FORMAT

.1 Provide CAD files in dwg format on CD or memory stick.

.2 Provide redline as-built drawing mark-ups in PDF format on CD or memory stick.

.3 Provide other documentation in PDF format on CD or memory stick.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;
- .1 Date of submission; names.
- .2 Addresses, and telephone numbers of the Departmental Representative and Contractor with name of responsible parties.
- .3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:
- .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data.
- .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.5 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, at site for the Departmental Representative one record copy of:
- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Change Orders and other modifications to Contract.
- .5 Reviewed shop drawings, product data, and samples.
- .6 Field test records.

.7 Inspection certificates.
.8 Manufacturer's certificates.

.2 Store record documents in the field apart from documents used for construction.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry, and legible condition.
.1 Do not use record documents for construction purposes.

.5 Keep record documents available for inspection by Departmental Representative.

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line drawings.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.
.1 Do not conceal Work until required information is recorded.

.4 Record information in AutoCAD dwg files.

.5 Contract Drawings and shop drawings: mark each item to record actual construction, including:
.1 Measured depths of elements of foundation in relation to finish first floor datum.
.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
.3 Field changes of dimension and detail.
.4 Changes made by change orders.
.5 Details not on original Contract Drawings.
.6 References to related shop drawings and modifications.

.6 Specifications: mark each item to record actual construction, including:
.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
.2 Changes made by Addenda and change orders.

.7 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

.8 Provide digital photos, if requested, for site records.

1.7 FINAL SURVEY

.1 Submit final site survey certificate certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.
.1 Prepare a complete in-trench survey for all utilities.

.2 Prepare a complete as-built topographical survey to capture all surface features.

.2 Locate all walks, roadways, pads, buildings, trees, shrubs, poles, bollards, posts, abandoned utilities, capped utilities and new utilities within the construction area.

.3 Locate manholes and storm drainage catchbasins c/w inverts indicated by north, south, east, west location.

.4 Locate electrical manholes, poles, transformers, switching cubicles and specialty lights.

.5 Survey to be completed by a Construction Surveyor and be a registered Nova Scotia Land Surveyor.

.6 Provide survey on CD or memory stick in AutoCAD dwg format along with CSV or ASCI file of raw data points.

1.8 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty management plan to Departmental Representative.

.3 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Assemble approved information on CD or memory stick as follows:
- .1 Separate each warranty or bond to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.

.6 Respond in timely manner to oral or written notification of required construction warranty repair work.

.7 Written verification to follow oral instructions.
- .1 Failure to respond will be cause for the Owner to proceed with action against Contractor.

1.9 DELIVERY SCHEDULE

.1 Accompany Record Information submissions with a transmittal containing:
- .1 Date.
- .2 Project title and number.

.3 Contractor's name and address.
.4 Other pertinent data.

.2 Within four (4) weeks of substantial completion, or as otherwise agreed, the Contractor shall deliver the Record Information package with the data required as identified herein.
.1 Allow ten working days for the Departmental Representative's or Owner's review of each submission.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

1.2 REFERENCES

.1 Definitions:

.1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority.

.2 Approved disposal area: Disposal area as designated by the Owner.

.3 Class III: non-hazardous waste - construction renovation and demolition waste.

.4 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities.

.5 Inert Fill: inert waste - exclusively asphalt and concrete.

.6 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.7 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.8 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.9 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.10 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.11 Separate Condition: refers to waste sorted into individual types.

.12 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Prepare and submit on monthly basis, throughout project or at intervals agreed to by Departmental Representative the following:

.1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.

.2 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.

.3 Submit prior to final payment the following:

.1 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

1.4 USE OF SITE AND FACILITIES

.1 Execute Work with minimal interference and disturbance to normal use of premises.

.2 Maintain security measures established by facility.

1.5 WASTE PROCESSING SITES

.1 Contractor is responsible to research and locate waste diversion resources and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling.

.2 See Section 02 50 00 – Site Remediation for removal of impacted soils.

1.6 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled, and salvaged in locations so as to not interfere with Work.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to designated disposal facility.

.5 Protect structural components not removed and salvaged materials from movement or damage.

.6 Protect surface drainage, mechanical and electrical from damage and blockage.

.7 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.

.8 Separate and store materials produced during project in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off-site processing facility for separation.

.3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.

.4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

1.7 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste type into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials on-site as Work progresses.

1.8 SCHEDULING

.1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 APPLICATION

.1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.2 SUMMARY

.1 The existing soil is considered impacted with petroleum hydrocarbon, polycyclic aromatic hydrocarbon and or inorganic metal contamination exceeding provincial and federal soil quality guidelines. The work includes the excavation, transportation, and disposal of impacted soils from the Site to an approved offsite facility.

1.3 REFERENCE STANDARDS

.1 CCME (Canadian Council of Ministers of the Environment) Contaminated Sites, Contaminated Soil and Groundwater, and Remediation of Contaminated Sites most current publications.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Excavate, store, and handle impacted soil in accordance with applicable provincial and federal laws, regulations, codes and guidelines.

.2 Transport impacted soil by sealed and secure containers or other suitable devices with no spillage, loss or cross contamination from site of excavation to the approved disposal facility.

.3 Dispose of impacted soil generated on site as result of excavation activities including measures to minimize water run-off and fugitive dust generation.

.4 All personnel working with or in contact with the impacted soil shall implement the following measures:

.1 Personnel Protective Equipment – at a minimum, workers should wear long pants, long sleeves, gloves and safety glasses. Standard coveralls and work gloves are recommended as these can be removed at the end of the day and left on-site and eventually laundered, to avoid tracking soil and dust from the work site.

.2 Minimize Dust Generation - water down the work area to control dust or wear half-face respirators with P100 dust cartridges if dust cannot be contained.

.3 Clean zone / safe area – establish a safe location where workers may take lunch breaks and consume beverages away from the soil excavation work such as job trailer or an upwind exterior area.

.4 Practice Good hygiene – workers should wash hands before eating to avoid accidental ingestion of soil and dust. An on-site source of water, cleaning supplies and towels should be arranged for site workers.

.5 Decontamination – clean tools and equipment with soap and water when finished working impacted soils, prior to storage or use in other locations.

1.5 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.6 MATERIALS

.1 Not used.

Part 2 Execution

2.1 PREPARATION

.1 Protection:

.1 Install and maintain erosion and sediment control measures for the duration of the site remediation.

.2 Keep excavation area of free of standing water throughout work and manage surface drainage away from area of work.

.3 Protect and isolate excavation area from unnecessary vehicle or construction traffic during excavation of impacted soil.

.4 Provide temporary surfacing to prevent mixing of impacted soil with non-impacted soils during excavation.

2.2 METHOD OF REMEDIATION

.1 Soil Removal:

.1 Excavate impacted soil to sub-grade elevation within limits of the new landing area.

.2 Soil Transportation:

.1 Haul contaminated soil to and from the barge with care to prevent spillage or dust. Soil should be contained on the barge for the transportation from the island to the mainland.

.3 Soil Disposal:

.1 Dispose of contaminated soil at an approved facility.

2.3 RESTORATION

.1 Restore any areas disturbed or damaged soil surfaces as required.

2.4 EQUIPMENT DECONTAMINATION

.1 Decontaminate and clean equipment on completion of work in contact with impacted soil

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM A 1064/ A 1064M-2017, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.2 CSA International
- .1 CAN/CSA-A23.1/A23.2-2014, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN/CSA-A3000-13, Cementitious Materials Compendium.
- .3 CAN/CSA-G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.
- .4 CAN/CSA-S2269.1-16, Falsework and Formwork.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 00 11 10 – Standard Contract Specifications.

.2 Shop Drawings:
- .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
- .2 Shop Drawings to be sealed by a Professional Engineer Registered in the Province of Nova Scotia.

1.3 QUALITY ASSURANCE

.1 Provide to Departmental Representative, 4 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
- .1 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements.

1.4 DELIVERY, STORAGE AND HANDLING

1. Delivery and Acceptance Requirements:
   - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
     - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
     - .2 Deviations to be submitted for review by the Departmental Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 DESIGN CRITERIA

.1 Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

.1 Cement: to CSA A3001, Type GU.

.2 Water: to CSA A23.1/A23.2.

.3 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.

.4 Welded steel wire fabric: to ASTM A 1064.

.5 Other concrete materials: to CSA A23.1/A23.2.

2.4 MIXES

.1 Provide concrete mix to meet following hard state requirements:
- .1 Proportion concrete in accordance with CAN/CSA-A23.1/A23.2.
- .2 Durability and class of exposure: C-1.
- .3 Compressive strength at 56 days: 35 MPa minimum.
- .4 Intended application: All concrete works.
- .5 Aggregate size 20 mm maximum.
- .6 Slump: 80 +/- 20mm.

2.5 FORMWORK

.1 Contractor to design, construct and remove formwork, framing supports and bracing to CAN/CSA-A23.1-14 and CAN/CSA-S269.3-16 to provide finished, poured concrete surfaces within specified tolerances.

Part 3 Execution

3.1 PREPARATION

.1 Provide Departmental Representative 24 hours notice before each concrete pour.

.2 During concreting operations:
- .1 Development of cold joints not allowed.
- .2 Ensure concrete delivery and handling facilitates placing with minimum re-handling and without damage to existing structure or Work.

