Parks Canada Agency

South Mountain – Pavement Rehabilitation

Technical Specifications

ISSUED FOR TENDER

January 2017

Project Number: 670

WSP Project #: 151-06993

Specifications
Issued for Tender

Parks Canada Agency

Cabot Trail
South Mountain
Pavement Rehabilitation
Cape Breton Highlands National Park

Project No. 670
WSP Canada Inc.

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END OF SECTION

APPENDICES

LIST OF DRAWINGS

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Public Act (Nova Scotia), Pit and Quarry Guidelines, Asphalt Paving Plant Regulations, Environmental Construction Practice Specifications, Forest Improvement Act, National Parks Act and Regulations and Canadian Environmental Protection Act.

1.2 DESCRIPTION OF WORK

.1 The work will be carried out on the Cabot Trail within the boundaries of Cape Breton Highlands National Park (CBHNP) from Station 51+030.727 to 55+230.768 and from Station 59+500 to 62+792.063. Station 0+000 is at the Park Boundary at the Chéticamp River.

.2 Work on this project consists generally of the following:

.1 Carry out a preconstruction survey to:

.1 Establish 20 m stationing and placement of an offset stake at each 20 m station on which is written the chainage and centerline offset. Remove all stakes at completion of work.

.2 Record the direction, start station and end station of all pavement marking passing lanes within the project limits. Establish offset stake at each location and re-establish prior to new pavement marking.

.3 Establish the layout of pavement markings, delineation, stop lines and arrows, etc. prior to line stripping. Provide Departmental Representative with drawings of new layout locations prior to pavement marking.

.4 The preconstruction survey is considered incidental to Contract.

.2 Supply and operation of traffic control for duration of the project, including signs, electronic portable message boards, traffic control personnel, temporary traffic control signals and pilot vehicle including means of transporting cyclist and their bicycles thru the traffic control zone.

.3 The Contractor shall develop an Environmental Protection Plan for submission and approval prior to starting work based on the Parks Canada's Best Management Practices document. *Parks Canada National Best Management Practices – Roadway, Highway, Parkway and Related Infrastructure (May 2015)*/, attached in Appendix A.

.4 Removal and disposal of noted existing culverts and replacement with new culverts.

.1 Supply, placement and compaction of bedding, surround and backfill/sub-grade materials around culverts.

.2 Ditching at inlets and outlets of noted existing culverts. Ensure positive drainage.

.5 Site erosion and sediment control measures, including check dams, silt fencing, silt curtain, hay/straw bales, vegetative stabilization and other measures as required, maintained for the duration of the project.

.6 Supply and installation of pre-cast concrete rigid frame culvert, complete with associated segmental concrete retaining wall structures.

.1 Construction of reinforced cast-in-place concrete foundation.

.2 Diversion and maintenance of existing stream flow to allow construction of new culvert.

.3 Construction and removal of temporary travel lanes around the work zone.

.4 Diversion and maintenance of traffic along temporary travel lanes.

.5 Supply and operation of traffic control including temporary traffic lights, for duration of the project.

.6 Permanent channel realignment and amour stone placement.

.7 Removal and disposal of existing features within limit of contract including tree clearing and grubbing, asphalt pavement, CMP culvert and concrete structures and foundations.

.7 Pre-selective cold milling of the existing asphalt concrete in noted areas and reuse/disposal as required.

.8 Pulverization to a depth of 300mm of the existing asphalt concrete and granular materials.

.9 Grading, shaping and compaction of the pulverized surfaces to the lines and grades shown on the Plans and as specified in the Specifications.

.10 Excavation of roadway structure in noted distress areas.

.11 Compact and proof roll new subgrade surface in noted distress areas.

.12 Supply, placement, compaction and grading of gravel sub-base and asphalt base in roadway pavement structure in noted distress areas.

.13 Supply and place base and surface course asphalt concrete. A material transfer vehicle (Roadtec SB 2500C or approved equal) is to be used to transfer all hot mix asphalt from haul units to asphalt spreader.

.14 Supply and placement of new asphalt gutters.

.15 Removal and disposal of existing weak post guide rail and posts and replacement with new weak post guide rail and posts.

.16 Supply and installation of finish surfacing, including rip-rap and shoulder gravels.

.17 Supply and place hydroseeding and dry mulch on disturbed embankment slopes.

.18 Supply and installation of temporary and permanent pavement markings.

.19 Supply and installation of new roadway signs and posts, including reinstatement of existing signs on new posts as noted.

.3 All work to be carried out in accordance with applicable federal, provincial regulations for those agencies having jurisdiction for the work. The work is subject to the National Park Act and Regulations, Canadian Environmental Protection Act, and the Code of Practice of the Department of Labour, as it applies to the Temporary Workplace Traffic Control Manual.

.4 The Contractor must be aware that other construction work may be being performed at several different locations near the project site during the time frame of this contract and

that coordination with other Contracts will be required. No claims for delay will be accepted due to other construction work in the area. Other projects planned for 2017 include the following:

.1 French Mountain Culvert Replacement.

.2 MacKenzie River Bridge Replacement.

.3 North Mountain Rock Slope Stabilization.

.4 French Mountain Rock Slope Stabilization.

.5 North Mountain Pavement Rehabilitation – 9km.

.6 French to MacKenzie Pavement Rehabilitation – 6.0km

.7 Clyburn Bridge Replacement (Carry Over from 2016).

.8 North Aspy North River Branch Replacement (Carry Over from 2016).

.9 Trout Brook Campground Reconstruction.

1.3 MAINTENANCE OF WORK DURING CONSTRUCTION

.1 Maintain work during construction. Undertake continuous and effective maintenance work day by day, with adequate equipment and forces so that the roadway, site signage or structures are continuously kept in a condition satisfactory to Departmental Representative.

1.4 CODES

.1 Perform Work in accordance with National Parks Act, Code of Practice of the Department of Labour, as it pertains to the Temporary Workplace Traffic Control Manual (Department of Transportation & Infrastructure Renewal and any other code of federal, provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply).

.2 Materials and workmanship must conform to or exceed applicable standards of Canadian General Standards Board (CGSB), Canadian Standards Association (CSA), American Society for Testing and Materials (ASTM) and other standards organizations.

.3 Conform to latest revision of any referenced standard as re-affirmed or revised to date of specification. Standards or codes not dated shall be deemed editions in force on date of tender advertisement.

.4 Vehicle weights and dimensions shall conform to Public Highway Act (Nova Scotia).

1.5 WORK WITHIN PARK BOUNDARIES

.1 The project is within a National Park, and it is essential that all lands remain as undisturbed as possible. The Contractor will be expected to use standards and methods beyond those for normal construction in order to protect the environment and ensure the aesthetics of the work. Contract limits shall be strictly adhered to and every precaution shall be taken to minimize environmental damage and disruption to vegetation, wildlife habitat, and structures or existing services, both on construction and storage sites.

.1 If any damage occurs during construction, bear the expense to immediately restore such damaged areas to the satisfaction of the Departmental Representative.

.2 If Contractor fails to repair damage to the satisfaction of the Departmental Representative, the Departmental Representative may complete repairs at the Contractor's expense.

.3 Confirm that contracted Work meets the standards outlined in the contract specification and drawings.

.4 Confirm that no damage will be done to aerial or underground electrical/ communications cables.

.5 All sources of aggregate and asphalt cement must be submitted to the Departmental Representative for approval prior to the pre-construction meeting.

.6 The Contractor is responsible to follow the Provincial requirements regarding the following:

.1 Pit and Quarry Guidelines;

.2 Environmental Construction Practice specifications

.7 Make arrangements with authorities or owners of private properties for quarrying and transporting materials and machinery over their properties and be responsible for obtaining and paying of fees.

1.6 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each of following:

.1 Contract drawings.

.2 Specifications.

.3 Addenda.

.4 Reviewed Shop Drawings.

.5 Change orders.

.6 Other modifications to Contract.

.7 Field Test Reports.

.8 Copy of Approved Work Schedule.

.9 Health and Safety Plan and Other Safety Related Documents.

.10 Plan Locating Underground Utilities.

.11 Other Documents as Specified.

.12 Environmental Control Plan.

.13 Record drawings (kept up to date on a daily basis).

1.7 SITE CONDITIONS

.1 The Contractor will be responsible to visit the roadway and review existing site conditions.

.2 For geotechnical and borehole information, refer to report prepared by WSP Canada Inc., dated January 16, 2016, attached in Appendix B. Any interpretations of its finding will be made at the Contractor's own risk and the Department Representative will not be held responsible for the interpretation of this document.

.3 Promptly notify Departmental Representative if subsurface conditions differ materially from those indicated in Contract Documents or a reasonable assumption of probable conditions based on thereon.

1.8 WASTE DISPOSAL

.1 All waste generated from this project will be disposed of outside of Park boundaries.

1.9 WORK SCHEDULE

.1 Provide to the Departmental Representative in writing and within 5 working days after Contract award, a detailed construction schedule and traffic control plan. The schedule shall show proposed work to be undertaken and anticipated completion dates for each category of work in the Unit Price Table.

.2 After receiving the Contractor's plan and prior to start of construction, a meeting involving Contractor, Departmental Representative and Parks Canada will be held at a place and time to be determined by the Departmental Representative. This meeting will review implications of the contract, design, schedule of work, methods of construction, environment protection methods and traffic control.

.3 Complete all cutting and patching areas within the Park prior to the operation.

.4 The final completion date shall be **September 1, 2017**.

.5 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

.6 No work will begin until the pre-construction meeting is held.

.7 Following the pre-construction meeting and approval of the schedule and traffic control plan, the work will be so scheduled to meet the time restraints and have the project completed on time.

1.10 PARTIAL OCCUPANCY OR USE

.1 The Contractor shall provide and maintain sanitary facilities for the use of workers at locations specified by the Departmental Representative. Provision of sanitary facilities shall meet requirements of provincial government and municipal statutes and authorities.

1.11 CONTRACTOR’S USE OF SITE

.1 Use of site: for execution of work within roadway right of way and those areas specified by the Departmental Representative. Project Limits/Construction Limits are as follows:

.1 Lateral: Clearing limits.

.2 Maintain one lane of traffic at all times.

.2 The Contractor shall maintain the site in a tidy condition free from the accumulation of waste products and debris. Upon substantial performance of the work, remove surplus products, tools, machinery and equipment from the site. Completion of clean-up is required for total performance of the work.

.3 Contractor shall provide any and all traffic control services required for the project.

.4 Contractor to obtain all necessary permits to perform work and to comply with all permit requirements and conditions.

1.12 PROJECT MEETINGS

.1 The Contractor will arrange project meetings at the call of the Departmental Representative and assume responsibility for setting times and recording and distributing minutes in accordance with Section 01 31 19 – Project Meetings.

1.13 SETTING OUT OF WORK

.1 Contractor shall carry out all layouts.

.2 Contractor shall assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.

.3 Contractor shall supply such devices as straight edges and templates required to facilitate Departmental Representative's inspection of work.

.4 Provide coordinates, elevations and dimensions in the field, as required by the Departmental Representative

.5 Contractor shall supply pre and post construction cross sections at 20m intervals in accordance with Section 01 71 00 – Examination and Preparation to ensure that lines and grades of the project can be checked by the Departmental Representative.

1.14 EXISTING SERVICES

.1 The Contractor shall confirm all inverts and critical elevations in the field prior to construction.

.2 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.

.3 Carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to pedestrian and vehicular traffic.

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

.5 Submit schedule to and obtain approval from Departmental Representative for any shutdown or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

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

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

.8 Ensure that at least one lane of traffic is maintained at construction sites at all times.

.9 Ensure pedestrian and other traffic is not unduly impeded, interrupted or endangered by execution or existence of work or plant.

.10 Maintain existing signs at all times. When it is necessary to temporarily remove a sign, it shall be dismantled and re-established on a temporary post or stand set back from

construction area. The work is considered to be incidental and no separate payment will be made for maintaining or moving signs.

1.15 ADDITIONAL DRAWINGS

.1 Departmental Representative may furnish additional drawings for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in Contract documents.

1.16 STANDARD HOURS

.1 The Contractor must maintain existing site hours for the work unless otherwise authorized by Departmental Representative.

.2 Work that involves temporary disruption of services will be scheduled through the Departmental Representative. Give Departmental Representative minimum 72 hours' notice of any disruption of services.

1.17 RELICS, ANTIQUES & WILDLIFE HABITAT

.1 Protect relics, antiquities, wildlife habitat, items of historical or scientific interest such as cornerstones and contents, animal nesting sites, commemorative plaques, inscribed tablets, and similar objects found during course of work.

.2 Give immediate notice to Departmental Representative and await Departmental Representative's written instructions before proceeding with work in this area.

.3 Relics, antiquities and items of historical or scientific interest remain her Majesty's property.

1.18 MEASUREMENT OF QUANTITIES

.1 Linear: Items which are measured by metre or kilometre, such as pipe culverts will be measured along centreline of installation unless otherwise shown on plans.

.2 Area:

.1 Longitudinal and transverse measurements for areas to be measured horizontally.

.3 Volume:

.1 In computing volumes of excavation, average end area method will be used unless otherwise directed by Departmental Representative in writing.

.2 Term: Litre shall mean 1000 mL or L.

.4 All volume measurements refer to in place measure unless specified elsewhere in specification.

.5 Mass:

.1 Term "tonne" shall mean 1000 kg.

.2 Materials which are specified for measurement by mass shall be weighed on scales at a location determined by the Contractor. Units used to haul material being paid for by mass shall bear legible identification numbers plainly visible to scale person as it approaches and leaves scale-house.

.6 Time:

.1 Unless otherwise provided for elsewhere or by written authority of Departmental Representative, hourly rental of equipment will be measured in actual working time and necessary travelling time of equipment within limits of project at an all-inclusive rate. Equip each unit of mobile equipment with an approved device to register hours of operation. Devices which only measure hours of running of motor will not be accepted.