.3 Protect previous Work from staining.

.4 Clean and remove stains prior to application of concrete finishes.

3.2 INSTALLATION/ APPLICATION

.1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.

.2 Existing concrete swale repair:
.1 Form and cast swale to match existing dimensions and grade to satisfaction of Departmental Representative.

3.3 FINISHES

.1 Provide light broom finish on all exposed surfaces.

3.4 CURING

.1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.5 CLEANING

.1 Use trigger operated spray nozzles for water hoses.

.2 Designate cleaning area for tools to limit water use and runoff.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.
- .4 ASTM D698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).
- .5 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 Nova Scotia Transportation & Infrastructure Renewal (NSTIR) Standard Specification for Highway Construction and Maintenance.

.4 Canadian Environmental Protection Act (1999) and relevant regulations. Amended.

.5 Provincial legislation – Nova Scotia Occupational Health and Safety Act (1996). Amended.

.6 Canada Occupational Health and Safety Regulations (1986). Amended.

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
- .1 Rock: solid material in excess of 1.0 m^3 and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m^3 bucket. Frozen material not classified as rock.
- .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

.3 Topsoil:
.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.

.4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
.1 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management.

.5 Borrow material: material obtained from locations outside area to be graded and required for construction of fill areas or for other portions of Work.

.6 Unsuitable materials:
.1 Weak, chemically unstable, and compressible materials.
.2 Frost susceptible materials:
.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.2.
.2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

.3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
.2 Submit for review by Departmental Representative proposed dewatering methods as described in PART 3 of this Section.
.3 Submit to Departmental Representative written notice at least 7 days prior to excavation work.
.4 Submit to Departmental Representative written notice when bottom of excavation is reached.
.5 Submit to Departmental Representative testing results as described in PART 3 of this Section.

.3 Preconstruction Submittals:
.1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.

.2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field and location plan of relocated and abandoned services, as required.

1.5 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

.2 Submit design and supporting data at least 2 weeks prior to beginning Work.

.3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer licensed in the Province of Nova Scotia.

.4 Keep design and supporting data on site.

.5 Engage services of qualified professional Engineer who is licensed in the Province of Nova Scotia in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning if required for Work.

1.6 EXISTING CONDITIONS

.1 Buried services:
- .1 Before commencing work, verify or establish location of buried services on and adjacent to site by approved methods. Location of services shown on plans are approximate only and not deemed accurate.
- .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
- .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
- .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .5 Prior to beginning excavation Work, notify Departmental Representative and establish location and state of use of buried utilities and structures. Departmental Representative to clearly mark such locations to prevent disturbance during Work.
- .6 Confirm locations of buried utilities by approved methods.
- .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
- .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Costs for such Work to be paid by Contractor.
- .9 Record location of maintained, re-routed and abandoned underground lines.
- .10 Confirm locations of recent excavations adjacent to area of excavation.

.2 Existing buildings and surface features:
- .1 Conduct, with Departmental Representative, a condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey benchmarks and monuments which may be affected by Work.
- .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Common Fill: Common material from site which is free of stumps, trees, roots, organics, boulders and masonry larger than 150 mm in any dimension and other deleterious materials as approved by the Departmental Representative.

.2 Imported Common: Material from the Contractors own sources that meets the requirements for common fill which is free of stumps, trees, roots, organics, boulders and masonry larger than 150 mm in any dimension and other deleterious materials as approved by the Departmental Representative.

.3 Type 1 and Type 2 granular bedding and backfill in accordance with NSTIR Specifications.

.4 Clearstone for French drain in accordance with NS Standard Specifications for Municipal Services Type C5:

.1 Table:

Sieve Designation	% Passing
28 mm	100
20 mm	90 - 100
10 mm	0 - 40
5 mm	0 - 10

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.2 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 PREPARATION/PROTECTION

.1 Keep excavations clean, free of standing water, and loose soil.

.2 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.

.3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.4 Protect buried services that are required to remain undisturbed.

3.4 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with the Provincial Health and Safety Act.

.2 Construct temporary Works to depths, heights and locations as approved by Departmental Representative.

.3 During backfill operation:
- .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
- .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
- .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.

.4 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.5 Upon completion of substructure construction:
- .1 Remove cofferdams, shoring and bracing.
- .2 Remove excess materials from site.

3.5 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Provide for Departmental Representative's approval, the details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
- .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in manner not detrimental to public and private property, or portion of Work completed or under construction.
- .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

.6 Pump sediment laden water into vegetation a minimum of 30 meters from stream or wetland. Ensure no sediment laden water reaches sewers, watercourses, wetlands or drainage areas. If necessary, provide flocculation tanks, settling basins, geotubes or other treatment methods and facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses, wetlands or drainage areas.

3.6 EXCAVATION

.1 Advise Departmental Representative at least 7 days in advance of excavation operations.

.2 Excavate to lines, grades, elevations and dimensions as indicated.

.3 Excavation must not interfere with bearing capacity of adjacent foundations.

.4 Do not disturb soil within branch spread of trees or shrubs that are to remain.
- .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.5 For trench excavation, do not excavate more than 30 m of trench in advance of installation operations. All excavations shall be filled at end of workday prior to leaving site.

.6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of all excavated material as unsuitable material in approved location.

.9 Do not obstruct flow of surface drainage or natural watercourses.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.11 Notify Departmental Representative when bottom of excavation is reached.

.12 Obtain Departmental Representative approval of completed excavation.

.13 Remove unsuitable material from trench bottom and as directed by Departmental Representative.

.14 Hand trim, make firm and remove loose material and debris from excavations.
- .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

3.7 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated on drawings.

3.8 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Hand place material in uniform layers not exceeding 150 mm compacted thickness as indicated on drawings.

.2 Place bedding and surround material in unfrozen condition.

3.9 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:
- .1 Departmental Representative has inspected and approved installations.
- .2 Departmental Representative has inspected and approved of construction below finish grade.
- .3 Inspection, testing, approval, and recording location of underground utilities.
- .4 Removal of concrete formwork.
- .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.5 Backfilling around installations:
- .1 Place bedding and surround material as specified elsewhere.
- .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
- .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 300 mm.

3.10 TESTING

.1 Refer to Section 01 45 00 – Quality Control.

.2 Contractor shall carry out compaction testing of all bedding and backfill materials and submit testing results to Departmental Representative for review and approval as they become available. The Departmental Representative will not consider payment for placement of any granulars unless satisfactory test results are submitted by the Contractor.

.3 Final testing procedure and frequency of tests to be determined by the testing agency.

3.11 RESTORATION

.1 Replace topsoil as indicated.

.2 Reinstate lawns to elevation which existed before excavation.

.3 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

.4 Clean and reinstate areas affected by Work as directed by Departmental Representative.

.5 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

.6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 ASTM International

.1 ASTM A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM D3786, Standard Test Method for Bursting Strength of Textile Fabrics – Diaphragm Bursting Strength Tester Method

.3 ASTM D4355, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Zenon Arc-Type Apparatus.

.4 ASTM D4491, Standard Test Method for water Permeability of Geotextiles by Permittivity.

.5 ASTM D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

.6 ASTM D4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

.7 ASTM D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.8 ASTM D5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect geotextiles from direct sunlight and UV rays.

.3 Replace defective or damaged materials with new.

.3 Packaging Waste Management: remove for reuse by manufacturer of pallets, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIAL

.1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.

.2 Properties:

.1 Weight: Minimum 240 g/m^2 to ASTM D5261.

.2 Grab Tensile Strength: Minimum 800 N to ASTM D4632.

.3 Grab Elongation: 50 % to ASTM D4632.

.4 Tear Resistance: Minimum 333 N to ASTM D4533.

.5 Puncture Resistance: Minimum 467 N to ASTM D4833.

.6 Mullen Burst: Minimum 2412 N to ASTM D3786.

.7 Permittivity: Maximum 1.5 Sec^{-1} to ASTM D4491.

.8 Water Flow Rate: 4047 l/min/m2 to ASTM D4491.

.9 Apparent Opening Size (AOS): 0.180 mm to ASTM D4751.

.10 UV Stability: Minimum 70 % @ 500 hours to ASTM D4355.

.3 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/$m^2$to ASTM A123M.

.4 Factory seams: sewn in accordance with manufacturer's recommendations.

.5 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed Departmental Representative.

3.2 INSTALLATION

.1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated.

.2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

.4 Overlap each successive strip of geotextile 600 mm over previously laid strip.

.5 Join successive strips of geotextile by sewing.

.6 Pin successive strips of geotextile with securing pins at midpoint of lap.

.7 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.8 After installation, cover with overlying layer within 4 hours of placement.

.9 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

.10 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

.1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 31 23 33.01 – Excavating, Trenching, and Backfilling.

.4 Section 32 11 23 – Aggregate Base Courses.

.5 Section 32 15 40 – Crushed Stone Surfacing.

1.2 REFERENCES

.1 ASTM International

.1 ASTM D4101, Standard Specification for Polypropylene Injection and Extrusion Materials.

.2 ASTM D5262, Standard Test Method for Evaluating the Unconfined Tension Creep Behaviour of Geosynthetics.

.3 ASTM D6637, Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for geogrids and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 During delivery and storage, protect geogrids from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

.3 Packaging Waste Management: remove for reuse by manufacturer of pallets, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIAL

.1 Geogrid: open grid polymer having triaxial orientation, free of striations, roughness, pinholes, blisters, undispersed raw materials or any sign of contamination by foreign matter.