1.19 PERMITS/AUTHORITIES

.1 The Contractor shall obtain, and pay for, permits from authorities as required for all operations and construction. He shall also comply with all pertinent regulations of all authorities having jurisdiction over the work. The Contractor shall provide copies of all permits to the Departmental Representative prior to starting the work. The Contractor shall be responsible for obtaining all applicable permits, inspections and approvals required and shall pay all changes in connection therewith.

1.20 EQUIPMENT RENTAL RATES

.1 Upon written request, the Contractor will supply the Departmental Representative with a list of the rental equipment to be used on work beyond the scope of bid items. Equipment rental rates will be in accordance with current rates published by the Nova Scotia Road Builders Association.

1.21 WORK SEQUENCE

.1 The Contractor shall schedule their work progression in the following sequence:

.1 Culvert removals and replacement, including precast rigid frame culvert.

.2 Selective asphalt cold milling.

.3 Removal of existing guide rail and posts.

.4 Reshaping of asphalt pavement (pulverization).

.5 Distressed area repairs.

.6 Repaving (asphalt paving to start and continue until completion within 21 days of completion of pulverization).

1.22 TRUCK MANAGEMENT PLAN

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

.2 Submit site-specific Truck Management Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Truck Management Plan shall include, but not limited to:

.1 Speed and Unsafe Driving: Contractor shall outline how they will monitor and discipline trucks for violations. The Plan must indicate the progressive steps that will be followed should violations occur.

.2 Over Weight Loads: Departmental Representative will periodically spot check and divert loads (i.e. any material without weigh slips) to scales for random compliance check.

.1 Any material hauled in excess of the maximum weight limits of Section 191, Weights and Dimensions of Vehicles Regulations under the NS Motor Vehicle Act, will be not paid for or considered eligible for payment as part of the work under any Section of the Contract.

.3 Tarping: All loads delivered to site shall be tarped. Loads delivered to site not tarped will not be paid for.

.3 The Contractor shall be responsible to provide a Daily Weighers Report to the Departmental Representative to cross reference delivered materials. The Report shall include, but not limited to:

.1 Driver name;

.2 Company;

.3 License plate number;

.4 Tare, including gross and net weight.

.4 Any work days with missing Daily Weighers Reports or weigh slips will not be paid for.

.5 Submit other data, information and documentation upon request as stipulated elsewhere in this Section.

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, runways, 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 Maintain existing services and provide for vehicle access at all times.

.3 All site activities related to construction are to be confined within the defined project boundaries.

.4 No work camps or office facilities will be located within the boundaries of the Cape Breton Highlands National Park.

.5 Water: in accordance with Departmental Representative's approval.

.1 All water for pulverization and dust control to be obtained outside of the Park Boundaries.

.6 Temporary storage parking areas and turn around facilities for Contractor related equipment and vehicles will be limited to those areas agreed to and designated by the Departmental Representative.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to travelling public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.4 EXISTING SERVICES

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

.1 The Contractor shall ensure that they make provisions for safe working conditions while operating near live power and communication lines. The Contractor has sole responsibility to have the utility companies place required safety coverings over power lines, hold poles or suspend lines at the Contractor’s expense. Contractors are advised to review these costs with the Utility prior to the submission of their tender. All costs are deemed to be included in the Contract unit prices quoted in the tender submission.

.2 Provide for pedestrian, cyclist and vehicular traffic.

1.5 SPECIAL REQUIREMENTS

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

.2 Keep within limits of work and avenues of ingress and egress.

.3 Work shall be conducted in accordance with Parks Canada BIA (if provided) and BMP's.

.4 Special Move Permits (over-weight and over-dimension) from the Province shall be submitted to Departmental Representative for review and approval prior to activity.

.5 Blasting is prohibited.

.6 Provide survey layout with stakes on both sides of the road/alignment at 20 metre station intervals (top of back slope, toe of slope, subgrade, granulars, shoulders, etc.) with centreline offset.

.7 Maintenance work on Contractor/Sub-Contractor equipment is prohibited within the National Park.

.8 If native topsoil is encountered during excavation, the Contractor shall salvage and stockpile such that embankments and designated areas can be dressed with the salvaged topsoil at the end of project prior to hydroseeding and dry mulch.

.9 Maintain roadways, detours and site signage at all times during the Contract (i.e. dust control and free from potholes, bumps, PVMS, etc.)

.10 Repaving (asphalt paving to start and continue until completion within 21 days of completion of pulverization).

.11 Work outside of normal working hours will require 48 hours written notice to the Departmental Representative. There are no restrictions on working on nights, weekends or statutory holidays. It should be noted that there will be no Work during the Cabot Trail Relay Race from May 27 – 28, 2017.

.12 The Contractor shall ensure that they make provisions for safe working conditions while operating near live power and telephone lines. The Contractor has sole responsibility to have the Utility place required safety coverings over power lines, hold poles, suspend lines, etc. at the Contractor's expense. Contractors are advised to review these costs with the Utility prior to the submission of their tender.

1.6 SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted.

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 DESCRIPTION

.1 Mobilization and Demobilization consists of preparatory work and operations including, but not limited to, those necessary for the movements of personnel, equipment, supplies and incidentals to and from the project sites.

.2 For those purposes of mobilization and demobilization, “project site” means the location.

1.2 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

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 BID AND ACCEPTANCE 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 Overhaul will not be paid for on this project.

.4 The quantities listed in the Bid and Acceptance 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.

.5 The numbers of the items described below correspond to the numbers of the items in the Bid and Acceptance Form.

.6 There will be no measurement or payment for Work carried out beyond the limits defined on the Drawings.

1.2 MEASUREMENT AND PAYMENT

.1 All items in this Contract will be paid for as indicated in the bid items below:

.2 Lump Sum Item 1 – Section 01 25 20 – Mobilization / Demobilization

.1 Terms of Payment: Lump Sum (LS).

.2 This item includes: For 50% of Lump Sum Contract Price for Mobilization and Demobilization to be paid when mobilization to site is complete. The remainder of the Lump Sum Price for Mobilization and Demobilization to be paid when work is complete and all materials, equipment, buildings, shops, offices, and other facilities have been removed from site and site cleaned and left in condition to the satisfaction of the Departmental Representative and all other Agencies having Jurisdiction.

.3 Lump Sum Item 2 – Section 01 35 00.06 - Special Procedures for Traffic Control

.1 Terms of Payment: Lump Sum (LS).

.2 This item includes:

.1 Traffic control persons and traffic accommodation person(s).

.2 Provision, installation and maintenance of temporary traffic control devices, including detour signs, construction signage, portable variable message signs, temporary traffic control signals and pad sites for temporary traffic control signals, portable variable message signs and mobile speed radar units.

.3 Provision and maintenance of detours.

.4 Vehicles including pilot vehicle including means of transporting cyclist and their bicycles through the work area, equipment, supplies, and additional manpower required by traffic accommodation persons.