- .1 Roll width: 3m or 4m
- .2 Roll length: 75m or as required
- .3 Rib pitch: 40mm
- .4 Mid-rib depth: 1.2mm
- .5 Mid-rib width: 1.1mm
- .6 Aperture shape: triangular
- .7 Polymer:
  - .1 Polypropylene: to ASTM D4101 and to resist deterioration by ultra-violet and heat exposure (70%) and chemical degradation (100%).

.2 Geogrid physical properties:

- .1 Rigid geogrid junction efficiency: minimum 93% to ASTM D6637-10.
- .2 Isotropic Stiffness Ratio: 0.6
- .3 Radial stiffness at low strain: 225 kN/m @ 0.5% strain

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed Departmental Representative.

3.2 INSTALLATION

.1 Place geogrid material by unrolling onto graded surface in manner and locations indicated and retain in position in accordance with manufacturer's written recommendations.

.2 Overlap each successive strip of geogrid 600mm over previously laid strip.

.3 Join successive strips of geogrid as recommended by manufacturer.

.4 Protect geogrid from displacement, damage or deterioration before and during placement of overlaid aggregate, geotextiles and soil layers.

.5 After installation, cover with overlay layer within 10 days of placement.

.6 Replace damaged or deteriorated geogrid to approval of Departmental Representative.

.7 Place and compact soil layers in accordance with Section 31 23 33.01- Excavating Trenching and Backfilling.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

.1 Vehicular traffic not permitted directly on geogrid.

.2 Do not overload soil or aggregate covering on geogrid.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 32 19.01 - Geotextiles.

Part 2 Products

2.1 STONE

.1 Hard, with relative density (formally specific gravity) not less than 2.65, durable quarry stone, free from seams, cracks or other structural defects, to meet following size distribution for use intended:

.1 150 mm river stone rip-rap with colouring to match existing stones found on the shore of the island. Material must be approved by Departmental Representative and be graded as follows:

.1 None greater than: 225 mm

.2 50% to 85%: 150 mm

.3 100% greater than: 60 mm

Part 3 Execution

3.1 PLACING

.1 Where rip-rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.

.2 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.

.3 Place geotextile on prepared surface in accordance with Section 31 32 19.01- Geotextiles and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.

.4 Place rip-rap to thickness and details as indicated.

.5 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.

.6 Hand placing:

.1 Use larger stones for lower courses and as headers for subsequent courses.

.2 Stagger vertical joints and fill voids with rock spalls or cobbles.

.3 Finish surface evenly, free of large openings and neat in appearance.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 45 00 – Quality Control.

.2 Section 01 74 11 – Cleaning.

1.2 REFERENCES

.1 Nova Scotia Transportation & Infrastructure Renewal (NSTIR) Standard Specification for Highway Construction and Maintenance.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused granular material to local facility as approved by Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Type 1 granular in accordance with NSTIR Specifications.

Part 3 Execution

3.1 PREPARATION

.1 Temporary Erosion and Sedimentation Control:
- .1 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .2 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PLACING

.1 Place granular base after excavation of native material to subgrade and excavation is inspected and approved by Departmental Representative.

.2 Construct granular base to depth and grade in areas indicated on drawings.

.3 Ensure no frozen material is placed.

.4 Place material only on clean unfrozen surface, free from snow and ice.

.5 Begin spreading base material on crown line or on high side of one-way slope.

.6 Place material using methods which do not lead to segregation or degradation of aggregate.

.7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

.9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.10 Remove and replace that portion of layer in which material becomes segregated during spreading.

3.3 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Compact to density not less than 100 % SPMDD except over sinker shed foundation.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.4 Apply water as necessary during compacting to obtain specified density.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.

.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.4 PROOF ROLLING

.1 Not used.

3.5 TESTING

.1 Refer to Section 01 45 00 – Quality Control.

.2 Contractor shall carry out compaction testing of aggregate base courses and submit testing results to Departmental Representative for review and approval as they become available.

.3 Final testing procedure and frequency of tests to be determined by the testing agency. However, as a minimum, it is expected that testing results will be furnished for each lift of granular at a rate of one (1) test for every 200 m^2 placed. If compaction is not being obtained, this rate should be increased until satisfactory results are achieved.

3.6 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.8 PROTECTION

.1 Maintain finished base in condition conforming to this section until succeeding asphalt material is construction or until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 45 00 – Quality Control.

.2 Section 01 74 11 – Cleaning.

1.2 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .2 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM D4318, Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m3).

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused granular material to local facility as approved by Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Granular topping (crusher dust):
- .1 Screenings: hard, durable, crushed stone particles, free from clay lumps, cementation, organic material, frozen material, and other deleterious materials.
- .2 Gradations: within limits specified when tested to ASTM C136 and ASTM C117.

Sieve Designation	% Passing
9.5 mm	100
4.75 mm	50-100
2.00 mm	30-65
0.425 mm	10-30
0.075 mm	5-10

Part 3 Execution

3.1 PLACING

.1 Place granular topping to compacted thickness as indicated on drawings.

.2 Place material in uniform layers not to exceed 150 mm compacted thickness.
- .1 Compact layer to 100% SPMDD in accordance with ASTM D698.

3.2 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Compact to density not less than 100 % SPMDD except over sinker shed foundation.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.4 Apply water as necessary during compacting to obtain specified density.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.

.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 PROOF ROLLING

.1 Not used.

3.4 TESTING

.1 Refer to Section 01 45 00 – Quality Control.

.2 Contractor shall carry out compaction testing of crushed stone surfacing and submit testing results to Departmental Representative for review and approval as they become available.

.3 Final testing procedure and frequency of tests to be determined by the testing agency. However, as a minimum, it is expected that testing results will be furnished for each lift of granular at a rate of one (1) test for every 200 m^2 placed. If compaction is not being obtained, this rate should be increased until satisfactory results are achieved.

3.5 SITE TOLERANCES

.1 Finished surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.7 PROTECTION

.1 Maintain finished surface in condition conforming to this section until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 11 - Cleaning.

1.2 REFERENCES

.1 Agriculture and Agri-Food Canada
- .1 The Canadian System of Soil Classification, Third Edition, 1998.

.2 Canadian Council of Ministers of the Environment
- .1 PN1340, Guidelines for Compost Quality.

1.3 DEFINITIONS

.1 Compost:
- .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
- .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
- .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below 50) and contain no toxic or growth inhibiting contaminates.
- .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category A.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submittals:
- .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.

.2 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 TOPSOIL

.1 Mixture of particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.
- .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.
- .2 Contain no toxic elements or growth inhibiting materials.
- .3 Finished surface free from:
  - .1 Debris and stones over 50 mm diameter.
  - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
- .4 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

.1 Fertilizer:
- .1 Complete non-toxic, non-burning, slow release fertilizer.
- .2 Fertilizer analysis for hydroseeding areas, sodding areas and planting areas as determined from soil sample test.

.2 Peat moss:
- .1 Derived from partially decomposed species of Sphagnum Mosses.
- .2 Elastic and homogeneous, brown in colour.
- .3 Free of wood and deleterious material which could prohibit growth.
- .4 Shredded particle minimum size: 5 mm.

.3 Sand: washed coarse silica sand, medium to course textured.

.4 Organic matter: compost Category A in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.5 Limestone:
- .1 Ground agricultural limestone.
- .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

Part 3 Execution

3.1 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct.
- .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
- .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
- .2 Remove debris which protrudes more than 75 mm above surface.
- .3 Dispose of removed material off site.

.4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
- .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.2 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Place topsoil where designated after Departmental Representative has accepted grading work.

.2 Spread topsoil in uniform layers not exceeding 150 mm.

.3 Spread topsoil to following minimum depths after settlement.
- .1 150 mm for hydraulic seeding areas.

.4 Manually spread topsoil/planting soil around trees, shrubs and obstacles, as/if required.

3.3 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.
- .1 Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
- .1 Leave surfaces smooth, uniform and firm against deep foot printing.

3.4 ACCEPTANCE

.1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.5 SURPLUS MATERIAL

.1 Dispose of materials except topsoil not required where directed by Departmental Representative.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

1.2 SCHEDULING

.1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

.2 Scheduling:
.1 Schedule hydraulic seeding to coincide with preparation of soil surface.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for seed, mulch, tackifier, fertilizer, liquid soil amendments and micronutrients.

.3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:
.1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.
.2 Inoculant containers to be tagged with expiry date.

.3 Storage and Handling Requirements:
.1 Store fertilizer in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management.

1.6 WARRANTY

.1 For seeding, 12 months warranty period is extended to 1 full growing season.

.2 End-of-warranty inspection will be conducted by PCA Representative.

Part 2 Products

2.1 MATERIALS

.1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.
- .1 Grass mixture: "Certified", "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".
  - .1 Mixture composition:
    - .1 40 % Kentucky Blue Grass.
    - .2 40 % Creeping Red Fescue.
    - .3 20% Annual Rye Grass.

.2 Mulch: specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:
- .1 Type I mulch:
  - .1 Made from wood cellulose fibre.
  - .2 Organic matter content: 95% plus or minus 0.5%.
  - .3 Value of pH: 6.0.
  - .4 Potential water absorption: 900%.

.3 Tackifier: water dilutable, liquid dispersion.

.4 Water: free of impurities that would inhibit germination and growth.

.5 Fertilizer:
- .1 To Canada "Fertilizers Act" and Regulations.
- .2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for hydraulic seeding.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PROTECTION OF EXISTING CONDITIONS

.1 Protect structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.

.2 Immediately remove any material sprayed where not intended as directed by Departmental Representative.

3.3 PREPARATION OF SURFACES

.1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.

.2 Fine grade areas to be seeded free of humps and hollows.
- .1 Ensure areas are free of deleterious and refuse materials.

.3 Cultivated areas identified as requiring cultivation to depth of 25 mm.

.4 Ensure areas to be seeded are moist to depth of 150 mm before seeding.

.5 Obtain Departmental Representative's approval of grade and topsoil depth before starting to seed.

3.4 FERTILIZING PROGRAM

.1 Fertilize prior to fine grading, during establishment and warranty period in accordance with manufacturer’s recommendations. Fertilizing program shall be submitted to and approved by the Departmental Representative.

3.5 PREPARATION OF SLURRY

.1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to Departmental Representative. Supply equipment required for this work.

.2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.

.3 After materials are in seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.6 SLURRY APPLICATION

.1 Hydraulic seeding equipment:
- .1 Slurry tank.
- .2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and/or mechanical agitation method.
- .3 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.
- .4 Tank volume to be certified by certifying authority and identified by authorities "Volume Certification Plate".

.2 Slurry mixture shall be applied to surface in accordance with manufacturer's instructions.

.3 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.
- .1 Using correct nozzle for application.
- .2 Using hoses for surfaces difficult to reach and to control application.

.4 Blend application 300 mm into adjacent grass areas or sodded areas or previous applications to form uniform surfaces.

.5 Re-apply where application is not uniform.

.6 Remove slurry from items and areas not designated to be sprayed.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .1 Clean and reinstate areas affected by Work.

3.8 PROTECTION

.1 Protect seeded areas from trespass until plants are established.

.2 Remove protection devices as directed by Departmental Representative.

3.9 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of seed application until acceptance by Departmental Representative.

.2 Grass Mixture:
- .1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
- .2 Mow grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass.
- .3 Fertilize seeded areas after 10 weeks after germination provided plants have mature true leafs in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.
- .4 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.
- .5 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

3.10 ACCEPTANCE

.1 Seeded areas will be accepted by Departmental Representative provided that:
- .1 Seeded areas are free of rutted, eroded, bare or dead spots.
- .2 Areas have been mown at least twice.
- .3 Areas have been fertilized.

.2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.11 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:
- .1 Repair and reseed dead or bare spots to satisfaction of PCA Representative.
- .2 Mow areas seeded and remove clippings that will smother grassed areas as directed by PCA Representative.
- .3 Fertilize seeded areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

.3 Section 03 30 00.01 – Cast-In-Place Concrete Short Form.

.4 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.5 Section 33 41 00 – Storm Utility Drains.

1.2 REFERENCES

.1 ASTM International
- .1 ASTM A48/A48M-03(2012), Standard Specification for Gray Iron Castings.
- .2 ASTM A123/A123M-2012, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM C117-13, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
- .4 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .5 ASTM C478M-13, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).
- .6 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3(600 kN-m/m^3)).

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 CSA Group
- .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .2 CAN/CSA-A165 Series-04(R2009), CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
- .3 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .4 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data and Shop Drawings:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for maintenance holes and catch basin structures and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations.
- .2 Store and protect maintenance holes and catch basin structures from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 New Catch Basin: Concrete pipe with bell end pointed up.

- .1 Reinforced (65D strength class) circular concrete pipe and fittings to ASTM C76M or CSA A257 with flexible rubber gasket joints to CSA A257.
- .2 Lifting holes:
  - .1 Lift holes not to exceed two in piece of pipe.
  - .2 Provide pre-fabricated plugs to effectively seal lift holes after installation.

.2 Frames, gratings, covers to dimensions as indicated and following requirements:
- .1 Metal gratings and covers to bear evenly on frames.
  - .1 Frame with grating or cover to constitute one unit.
  - .2 Assemble and mark unit components before shipment.
- .2 Gray iron castings: to ASTM A48/A48M, strength class 30B.
- .3 Castings: sand blasted or cleaned and ground to eliminate surface imperfections.
- .4 Size: as specified.

.3 Concrete and associated materials as described in Section 03 30 00.01 – Cast-in-Place Concrete Short Form.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for maintenance holes and catch basin structures installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling as needed to perform further work and install a new catch basin. If, during the excavation of the new catch basin, the existing catch basin is discovered; the existing catch basin is to be used instead of installing a new catch basin.

.2 Obtain approval of Departmental Representative before installing catch basin and components.

.3 Place backfill as noted on drawings to ASTM D698.

3.3 INSTALLATION

.1 If during the excavation for the new catch basin, the existing catch basin is found, proceed to item 3.3.2. If the existing catch basin is not found during this excavation proceed to item 3.3.3.

.2 Repair existing catch basin with cast-in-place concrete as per Section 03 30 00.01 – Cast-in-Place Concrete Short Form, to the satisfaction of both the PCA and Departmental Representatives. The catch basin rim should be brought-up to design grade of proposed catch basin specified in the drawings. In addition, a hole may need to be cored for the new catch basin lead. Any existing outfall leads discovered are to be capped and filled and abandoned.

.3 Install new pre-cast concrete structures as detailed on drawings. All existing storm piping found in the vicinity of the new catch basin location must be redirected to drain into new catch basin. This may involve coring in the new structure.

.4 Inform Departmental Representative when installation is complete so that work can be inspected prior to backfilling.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.3 Section 33 05 16 – Manhole and Catch Basin Structures.

1.2 REFERENCES

.1 ASTM International

.1 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.2 CSA International

.1 CAN/CSA-B1800-06, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.

1.3 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certification to be marked on pipe.

.4 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect pipes from damage.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PLASTIC PIPE

.1 Type PSM Poly Vinyl Chloride (PVC): to CAN/CSA-B1800.

.1 Standard Dimensional Ratio (SDR): 35.

.2 Locked-in gasket and integral bell system.

2.2 PIPE BEDDING AND SURROUND MATERIAL

.1 Granular material in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

2.3 BACKFILL MATERIAL

.1 In accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 PREPARATION

.1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site.

3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Protect trench from contents of sewer.

.3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.1 Do not use blocks when bedding pipes.

.4 Shape transverse depressions as required to suit joints.

.5 Compact bedding as noted on drawings to ASTM D698.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

3.4 INSTALLATION

.1 Lay and join pipes to: ASTM C12.

.2 Handle pipe using methods approved by Departmental Representative.

.1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.5 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.6 Install plastic pipe and fittings in accordance with CAN/CSA-B1800.

.7 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative to prevent "creep" during down time.

.8 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.9 Make watertight connections to manholes and catch basins.

.1 Rubber gaskets shall be used for connecting pipes to new manholes.

.2 Kor-N-Seal fittings shall be used to connect pipes to existing manholes.

.10 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

3.5 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.

.1 Leave joints and fittings exposed until field testing is completed.

.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

.1 Do not dump material within 1.5 m of pipe.

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Compact each layer from pipe invert to underside of backfill as noted on drawings to ASTM D698.

.6 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.6 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.3 Compact backfill as noted on drawings to ASTM D698.

3.7 FIELD TESTS AND INSPECTIONS

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 Remove foreign material from sewers and related appurtenances by flushing with water.

.3 Television inspections:

.1 Carry out inspection of installed sewers by CCTV inspections and provide results to Departmental Representative for approval.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 CSA International

.1 CSA B1800-11, Thermoplastic Non-Pressure Pipe Compendium (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8, B182.11 and B182.13).

.1 CSA B182.2-11, PSM Type Polyvinylchloride (PVC) Sewer Pipe and Fittings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for pipe and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect drainage material from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PIPE

.1 Flexible plastic tubing and fittings: perforated, nominal inside diameter 150 mm.

.2 Rigid plastic pipe and fittings: to CSA B182.2, complete with fittings.

2.2 BEDDING AND SURROUND MATERIALS

.1 In accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling and as indicated.

.2 Geotextile filter: see Section 31 32 19.01 - Geotextiles.

2.3 BACKFILL MATERIAL

.1 In accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling and as indicated.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for drainage materials installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

.2 Make sure graded subgrade conforms with required drainage pattern before placing bedding material.

.3 Make sure improper slopes, unstable areas, areas requiring additional compaction or other unsatisfactory conditions are corrected to approval of Departmental Representative.

.4 Make sure foundation wall and any required waterproofing have been installed and approved by Departmental Representative before placing bedding material.

3.2 BEDDING PREPARATION

.1 Cut trenches in subgrade and place bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.2 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.3 Shape transverse depressions, as required, to suit joints.

.4 Compact each layer full width of bed to at least 98% SPMDD.

.5 Fill excavation below design elevation of bottom of specified bedding with compacted bedding material.

3.3 INSTALLATION

.1 Make sure pipe interior and coupling surfaces are clean before laying.

.2 Lay perforated pipe as indicated. For pipe face perforations and coupling slots downward.

.3 Lay non-perforated pipe as indicated from perforated pipe to disposal area. Make joints watertight.