.5 Traffic control devices and measures required to comply with NSTIR's Temporary Workplace Traffic Control Manual (TWTCM) including but not limited to all labour, materials and equipment related to traffic control, Accredited Sign Supervisor, traffic control signage, flashing light units, jersey barriers, traffic barrels and all incidentals.

.6 Trailer Mounted Speed Radar Signs:

.1 The Contractor shall supply, install and maintain two (2) trailer – mounted speed radar signs during construction at locations identified by the Departmental Representative, including the construction of temporary pads, if required.

.2 The units shall be installed as per manufacturer's specifications. Upon initial installation, a manufacturer's representative shall inspect the units to ensure they are operating properly (radar, display, solar/battery backup, data logging, etc.).

.3 The Contractor shall be advised that the locations where these units are to be placed, may not be part of the temporary traffic control setup, but may be at other locations within the Cape Breton Highlands National Park.

.4 Upon completion of construction, the Contractor shall turn over the ownership of two operable units to the Owner. The Contractor shall provide all necessary title/ownership documentation to the Departmental Representative prior to final payment.

.5 Upon completion of construction, the Departmental Representative will provide the location where the units are to be delivered inside Cape Breton Highlands National Park.

.4 Lump Sum Item 3 – Section 01 35 43 – Environmental Procedures

.1 Terms of Payment: Lump Sum (LS).

.2 This item includes:

.1 Periodic and general maintenance of all erosion control measures or as directed by Departmental Representative.

.2 All environmental protection, sedimentation and erosion control measures required to complete the project, such as (but not limited to) diversion ditching, temporary ground covers and rock flow checks in accordance with Parks Canada National Best Management Practices – Roadway, Highway, Parkway and Related Infrastructure (May 2015).

.5 Lump Sum Item 4 – Section 01 52 00 – Construction Facilities

.1 Terms of Payment: Lump Sum (LS).

.2 This item includes:

.1 Provide and maintain adequate access to project site.

.2 Build and maintain temporary roads during period of the Work.

.3 Upon completion of the Work, rehabilitate any temporary roads to the satisfaction of the Departmental Representative.

.4 Clean roads and parking areas where used by the Contractor or employees.

.5 Provide, erect and maintain project identification site signs, Safety and Instruction signs, trail closure signs and notices.

.6 Provide sanitary facilities.

.7 Construction Site Trailer.

.8 Asphalt Lab.

.9 Removal of temporary facilities from site as directed by the Departmental Representative.

.6 Lump Sum Item 5 – Section 10 14 53 – Traffic Signage

.1 Terms of Payment: Lump Sum (LS).

.2 This item includes:

.1 Supply and installation of new regulatory and warning signs and timber posts, including all hardware, common excavation and backfill as indicated on the Plans. Regulatory and warning signs to be supplied by the Contractor.

.2 Supply and installation of new timber posts and reinstatement of salvaged Parks Canada signs; including all hardware, common excavation, backfill as indicated on the Plans. Parks Canada signs to be supplied by the Departmental Representative.

.7 Lump Sum Item 6 – Section 32 17 23 – Pavement Markings

.1 Terms of Payment: Lump Sum (LS).

.2 This item includes: The supply and application of paint in the colours, sizes, and configurations shown on the Drawings and as specified by the Departmental Representative. Also includes layout and pre-marking. All intersection markings, arrows, delineation, and other special markings in the sections will be considered incidental to this item. No additional payment for traffic control associated with the application of pavement markings shall be made.

.8 Lump Sum Item 7 - Section 33 42 13.01 – Precast Rigid Frame Culvert

.1 Unit of Measurement: Lump Sum (LS).

.2 This item includes:

.1 Dewatering of site and temporary water control works.

.2 Construction staging and sequencing of the works to install the new culvert.

.3 Supply and installation of temporary detours and associated traffic control, along with removal of temporary detours upon completion of construction.

.4 All required clearing and grubbing necessary to complete the Work.

.5 All excavation, removal and disposal of existing asphalt concrete at the culvert replacement location.

.1 Surplus materials shall become the property of the Contractor and disposed of outside the Park.

.6 Supply and placement of bedding and backfill materials, and disposal of all excavated materials required to install new culvert.

.7 Supply and installation of the new precast rigid frame culvert, including cast-in-place concrete footings and fittings. Year of fabrication to be embedded in the inlet and outlet end sections as dimensioned in the Drawings.

.8 Supply and installation of waterproofing membrane system.

.9 Supply and installation of the segmental concrete block retaining walls at the culvert inlet and outlet.

.10 Restoration of all trenches and any areas disturbed during the progress of the work including roadway subgrade, gravel sub-base, gravel base, hydraulic seeding, dry mulching and all related work.

.11 Supply and installation of the clay layer through the culvert and under the energy dissipation outlet pool.

.12 Construction of new energy dissipation outlet pool, including excavation and amour stone / rip-rap supply and placement.

.13 Geotextile and amour stone / rip-rap for inlet or outlet end treatments, along with offtake channels as specified.

.14 Construction of new watercourse channel in the culvert, along with the inlet and outlet, and associated tie-ins to the existing watercourse. Work includes excavation and amour stone / rip-rap supply and placement.

.15 Inlet and outlet channel reconstruction including excavation, amour stone and rip-rap supply and placement.

.16 Environmental protection measures, including sediment control fence and straw bale barriers.

.17 The removal and disposal of existing culverts and associated concrete footings.

.18 Shoring, bracing, cofferdams and underpinning of the excavation, if required.

.19 Provisions for safe working conditions while operating near live power lines. The Contractor has sole responsibility to have the Utility place required safety coverings over power lines, hold poles, suspend lines, etc.

.9 Lump Sum Item 8 - Other Items Not Included in the Unit Price Table

.1 Unit of Measurement: Lump Sum (LS).

.2 This item includes all other work considered incidental to the work and which are not specifically mentioned or accounted for in the Unit Price Table or other items in the Lump Sum Table, but are necessary to complete the work in accordance with the Contract, the Drawings, and Specifications. This item shall include but are not limited to the following; project layout and surveying, weigh scales, permits, temporary structures and approvals required to complete the job.

.10 Unit Price Item 1 - Section 02 41 13 - Selective Site Demolition - Removal and Disposal of Guide Rail and Posts

.1 Unit of Measurement: Lineal Metre (m).

.2 Method of Measurement: End points of measurements will be at centreline of the guide rail and at the ends of each section of guide rail.

.3 This item includes: Dismantling, stockpiling and disposal of guide rail, hardware, wooden guide posts, delineators and offset blocks as indicated in the Contract Documents. Work also includes supplying and compacting materials for backfilling existing post holes.

.4 For all other items to be removed such as (but not limited to) fencing, driveway markers, etc. including location and protection (in operating condition) of utilities traversing the site there shall be no measurement for payment and the work is considered incidental to the overall work of the project.

.11 Unit Price Item 2 - Section 02 41 13 - Selective Site Demolition – Removal of Signs and Sign Posts

.1 Unit of Measurement: Each (ea).