.4 Grade bedding to establish pipe slope.

.5 Install end plugs at ends of collector drains to protect pipe ends from damage and ingress of foreign material.

.6 Connect non-perforated pipe to outlet as indicated by appropriate adapters.

3.4 PIPE SURROUND MATERIAL

.1 Upon completion of pipe laying and after Departmental Representative has inspected and approved Work in place, surround and cover pipe and install geotextile filter as indicated.

.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness, as indicated.

.3 Place layers uniformly and simultaneously on each side of pipe.

.4 Compact each layer from pipe invert to mid-height of pipe to at least 98% SPMDD.

.5 Compact each layer from mid-height of pipe to underside of backfill to at 98% SPMDD.

.6 Place low strength unshrinkable fill where compaction cannot be achieved using mechanical methods.

3.5 BACKFILL MATERIAL

.1 Place backfill material above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.2 Compact backfill to at least 95 % SPMDD to ASTM D698.

.3 Use appropriate compaction equipment.

.1 Conduct hand tamping around confined areas of pipe.

.2 Do not use water or other hydraulic means to place or consolidate backfill material.

3.6 FOUNDATION

.1 Not used.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Appendix A

Site Photo Log

Georges Island NHS Pilot Project Phase 1
Halifax, NS
Visual Site Survey - Aerial Legend (May, 2020)

Photo 1 - End of western sea wall looking east towards wharf.

Photo 2 - Edge of sea wall and most western ruins. Looking SE

Photo 3 - Most western ruins looking SE.

Photo 4 - North side of most western ruins. Looking east.

Photo 5 - Interior of the most western ruins. Looking east.

Photo 6 - Catch basin/well structure with steel grate between ruins.

Photo 7 - Interior of the most western ruins. Looking NW.

Photo 8 - Looking east towards site and new washroom from just south of catch basin/well structure.

Photo 9 - Catch basin/well structure and ruins. Facing NE.

Photo 10 - In between ruins, just north of catch basic/well. Looking east.

Photo 11 - Western sea wall looking west.

Photo 12 - Western sea wall looking east towards wharf (outdated - not showing new ramp).

Photo 13 - Looking south towards catch basin/well structure.

Photo 14 - Looking west at ruins.

Photo 15 - Ruins.

Photo 16 - New washroom facility**.** Facing SW.

Photo 17 - New washroom facility and adjacent road to Fort Charlotte. Facing south.

Photo 18 - Ammunition loading depot and grown-over concrete swale. Supposed location of catch basin.

Photo 19 - Ruins facing west.

Photo 20 - Ruins adjacent to shore rocks. Facing west.

Photo 21 - New sea wall landing area.

Photo 22 - New ramp, wharf, and sea wall landing area.

Photo 23 - Existing grade facing the Ammunition Loading Depot.

Photo 24 - Retaining wall, buried concrete swale, and road to Fort Charlotte.

Photo 25 - Retained pathway south of the new washroom.

Photo 26 - Looking north towards the new wharf down the road to Fort Charlotte (outdated - not showing new ramp).

Photo 27 - Looking over the south side of the ammunition loading depot and retaining wall.

Photo 28- Looking NE at the ammunition loading depot, retaining wall, and end of concrete swale.

Photo 29 - South side of new washroom and adjacent existing grade.

Photo 30 - Overgrown concrete swale along the road to Fort Charlotte.

Photo 31 - New wharf, ramp, and surrounding existing grade.

Photo 32 - Shore and existing grade just west of new wharf. Facing west.

Photo 33 - Existing grade with new landing area granulars. Looking at Coal Shed.

Photo 34 - New sea wall and landing area east of new wharf. Facing east.

Photo 35 - Existing grade facing SW towards road to Fort Charlotte and new washroom. Showing end of new ramp.

Photo 36 - Existing grade looking toward connecting-up shed. Showing Davit foundation and sinker shed column to

Photo 37 - New sea wall landing area looking towards Coal Shed.

Photo 38 - Coal shed.

Photo 39 - Existing grade taken from coal shed looking north towards new wharf.

Photo 40 - Existing grade along front of ruins.

Photo 41 - Existing grade in front of coal shed.

Photo 42 - Existing grade between coal shed and ruins.

Photo 43 - Existing grade behind coal shed facing south.

Photo 44 - Existing grade behind coal shed towards another building. Facing SE.

Photo 45 - Existing grade between coal shed, ruins, and other building. Facing east.

Photo 46 - Ruins beside coal shed.

Photo 47 - Shoreline facing NW towards new wharf.

Photo 48 - Shore and existing grade facing west towards wharf (outdated - not showing new landing area).

Photo 49 - New sea wall landing area, facing SW towards new washroom, and road to Fort Charlotte.

Photo 50 - Looking NE down the road to Fort Charlotte towards the new wharf.

Photo 51 - Ruins south of washroom facing NW.

Photo 52 - Looking NE toward washroom and new wharf (outdated - not showing new ramp or landing area).

Photo 53 - Existing grade just west of the start of the road to Fort Charlotte. Facing north.

Photo 54 - Existing grade just west of the start of the road to Fort Charlotte. Facing west.

Photo 55 - Ruins west of washroom and road to Fort Charlotte. Facing SW.

Photo 56 - New ramp, looking east.

Photo 57 - Ruins, sea wall, and existing grade west of new wharf. Facing west.

Photo 58 - Existing grade and new ramp.

Photo 59 - Excavation from existing catch basin investigation on May 4, 2020. Excavator dug ~1m with no findings.

Photo 60 - Excavation from existing catch basin investigation on May 4, 2020. After excavator dug ~1m with no findings another ~0.5m was dug by hand with no catch basin findings.

Photo 61 - Bottom of burried concrete swale was discovered during the excavation.

Photo 62 - Small PVC pipe (white) with wye connection as well as small corrugated pipe (black) discovered during the excavation.

Appendix B

Archaeological Mitigation Measures

Capping Strategy for the c. 1880s Sinker Shed (11B164)

a Key Structural Component of the Submarine Mining Establishment on George's Island NHS

Capping Over In-Situ Cultural Resources: Cultural Resource Sensitivity

The organic and inorganic cultural resources buried within an area of potential effect (APE) have been preserved for centuries due to prevailing environmental conditions that are defined by soil structure, soil chemistry, hydrodynamics, atmospheric pressure, temperature, biological effects, and soil loading. Changes to these variables alter the preservation capacity within a given area (Davis, 2012; Schiffer, 1987). For example, reduced water flow to damp, boggy terrain will affect the preservation of organic materials contained within that context because organic preservation in bogs depends on wet, anoxic conditions to inhibit microbial activity (Williams & Corfield, 2003).

Of course, archaeological features are naturally to be found in a state of degradation because they are not immune to "prevailing – or changing — burial conditions [e.g. the effects of bioturbation and cryoturbation]. However, the fact that (intact) archaeological finds are present at a site indicates that preservation conditions have been adequate in the past." (van Os, de Kort, & Huisman, 2012, p. 334).

Artifacts and features tend to be preserved in stratified, buried context; they are not crushed or impaired by depositional load because "cultural and environmental changes proceed at sufficiently gradual rates so that in most cases succeeding depositions are chemically and biologically compatible with the lower levels and decay of the lower levels is not accelerated." (Thorne, 1991, p. 1)

However, organic and inorganic materials decay differentially, partly due to their material characteristics and partly due to environmental conditions. "The properties of artifacts alone do not determine the way in which they will interact with the environment. The most 'perishable' artifacts, such as paper and textiles, can survive millennia under the right conditions." (Schiffer, 1987, p. 147)

As for material vulnerability generalities, porous ceramics such as earthenwares are vulnerable to moisture and compression; glass is vulnerable to moisture and both acidic and alkaline conditions; wood is vulnerable to compression, moisture and acidity in an oxygenated environment that favours bacterial and fungal attack; bone and shell are also vulnerable to compression, moisture and acidity in an oxygenated environment; and metals are vulnerable to solutions containing electrolytes, such as rainwater, as well as temperature, acidity, alternating wet/dry conditions, and availability of oxygen (Schiffer, 1987).

A significant potential threat to *in situ* preservation of cultural resources is **compression**. When a load, or surcharge, is rapidly added to a ground surface, its weight compresses the underlying terrain and impacts *in-situ* cultural resources by affecting both the depositional environment and the artifacts contained within the environment. Potential adverse effects include deformation of soil layers, accelerated decomposition, horizontal displacement, alteration of water regime, and changes in soil chemistry. (Davis, 2012; van Os, de Kort, & Huisman, 2012; Huisman, 2012).
Compression alters depositional contexts by deforming the horizontal distribution of cultural resources due to variations in subsurface relief or by co-mingling artifacts from stratified and distinct cultural and chronological contexts (de Lange, Bakr, Gunnink, & Huisman, 2012).
These effects greatly impair heritage values, archaeological investigation and subsequent interpretation of the site by deranging the original dispositional environment.

Developing a Capping Conservation Strategy

Capping, also known as 'intentional site burial' or *recouvrement* in French, involves judiciously covering an archaeological site with soft materials, such as soil or vegetation, or hard materials, such as asphalt or concrete, to protect the site, and it is most often considered in a development context. Once a cap has been installed, proposed activities may occur over the site without further conservation intervention.

"The aim of this approach is to actively maintain the burial environment conditions thought to be responsible for the *in situ* preservation of the remains, while still permitting development at ground level. A mitigation strategy which relies on a covering regime can use the following approach: existing soils may be left *in situ* but all engineering techniques are confined to a level above-ground surface. Though the site will be covered by construction activities, this is effectively an avoidance strategy, for example hardstanding, landscaping or foundation elements are placed on top of, or suspended above, the undisturbed ground surface." (Davis et al, 2004, p. 38)

"If construction activities are to be located above the *in situ* archaeology, either there must be no construction impact on the archaeological deposits, or it must be confined within an archaeologically devoid or sterilised layer at the surface (eg topsoil). The devoid layer will act as a buffer between the new development and underlying deposits. Alternatively, a material could be introduced above the archaeological deposits to act as a buffer zone, either in place of or in addition to an archaeologically devoid surface material." (Davis et al. 2015, p. 38).

the Standards and Guidelines for the Conservation of Historic Places in Canada, a pan-Canadian document adopted by Parks Canada in 2003, offers 'capping' as a possible methodology for protecting cultural resources from natural or human activity (Standards and Guidelines, 2nd ed. 2010, section 4.2.1). Of particular note, the Standards and Guidelines direction for capping is not prescriptive and the means by which this approach is suitable depends upon the nature of the proposed project and the unique heritage elements that may be impacted by the project.

In cases where there are no alternative locations for modern activity and a culturally-sensitive site has been selected for capping intervention, there are accepted conservation procedures for protecting *in situ* cultural resources within the APE, and these are listed below. However "there is no single evaluation methodology appropriate for all situations" (Department of Planning and Transportation, 2004, p. 14); each proposed impact must treated as a separate case. (Thorne, 1991; Williams & Corfield, 2003)

1. Research and document (file a report) the nature and condition of the *in situ* cultural resources, historically and physically, and determine material and structural vulnerabilities to a capping intervention. This may require desk-based assessments, geophysical survey, contour survey, chemical analysis, and archaeological excavation – testing or salvage operations.

2. Research and document (file a report) terrain conditions, chemically, hydraulically, and geologically, and determine suitability (e.g. appropriate soil permeability, density, stability) for a capping intervention. This may involve geophysical survey, contour survey, chemical analysis, and hydrological or other geotechnical investigations.

3. Based on information derived from Steps 1 and 2, engineer a capping strategy that will "insure that maximum protection is afforded the resource while minimizing any negative effects caused by such an overburden." (Thorne, 1991, p. 2)
   In other words, "the loading capacity of the burial material should replicate the previous burial conditions so that excessive loading does not introduce new pressures and to minimize further impact on the archaeological remains that are to be preserved in situ." (Department of Planning and Transportation, 2004, p. 25)
   The engineer needs to consider the potential long-term impacts of load pressure and altered drainage

patterns on *in situ* cultural resources when designing a capping strategy. Compression or compaction impacts are anticipated to last approximately thirty years, after which "all excess pore water pressure caused by the surcharge in the relatively poor permeable clay and peat layers will then be dissipated." (de Lange, Bakr, Gunnink, & Huisman, 2012, pp. 289-290)

4. Monitor and document (file a report) the installation process and ensure the engineered design is followed accordingly.
5. Carefully install the capping, following engineered specifications and ensuring that the site is protected during the placement process, "consideration should be given to damage to upper levels of the site that may result from the grinding action of heavy equipment traffic." (Thorne, 1991, p. 5)
6. During capping installation, embed monitoring mechanisms, such as compression test plots or electronic monitoring devices (e.g. displacement gauges) for short- and long-term inspection and assessment of the effectiveness of the capping strategy. Alternatively, define and mark post-burial test loci and schedule subsurface evaluations at specified time frames.
7. Provide an inert buffer, such as geofabric or iron-free sand between the terrain and capping material to protect the archaeological resources and act as a physical marker. (Department of Planning and Transportation, 2004)
8. Keep an eye on water movement around the capping during installation to identify potential drainage problems and rectify accordingly. When possible, install hydrology monitoring points to be later assessed.

Preparing a Capping Strategy for the Sinker Shed

Selection of an appropriate capping strategy for the sinker shed involved open communication between the project manager, engineer, and archaeologist. Discussion of key objectives for the activity, namely in-situ cultural resource preservation, design completion with positive drainage, and feasible installation methodology led to the following proposed installation steps:

1. Placement of geofabric layer over the backfilled sinker shed feature (approximately 13m E-W x 12m N-S allowing for ~1metre buffer around building perimeter) while skirting around elevated features that will protrude through the capping - the concrete davit foundation and 1-2 of the concrete pillars.
2. Careful placement of imported granular fill soil over geofabric to raise south elevation and to level off terrain where needed, 100mm at the south end of the padding and tapering northward, fill to be well-drained and debris-free (clean).
3. Careful placement of 100mm gravel layer atop granular fill, though anticipating layer will be thinner over north wall of the structure.
4. Placement of triaxial geogrid over gravel layer.
5. Careful placement of 100mm crusher dust layer atop geogrid.
6. Minimal compression of capping, minimal vibration impact to subsurface.

In all, a maximum of 300mm of capping layers will overlay the Sinker Shed structure, except where the Davit foundation and 1-2 concrete pillars protrude through the surface. Given the upper elevations of these structural elements, it is not possible to cover them and achieve design grade; they will be exposed to the elements and risk of further disturbance. It is possible that Visitor Experience interpretation techniques could shelter/mask these exposed elements of the Sinker Shed.

While a topographic survey of the Sinker Shed structure was not part of the archaeological recording, sufficient surface elevations were recorded to allow for observation of the surface terrain conditions within the Sinker Shed. The following plans and profiles (Figures 1-3) illustrate the elevations (MASL CGVD2013) and surface conditions prior to capping.

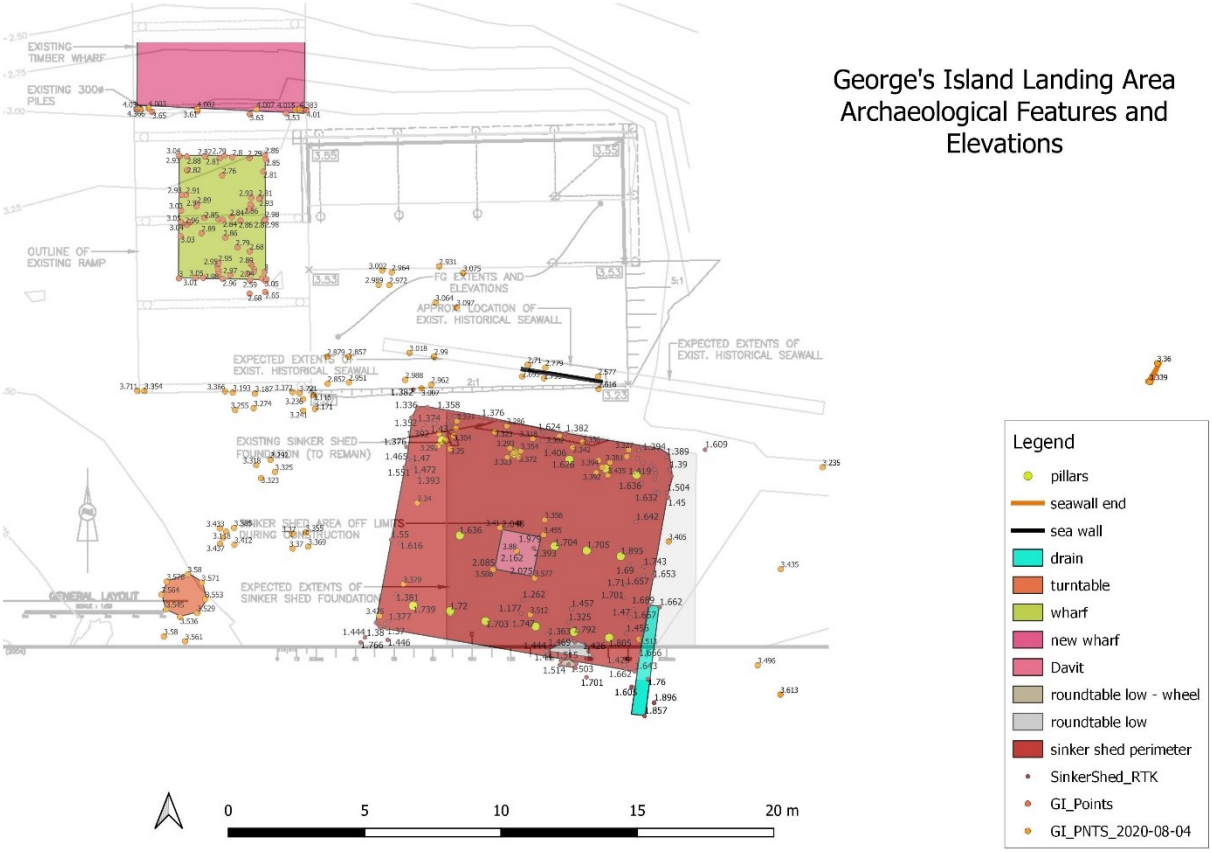

Figure 1: Plan of Sinker Shed with feature surface elevations (masl) in relation to the original wharf discovered in 2019 and the seawall design plan (seawall installed December 2020).