.2 Method of Measurement: Number of signs removed, including associated posts.

.3 This item includes: Dismantling, salvaging and transporting of information signs and hardware to a location within Cape Breton Highlands National Park, along with disposal of associated posts. Work also includes dismantling, disposal of regulatory and warning signs and associated hardware, along with disposal of associated posts.

.4 There shall be no payment for transporting and stockpiling salvaged materials.

.5 For all other items to be removed such as (but not limited to) fencing, driveway markers, etc. including location and protection (in operating condition) of utilities traversing the site there shall be no measurement for payment and the work is considered incidental to the overall work of the project.

.12 Unit Price Item 3 - Section 02 41 13.14 - Asphalt Pavement Removal

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

.2 Method of Measurement: Horizontal measurement of surface area.

.3 This item includes: the supply of all necessary materials, labour and equipment required for the removal of asphaltic concrete pavement, regardless of depth removed or number of operations required. RAP generated by asphalt cold milling may be required for re-use in the base asphalt. The 2015 geotechnical report is included in Appendix B. Payment will include all sawcutting, milling removal, loading, hauling, stockpiling, disposal of surplus milled asphalt, key joints, temporary asphalt tapers and cleaning of remaining pavement surface. This item also includes removal of asphalt gutters and drainage swales.

.4 Asphalt concrete used to construct tapers shall not be measured and shall be considered incidental to the overall work of the project.

.13 Unit Price Item 4 - Section 31 11 00 – Clearing

.1 Unit of Measurement: Hectare (ha).

.1 Clearing will be measured in hectares by plan area within limits indicated or as directed by the Departmental Representative.

.2 All timber with a butt diameter of 300mm or less shall be cleared by shredding or chipping.

.1 All timber with a butt diameter larger than this shall be cut into 2.5 metre lengths and delivered to a location designated by the Departmental Representative.

.3 This Section includes: Mobilization and demobilization for the project including the shredding or chipping of all trees and brush from areas indicated, disposal of shredded or chipped materials, cutting and delivery of timber to a designated location inside Cape Breton Highlands National Park.

.14 Unit Price Item 5 – Section 31 23 33.01 – Excavating, Trenching and Backfilling – Rock (Provisional)

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

.2 Method of Measurement: Calculated from cross sections taken by the Departmental Representative in areas of excavation and will be the actual volume removed within following limits:

.1 Width for excavation for structures to be bounded by vertical planes up to 500 mm outside of and parallel to neat lines of footings as indicated.

.2 Where design elevation is less than 300 mm below original rock surface, depth will be considered to be 300 mm below original rock surface.

.3 Departmental Representative will take initial cross sections from rock surface elevations and final cross sections will be taken when material is excavated to the final lines and grades.

.4 Volume of individual boulders and rock fragments will be determined by measuring three maximum mutually perpendicular dimensions.

.3 This item includes: Excavation, loading, hauling, disposal of surplus or excess rock material.

.1 Excavated material shall become the property of the Contractor and disposed of outside the Park.

.4 There shall be no payment for excavation beyond the limits indicated on the Drawings.

.15 Unit Price Item 6 – Section 31 23 33.01 – Excavating, Trenching and Backfilling – Common Excavation

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

.2 Method of Measurement: Calculated from cross sections taken by the Departmental Representative in areas of excavation. Departmental Representative will take initial cross sections after stripping and removal of asphalt are completed and immediately prior to excavation of material. Final cross sections will be taken when material is excavated to the final lines and grades.

.3 This item includes: Excavation, loading, hauling, disposal of materials, shaping, compaction and preparation of the subgrade and trimming of slopes as indicated on the Drawings.

.1 Excavated material shall become the property of the Contractor and disposed of outside the Park.

.4 There shall be no payment for excavation beyond the limits indicated on the Drawings.

.5 Re-ditching of the existing roadway embankments in distress areas at locations as indicated on the Drawings shall not be measured separately for payment and shall be considered as incidental to the Work.

.6 Excavation of subgrade materials to correct deficiencies in subgrade discovered during proof rolling will be measured as common excavation under this Section.

.1 Backfill and compaction of subgrade with granular sub-base materials will be measured under Section 32 11 16.01 - Granular Sub-Base.

.7 The reconstruction of existing roadway embankments at locations of culverts as indicated on the Drawings shall not be measured separately for payment and shall be considered as incidental to the Work.

.16 Unit Price Item 7 - Section 32 01 16.13 – Reshaping Asphalt Pavement (Pulverization)

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

.2 Method of Measurement: Horizontal measurement of surface area.

.3 This item includes: the supply of all necessary materials, labour and equipment required for the full width (roadway surface and shoulders) reshaping of asphaltic concrete pavement, to a depth of 300mm and the insitu top layer of gravel base (at least 50mm) in such a manner as to ensure thorough blending, regardless of number of operations required. The 2015 geotechnical report is included in Appendix B. Payment will include all pulverizing, reshaping, fine grading and compaction of the existing asphalt pavement to the lines and grades specified on the Drawings. Water for reshaping asphalt pavement and compaction will not be measured and shall be considered incidental to the pulverization. Work also includes the roadway maintenance of the pulverized surface.

.4 Surplus pulverized materials may be utilized for roadway shouldering or as otherwise directed by the Departmental Representative. Work also includes the loading, hauling and disposal of surplus pulverized materials beyond what can be utilized for roadway shouldering.

.17 Unit Price Item 8 - Section 32 11 16.01 – Granular Sub-base – NSTIR Type 2 Gravel

.1 Unit of Measurement: Metric Tonne (1000 kg).

.2 Method of Measurement: From scale and ticket generated and signed by the Departmental Representative.

.3 This item includes: Supply, handling, loading, hauling, placing, fine grading and compacting of the gravel sub-base materials, as well as any incidentals, to the limits and at the locations indicated on the Drawings.

.4 There shall be no payment for extra thickness of sub-base materials placed outside of the theoretical lines and grades as indicated on the Drawings. Whenever in the opinion of the Departmental Representative there is extra thickness, the appropriate weight will be deducted.

.18 Unit Price Item 9 - Section 32 11 23 – Aggregate Base Courses – NSTIR Type 1 Gravel

.1 Unit of Measurement: Metric Tonne (1000 kg).

.2 Method of Measurement: From scale and ticket generated and signed by the Departmental Representative.

.3 A provisional quantity of 2,000 tonnes of aggregate base course has been included in the estimated quantity to allow for placement on the reshaped asphalt pavement surface where excessive grade deviations exist.

.4 This item includes: Supply, handling, loading, hauling, placing, fine grading and compacting of the gravel base materials, as well as any incidentals, to the limits and at the locations indicated on the Drawings or directed in the field by the Departmental Representative.

.5 There shall be no payment for extra thickness of base materials placed outside of the theoretical lines and grades as indicated on the Drawings. Whenever in the opinion of the Departmental Representative there is extra thickness, the appropriate weight will be deducted.

.19 Unit Price Item 10 - Section 32 11 23 – Aggregate Base Courses – NSTIR Type 1S Gravel

.1 Unit of Measurement: Metric Tonne (1000 kg).

.2 Method of Measurement: Method of Measurement: From scale and ticket generated and signed by the Departmental Representative.

.3 This item includes: Supply, handling, loading, hauling, placing and compacting of the gravel shouldering materials, as well as any incidentals, to the limits and at the locations indicated on the Drawings.

.4 There shall be no payment for extra thickness of shouldering materials placed outside of the theoretical lines and grades as indicated on the Drawings. Whenever in the opinion of the Departmental Representative there is extra thickness, the appropriate weight will be deducted.

.20 Unit Price Item 11 - Section 32 12 16 – Asphalt Paving – Type “D–HF”

.1 Unit of Measurement: Metric Tonne (1000 kg).

.2 Method of Measurement: From scale and ticket generated and signed by the Departmental Representative.

.3 Payment adjustment will be made for escalation/de-escalation in the price of liquid asphalt in accordance with the supplementary conditions of the contract documents.

.4 Quality assurance payment adjustment will be made in accordance with Section 32 12 16 – Asphalt Paving.

.5 There shall be no payment for extra thickness or extra width of asphalt placed outside of the theoretical lines and grades as indicated on the Drawings. Wherever in the opinion of the Departmental Representative there is extra thickness, the appropriate weight will be deducted.

.6 This item includes: Supply, transportation, placement and compaction as indicated and all equipment, labour, materials required, including the material transfer vehicle, the supply and application of tack coat and temporary pavement markings. Asphalt Cement will be paid for separately.

.7 The supply and application of asphalt tack coat between the asphalt base course and asphalt seal course shall be included under this item, along with the application of asphalt tack on longitudinal joints.

.21 Unit Price Item 12 - Section 32 12 16 – Asphalt Paving – Type "B–HF"

.1 Unit of Measurement: Metric Tonne (1000 kg).

.2 Method of Measurement: From scale and ticket generated and signed by the Departmental Representative.

.3 Payment adjustment will be made for escalation/de-escalation in the price of liquid asphalt in accordance with the supplementary conditions of the contract documents.

.4 Quality assurance payment adjustment will be made in accordance with Section 32 12 16 – Asphalt Paving.

.5 There shall be no payment for extra thickness or extra width of asphalt placed outside of the theoretical lines and grades as indicated on the Drawings. Wherever in the opinion of the Departmental Representative there is extra thickness or width, the appropriate weight will be deducted.

.6 This item includes: Supply, transportation, placement and compaction as indicated and all equipment, labour, materials required, including the material transfer vehicle, the supply and application of tack coat as required and temporary pavement markings. Asphalt Cement will be paid for separately.

.22 Unit Price Item 13 – Section 32 12 16 – Asphalt Paving - Asphalt Gutter

.1 Unit of Measurement: Lineal Metre (m).

.2 Method of Measurement: Slope measure along centreline of gutter.

.3 Payment adjustment will be made for escalation/de-escalation in the price of liquid asphalt in accordance with the supplementary conditions of the contract documents.

.4 This item includes: Preparation of existing surfaces, placement and construction of new asphalt gutters including paved takeoffs as directed by the Departmental Representative. Asphalt concrete will be paid for separately.

.23 Unit Price Item 14 – Section 32 12 16 – Asphalt Cement

.1 Unit of Measurement: Metric Tonne (1000 kg).

.2 Method of Measurement: Performance Graded Asphalt Binder (PGAB) will be paid at the contract bid Unit Price per tonne. The quantity of PGAB to be paid for under this section shall be calculated on the basis of the PGAB delivered to the plant and adjustments will be made for initial and final tank measurements corrected to 15ºC. Contractor shall provide inbound delivery tank slips. The quantity of PGAB contributed to the B-HF mix from the use of RAP shall not be considered for payment.

.3 The Contractor will not be reimbursed for PGAB that is used in other work or any that is wasted. If other work is undertaken by the Contractor, additional tank measurements will be undertaken to determine the quantity of PGAB used in the other work.

.4 The payment adjustment for PGAB will be made for escalation/de-escalation in the price of liquid asphalt in accordance per the supplementary conditions of the contract documents.

.24 Unit Price Item 15 – Section 32 15 60 – Roadway Dust Control – Water

.1 Unit of Measurement: kilolitres (1000 l).

.2 Method of Measurement: Water shall be measured in kilolitres. This price shall be full compensation for furnishing, handling, transporting and applying water, and for the supplying of all equipment, plant, labour and incidentals necessary to complete the work and at times as directed by the Departmental Representative.

.25 Unit Price Item 16 – Section 32 15 60 – Roadway Dust Control – Calcium Chloride

.1 Unit of Measurement: Metric Tonne (1000 kg).

.1 Method of Measurement: Calcium Chloride solution shall be measured in tonnes. This price shall be full compensation for furnishing, handling, transporting and applying calcium chloride, and for the supplying of all equipment, plant, labour and incidentals necessary to complete the work and at times as directed by the Departmental Representative

.26 Bid Items 17, 18, 19 and 20 - Section 33 42 13 – Pipe Culverts (Various Diameters, Types and Classes, and Temporary Water Control Works)

.1 Unit of Measurement: Lineal Metre (m) for each size and type of culvert.

.2 Method of Measurement: Along centreline of new culvert pipe, from end to end of culvert, as laid and as accepted by the Departmental Representative.

.3 Payment for this item includes:

.1 Dewatering of site and temporary water control works.

.2 The removal and disposal of existing culverts.

.3 All excavation and, if prior to cold milling operations, removal and disposal of existing asphalt concrete at culvert replacement locations.

.1 Surplus materials shall become the property of the Contractor and disposed of outside the Park.

.4 Supply and placement of bedding and backfill material, and disposal of all excavated materials required to install new culverts.

.5 Supply and installation of new culverts, including coupling and fittings.

.6 Restoration of all trenches and any areas disturbed during the progress of the work including roadway subgrade, gravel sub-base, gravel base, hydraulic seeding, dry mulching and all related work will not be measured but shall be considered as incidental to the pipe culvert work.

.1 Trench restorations are to match the elevations of the adjacent roadway, to enable traffic to safely pass over top.

.7 Geotextile and rip-rap for inlet or outlet end treatments, along with offtake channels and embankment slop protection as specified.

.8 Supply and installation of tension bar assemblies at culvert outlets at location as indicated on the Drawings.

.9 Inlet or outlet ditching at locations as indicated on the Drawings.

.10 Environmental protection measures, including sediment control fence and straw bale barriers.

.11 Shoring, bracing, cofferdams and underpinning of the excavation, if required.

.27 Bid Item 21 – Section 34 71 13.25 – Vehicle W-Beam Guide Rail (Weak Post)

.1 Unit of Measurement: Lineal Metre (m).

.2 Method of Measurement: Lineal metres of guide rail installed as indicated on the Drawings. The measurement shall be taken along the centre of the guide rail from end to end of each section of guide rail including buried ends, not including overlaps.