Figure 2: Overlay of Sinker Shed footprint (grey box with green dots identifying the pillars) in relation to projected Sinker Shed size/location (smaller blue box beneath grey box), the Landing Area construction boundary (pink polygon), and the culturally sensitive area within the work boundary (beige polygon). C.1900 Historical plan here shown for feature correlations.

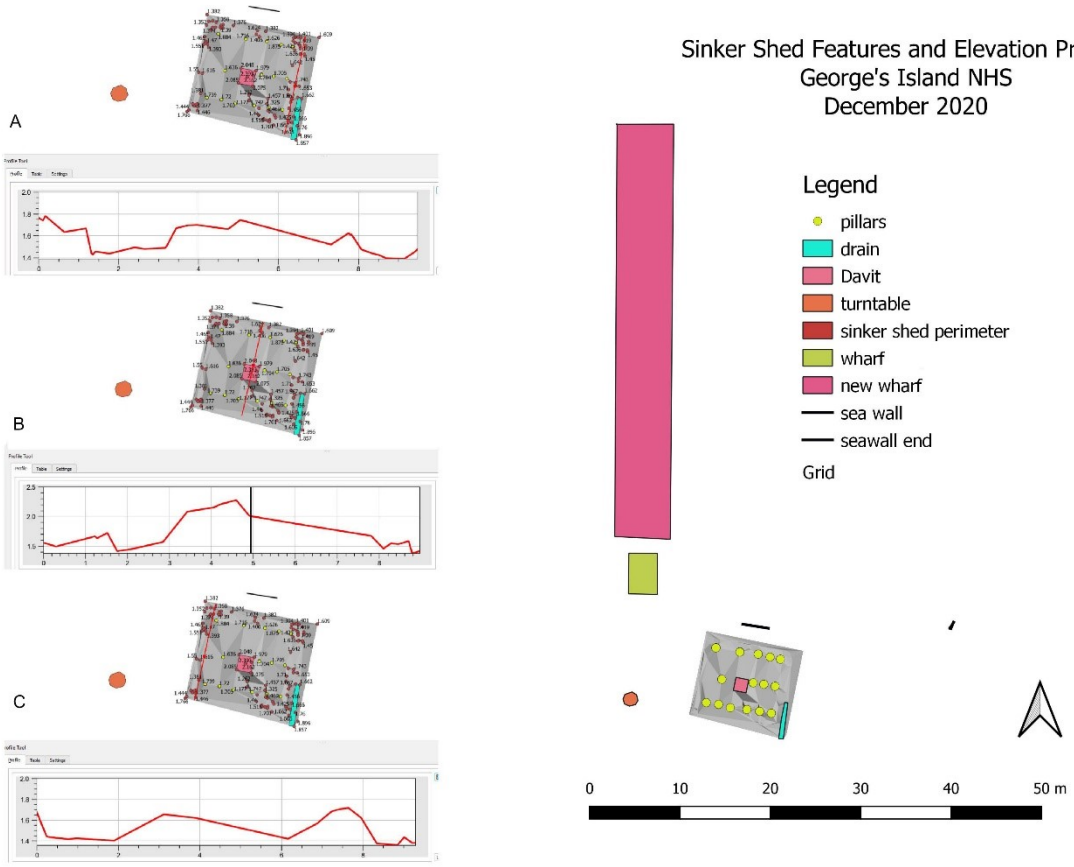

Figure 3: Plan of the Sinker Shed in relation to the new wharf, the remnants of an earlier wharf now covered by the wharf ramp, the exposed portions of the original seawall, and the turntable in front of the Loaded Mine Store. The cross-section profiles A, B, C (at left) illustrate the surface contours of the Sinker Shed based on RTK survey recorded during archaeological fieldwork in 2020.

The cross-sections shown in Figure 3 illustrate the uneven surface over which the capping fills are to be deposited. Figures 4-6 provide larger views of these profiles. The surface profiles are illustrated in relation to a capping layer (black line) set at approximately 2.0 MASL and tapering northward to 1.85 MASL (by means of example). In this scenario the capping is shown to provide approximately 30cm of cover - in most cases. However, in some elevated locations, as shown in Figures 5 & 6, the capping will be very thin and unlikely to provide suitable protection for the in-situ features. This is the case for most of the concrete pillars, a concrete pad along the east wall, and the brick footer wall at the north end of the building. Please refer to the forthcoming archaeological report by Boreas Heritage Consulting for details about these structural elements.

Geogrid reinforcement has been included in the capping design to help alleviate compression impacts where there is less than ideal capping thickness over the Sinker Shed. However, the position of this structure should be factored into future site plans for maintenance, vehicular traffic, and site development in the Landing Area. The north end of the Sinker Shed will be most vulnerable to surface cover loss by maintenance activity such as grading and potentially erosion.

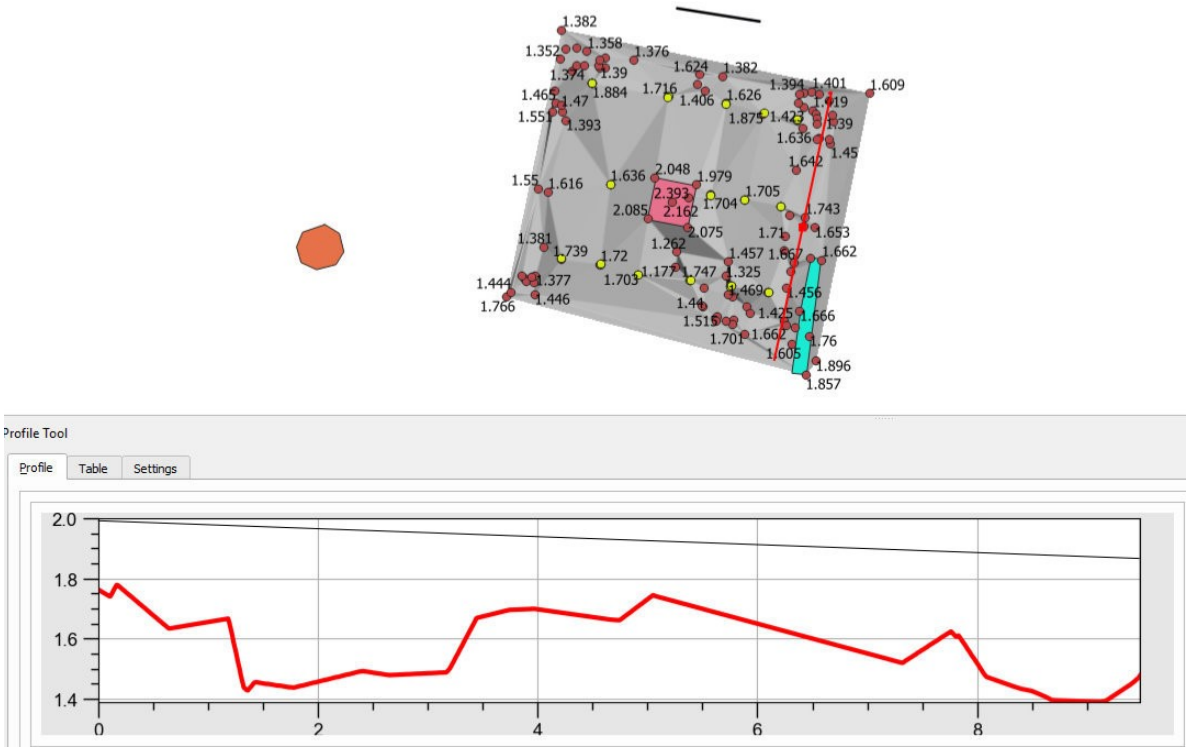

Figure 4: East cross-section of Sinker Shed, North at top. Cross section in metres, S→ N.