.1 The value used in the calculations for the length of standard rail is 3.81 m, the distance between support holes.

.3 This item includes: Supply and installation of new guide rail, posts, hardware, reflectors, accessories, offset blocks, hardware, plow markers and all necessary appurtenances, digging and/or auguring of post holes, setting of posts, installing reflectors, backfilling and compacting, disposal of surplus material, adjustment of guard rail system, rough grading, burial of guide rail at terminal ends, cleanup of the site and all equipment, plant, labour, quality control and any other incidentals necessary to complete the work to the satisfaction of the Departmental Representative.

.28 Bid Item 22 – Section 34 71 13.25 – Vehicle W-Beam Guide Rail (Bridge Approach)

.1 Unit of Measurement: Lineal Metre (m).

.2 Method of Measurement: Lineal metres of guide rail installed as indicated on the Drawings. The measurement shall be taken along the centre of the guide rail from end to end of each section of guide rail including buried ends, not including overlaps.

.1 The value used in the calculations for the length of standard rail is 3.81 m, the distance between support holes.

.2 Length of a Michigan shoe is 0.58 m.

.3 This item includes: Supply and installation of new guide rail, posts, Michigan shoe, channels, hardware, reflectors, accessories, offset blocks, hardware, plow markers and all necessary appurtenances, digging and/or auguring of post holes, setting of posts, installing reflectors, backfilling and compacting, disposal of surplus material, adjustment of guard rail system, rough grading, burial of guide rail at terminal ends, connections to existing bridge, cleanup of the site and all equipment, plant, labour, quality control and any other incidentals necessary to complete the work to the satisfaction of 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 RELATED REQUIREMENTS

.1	Section 31 05 16	Aggregate Materials
.2	Section 31 23 33.01	Excavating, Trenching and Backfilling
.3	Section 31 24 13	Roadway Embankments
.4	Section 32 11 16.01	Granular Sub-Base
.5	Section 32 11 23	Aggregate Base Courses
.6	Section 32 12 13.16	Asphalt Tack Coat
.7	Section 32 12 16	Asphalt Paving

.8 Particular requirements for inspection and testing to be carried out by testing laboratory designated by the Departmental Representative are specified under various sections.

1.2 APPOINTMENT AND PAYMENT

.1 The Departmental Representative will appoint and pay for services of testing laboratory except as follows:

- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
- .2 Inspection and testing performed exclusively for Contractor's convenience.
- .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
- .4 Mill tests and certificates of compliance.
- .5 Tests specified to be carried out by Contractor under the supervision of the Departmental Representative.

.2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by the Departmental Representative to verify acceptability of corrected work.

1.3 CONTRACTOR’S RESPONSIBILITIES

.1 Provide labour, equipment and facilities to:

- .1 Provide access to Work for inspection and testing.
- .2 Facilitate inspections and tests.
- .3 Make good Work disturbed by inspection and test.
- .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

.2 Notify the Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved 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 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting two days in advance of meeting date to Departmental Representative.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and Departmental Representative.

.8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.1 Schedule of Work: in bar (GANTT) Chart format.

.2 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.

.3 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.4 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.

.5 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.6 Monthly progress claims, administrative procedures, photographs, hold backs.

.7 Appointment of inspection and testing agencies or firms.

.8 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

.1 During course of Work and one week prior to project completion, schedule progress meetings bi-weekly.

.2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.

.3 Notify parties minimum two days prior to meetings.

.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three days after meeting.

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Corrective measures and procedures to regain projected schedule.

.6 Revision to construction schedule.

.7 Progress schedule, during succeeding work period.

.8 Review submittal schedules: expedite as required.

.9 Maintenance of quality standards.

.10 Review proposed changes for effect on construction schedule and on completion date.

.11 Other business.

1.4 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the 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 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in 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, product data, samples and mock-ups 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 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

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

.11 Make any changes in submissions which Departmental Representative may require consistent with Contract Documents and resubmit as directed by Departmental Representative.

.12 Notify Departmental Representative, in writing, when resubmitting of any revisions other than those requested by Departmental Representative.

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 Nova Scotia of Canada.

.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 10 days for Departmental Representative's review of each submission.

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

.6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify 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, product data and sample.
- .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 Departmental Representative's review, distribute copies.

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

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

.12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by 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 one year of date of contract award for project.

.13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by 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 copies of manufacturers' instructions for requirements requested in specification Sections and as requested by 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 copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by 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 copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.18 Delete information not applicable to project.

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

.20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies 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.

1.3 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

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

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in jpg format, standard resolution, monthly with progress statement as directed by Departmental Representative.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints:

.1 Viewpoints and their location as determined by Departmental Representative.

1.5 WORK SCHEDULE

.1 Provide within 5 working days after contract award, schedule showing anticipated progress stages and final completion of work within time period required by Contract Documents.

.2 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

1.6 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the 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 RELATED REQUIREMENTS

.1	Section 31 24 13	Roadway Embankments
.2	Section 32 11 23	Aggregate Base Courses
.3	Section 32 12 16	Asphalt Paving
.4	Section 33 42 13	Pipe Culverts
.5	Section 33 42 13.01	Precast Rigid Frame Culverts

1.2 REFERENCES

.1 Nova Scotia Ministry of Transportation and Infrastructure Renewal

.1 Nova Scotia Temporary Workplace Traffic Control Manual, latest edition.

.2 The Departmental Representative reserves the right to direct the Contractor to reduce either the number or length of traffic control work areas during peak traffic volumes or when cumulative delays exceed the specified maximum.

1.3 PROTECTION OF PUBLIC TRAFFIC

.1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.

.2 When working on travelled way:

.1 Place equipment in position to minimize interference and hazard to travelling public.

.2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.

.3 Do not leave equipment on travelled way overnight.

.3 Close lanes of road only after receipt of written approval from Departmental Representative.

.1 Before re-routing traffic erect suitable signs and devices to NSTIR Temporary Workplace Traffic Control Manual.

.4 Keep travelled way graded, free from pot holes and of sufficient width for required number of lanes of traffic.

.1 Provide 7 m wide minimum temporary roadway for traffic in two-way sections through Work and on detours.

.2 Provide 4.5 m wide minimum temporary roadway for traffic in one-way sections through Work and on detours.

.5 Provide gravelled detours or temporary roads as indicated, to facilitate passage of traffic around restricted construction area:

.1 Grade for detour in accordance with Section 31 24 13 - Roadway Embankments.

.2 Place and compact granular sub-base in accordance with Section 32 11 16.01 - Granular Sub-base.

.3 Place and compact granular base in accordance with Section 32 11 23 - Aggregate Base Courses.

.6 Provide and maintain road access and egress to property fronting along Work under Contract and in other areas as indicated, except where other means of road access exist that meet approval of Departmental Representative.

1.4 INFORMATIONAL AND WARNING DEVICES

.1 Provide and maintain signs, flashing warning lights, variable message signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.