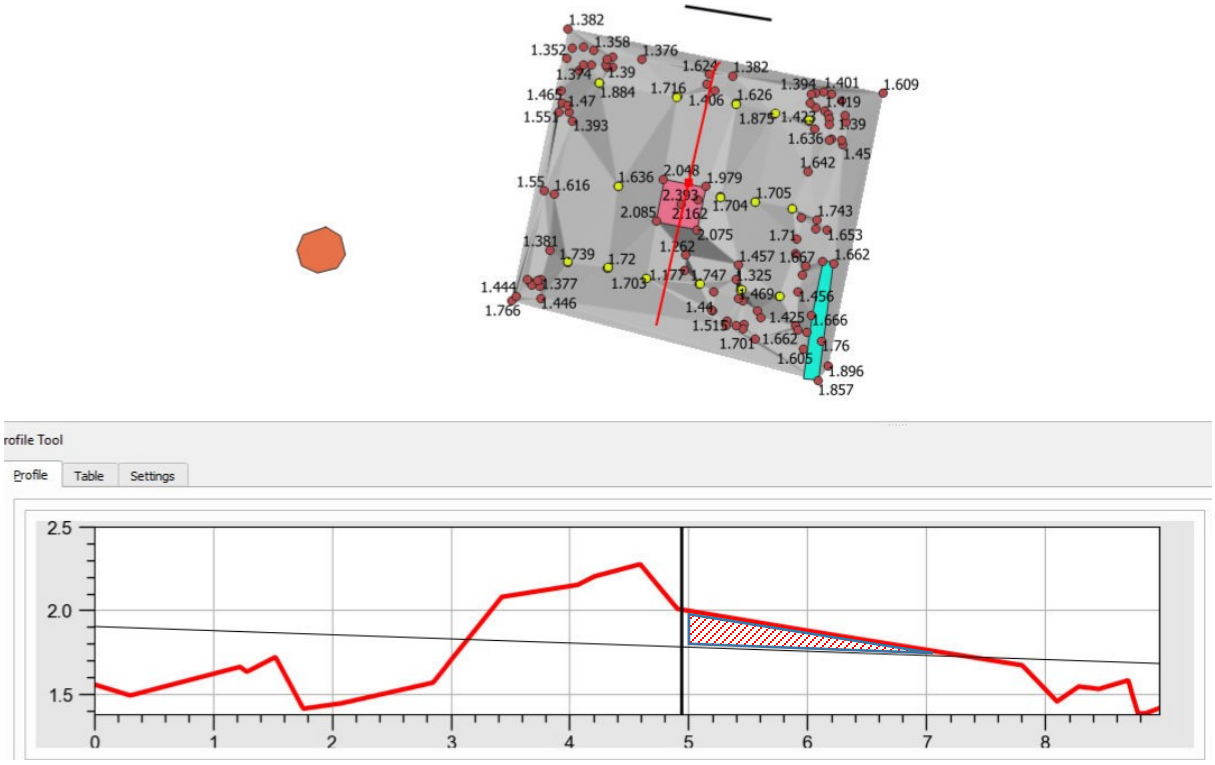

Figure 5: Central cross-section of Sinker Shed, North at top. Cross section in metres, S→ N. Note the elevation of the Davit at the 3.5-4.5m point, north of this the terrain is flatter than shown in this profile (slope due to elevation extrapolation between spaced survey points).

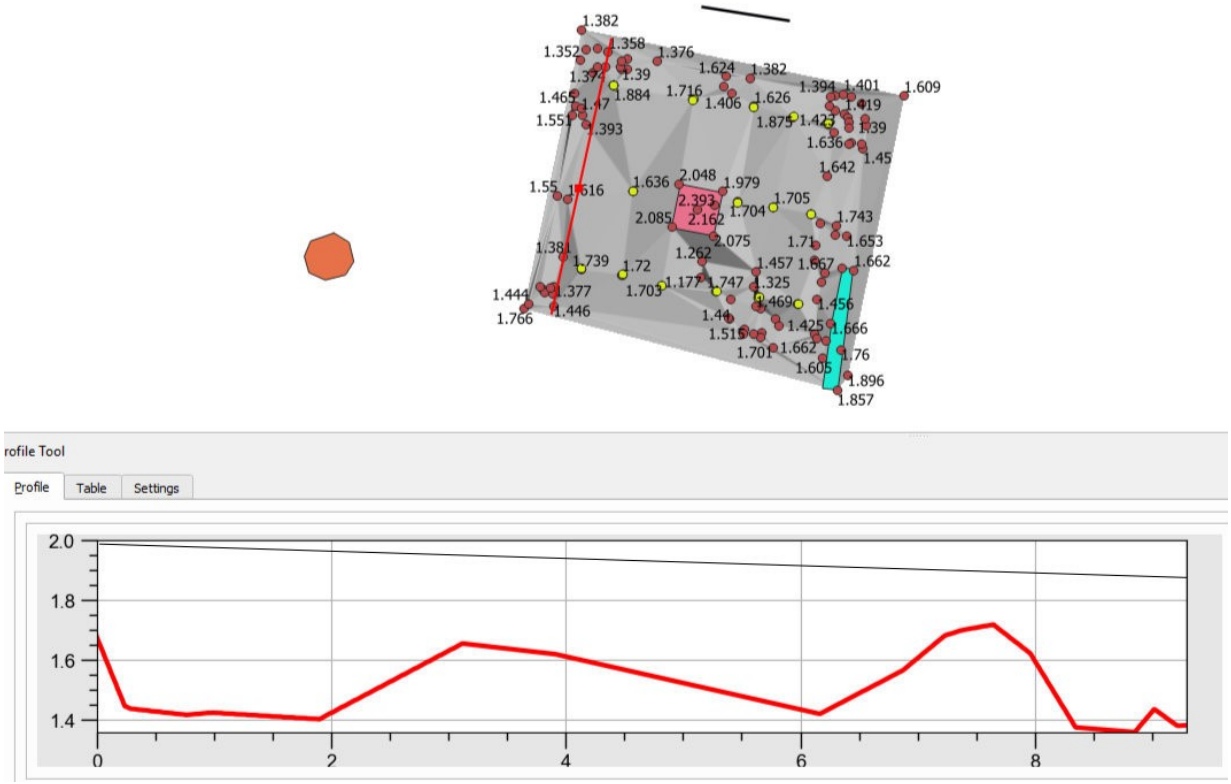

Figure 6: West cross-section of Sinker Shed, North at top. Cross section in metres, S→ N.

The Capping Strategy

Based on capping research, standard archaeological conservation measures, and the agreed-upon capping installation steps (as noted above), A capping strategy to preserve the recently uncovered Sinker Shed includes the following measures (completed steps identified by shading):

- Desk-based archaeological assessment of known and/or anticipated cultural resource within the APE;
- Archaeological survey and field testing of select areas within the APE to determine accuracy of historical documentation as well as nature and condition of in-situ cultural resources and soil conditions;
- GIS-based spatial organization of historical data to document heritage resources within the APE;
- Physical survey and plotting of final design in the field;
- Installation of protective padding with archaeological surveillance.
    a. Line the sinker shed structural elements and soil layers exposed through archaeological excavation with geofabric and backfill with the soil removed from the excavation units and screened through 1/4" mesh; these materials must stay in place. Reuse of soils removed from the excavation units contributes to cultural resource preservation by maintaining soil chemistry and permeability, as much as possible. Gradual settling of the backfilled soils contributes to preservation of structural elements by applying light compaction over time.

b. Place a layer of geofabric over the backfilled structure and approximately 0.5 metres beyond the lateral extent of the structure (as an outer buffer). The geofabric will serve as a permeable marker layer between the archaeological feature and overburden layer.

c. Install a compression test plot at the beginning stages of the capping installation as a means of tracking potential impacts/alterations to the resources beneath the capping. This test plot should be installed by the Project archaeologist.

d. Place a layer of clean, permeable fill soil atop the geofabric layer taking care that mechanical equipment does not travel over the archaeological feature. The soil should be deposited progressively, not driving over the uncapped surface. The machinery should be tracked and as lightweight as possible. It is expected that the fill layer will taper in thickness northward – 100mm at the south end and reducing northward as required.

e. Place 100mm of gravel over the fill and/or geofabric, adding the fill progressively and minimizing passes over the structure.

f. Cover the gravel layer with triaxial geogrid. Geogrid ends can be held down with small fill piles until capping layers are in place.

g. Place 100mm of crusher dust over the geogrid, adding the fill progressively.

h. The capping layers can then be subject to minimal compaction using lightweight machinery with minimal subsurface vibration. The capped area should be subject to less compaction than the surrounding Landing Area. Avoid the risk of over-compaction.

i. The surface grade of the capping should encourage positive drainage away from the structure.

- Production of archaeological summary document reviewing all steps of the capping process.

References

Davis, K.J, Gdaniec, K.L.A, Brice, M., & White, L. (2004). Mitigation of Construction Impacts on Archaeological Remains. Volume 1: Main Report. Museum of London for English Heritage.

Davis, M. (2012). A Study into the Mitigation of Construction Impacts on Archaeological Remains. In S. S. (Eds), *Conservation and Management* (pp. 283-292). Los Angeles: The Getty Onservation Institute.

de Lange, G., Bakr, M., Gunnink, J. L., & Huisman, D. J. (2012). A Predictive Map of Compression-Sensitivity of the Dutch Archaeological Soil Archive. *Conservation and Management of Archaeological Sites, 12*(1-4), 284-293.

Department of Planning and Transportation. (2004). *Archaeology in the City of London Archaeology Guidance: Planning Advice Note 3.* London: Corporation of London . Retrieved from https://www.cityoflondon.gov.uk/services/environment-and-planning/planning/planning-applications/submitting-planning-applications/Documents/planning-advice-note-3-archaeology-in-the-city-of-london.pdf

Huisman, D. (2012). Deep Impact: What Happens When Archaeological Sites are Built On? *Conservation and Management of Archaeological Sites, 14*(1-4), 60-71.

Schiffer, M. B. (1987). *Formation Processes of the Archaeological Record.* Albuquerque: University of New Mexico Press.

Thorne, R. (1991). *Archaeological Assistance Program Technical Brief No. 5: Intentional Site Burial.* US Department of the Interior. Retrieved from http://www.nsp.gov/archeology/pubs/techbr/tch5.htm#intro

van Os, B., de Kort, J. W., & Huisman, H. (2012). A Qualitative Approach for Assessment of the Burial Environment by Interpreting Soil Characteristics; A necessity for Archaeological Monitoring. *Conservation and Management of Archaeological Sites, 14*(1-4), 330-340.

Williams, J., & Corfield, M. (2003). Construction impacts on in situ preservation of archaeological sites and artefacts. *Proceedings of the 5th European Commission Conference on Research for Protection, Conservation and Enhancement of Cultural Heritage, Cracow, Poland May 2002* (pp. 276-279). Cracow: Polish Academy of Science.