.1 Construction of temporary pads, if required for the placement of temporary traffic control devices shall be supplied by the Contractor. Temporary pad sites shall be approved by the Departmental Representative.

.2 Supply and erect signs, delineators, barricades and miscellaneous warning devices to NSTIR Temporary Workplace Traffic Control Manual.

.3 Place signs, delineators, barricades and miscellaneous warning devices in locations recommended in NSTIR Temporary Workplace Traffic Control Manual.

.1 If situation on site changes, revise to approval of Departmental Representative.

.4 The Contractor shall provide a Temporary Workplace Signer (TWS), who has successfully completed the Temporary Workplace Traffic Control Training Course, to be on site at all times when active construction is taking place. The Temporary Workplace Signer will be responsible to assess condition, prepare, implement and review traffic control plans for construction. The Temporary Workplace Signer will be responsible for ongoing compliance with the NSTIR Temporary Workplace Traffic Control Manual and for ensuring the safe regulation of traffic and safe passage of pedestrians at temporary workplaces. The Temporary Workplace Signer is considered part of the Contractor's supervision and administration staff and compensation for the provision of this individual is considered incidental to the work.

.5 A traffic control plan and emergency response plan must be submitted for review by the Departmental Representative prior to the pre-construction meeting.

.6 Continually maintain traffic control devices in use:

.1 Check signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

.2 Remove or cover signs which do not apply to conditions existing from day to day.

1.5 TRAILER-MOUNTED SPEED RADAR SIGNS

.1 The Contractor shall supply two (2) trailer –mounted speed radar signs. Units shall be solar powered with battery backup and have a fold down sign, removable hitch and a

spare tire. Each unit shall be provided with a data package and wireless Bluetooth communications.

.1 Units shall be complete with five (5) speed plate numbers with a white background as requested by the Departmental Representative.

.2 Trailer-mounted speed radar signs shall be Traffic Logix Classic Cruiser Trailer SafePace 450 radar sign trailers by Trans Canada Traffic Inc. or approved equivalent.

.3 The units shall be installed as per manufacturer's specifications. Upon initial installation, a manufacturer's representative shall inspect the units to ensure they are operating properly (radar, display, solar/battery backup, data logging, etc.).

1.6 CONTROL OF PUBLIC TRAFFIC

.1 Provide competent flag personnel who have a valid provincial license, trained in accordance with, and properly equipped to NSTIR Temporary Workplace Traffic Control Manual for situations as follows:

.1 When public traffic is required to pass working vehicles or equipment that block all or part of travelled roadway.

.2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and a traffic control signal system is not in use.

.3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.

.4 Where temporary protection is required while other traffic control devices are being erected or taken down.

.5 For emergency protection when other traffic control devices are not readily available.

.6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.

.7 At each end of restricted sections where pilot cars are required.

.2 All Traffic Control Personnel shall be equipped with portable radios of sufficient range to ensure continuous communication within the traffic control zone.

.3 All construction vehicles shall operate in accordance with and are subject to traffic control restrictions and operations in place on the project.

1.7 OPERATIONAL REQUIREMENTS

.1 Existing conditions for traffic within right- of-way containing work in this Contract are indicated by following descriptions:

.1 Section within Park Boundaries within contract limits are asphalt concrete surfaced two lane undivided trunk roadway with posted speeds up to 80 km/h.

.2 Maintain existing conditions for traffic throughout period of contract except that, when required for construction under contract and when measures have been taken as specified and approved by Departmental Representative to protect and control public traffic, existing conditions for traffic may be restricted as follows:

.1 In accordance with NSTIR Temporary Workplace Traffic Control Manual.

.2 The maximum cumulative traffic delay associated with work carried out under this Contract shall not exceed 20 minutes through the Contract limits.

.3 Maintain existing conditions for traffic crossing right-of-way containing work except that, when required for construction under this Contract and when measures have been taken as specified herein and approved by Departmental Representative to protect and control public traffic.

.3 With the exception of the installation of the precast rigid frame culvert, at the end of each day of work, traffic must be returned to two-lane two-way traffic. Restrictions of one lane traffic overnight or outside of work hours will not be permitted.

.4 Temporary structures shall be constructed as indicated on approved shop drawing submitted to Departmental Representative. All existing dimensions to be verified prior to construction with any discrepancies reported to the Departmental Representative.

.5 Road closures, unless otherwise approved by the Departmental Representative, shall be limited to the following:

.1 Approved 20 minute duration closures to facilitate phasing of traffic and to erect precast culvert segments. There shall be no more than 1-20 minutes closure in any consecutive 2 hour timeframe.

.2 Closure plans shall be set in place by the Contractor to ensure the safe passage of emergency vehicles throughout the construction area within 15 minutes of being alerted by emergency response personnel. The 15 minute emergency response time must be able to be met during all phases of construction and a dedicated on-site emergency phone line is to be set up by the Contractor to achieve this.

1.8 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

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 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Province of Nova Scotia

.1 Occupational Health and Safety Act, S.N.S. - Updated 2013.

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 electronic copies of Contractor's authorized representative's work site health and safety inspection reports to authority having jurisdiction and Departmental Representative.

.4 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Submit WHMIS MSDS - Material Safety Data Sheets.

.7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within seven days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within five days after receipt of comments from Departmental Representative.

.8 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.

.9 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 Departmental Representative.

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

.11 Submit other data, information and documentation upon request as stipulated elsewhere in this Section.

1.3 FILING OF NOTICE

.1 File Notice of Project and any other required Notices with the Provincial Authorities prior to commencement of the 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 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work. Have Contractor's site safety supervisor in attendance. Departmental Representative will advise of time, date and location of the meeting and will be responsible for recording and distributing the minutes.

.2 Conduct site specific occupational health and safety meetings as required by the Nova Scotia Occupational Health and Safety Act, and the Regulations made pursuant to the Act for the duration of the work.

.3 Record and post minutes of all meetings in plain view on the work site. Make copies available to Departmental Representative upon request.

.4 Conduct an orientation meeting with all workers prior to start-up of the Work to ensure everyone is aware of the Health and Safety issues for this specific project. Each new worker to receive the same orientation briefing prior to performing any work on this project.

1.6 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:

.1 Continuous movement of public traffic through the construction site at all hours of the day and night.

.2 The above list shall not be construed as being complete and inclusive of all safety and health hazards encountered as a result of Contractor's operations during the course of work. Include above items into the hazard assessment program specified herein.

1.7 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Health and Safety Plan shall contain the following three (3) parts:

.1 Part 1: List of individual health risks and safety hazards identified by hazard assessments.

.2 Part 2: List of specific measures to control or mitigate each hazard and risk identified in part one of Plan. Describe the engineering controls, personnel protective equipment and safe work practices to be implemented and followed when performing work related to each identified hazard or risk.

.3 Part 3: Emergency Measures and Communications Procedures as follows:

.1 Emergency Measures: on-site operating procedures, evacuation measures and emergency response to be implemented in the occurrence of an incident. Procedures to be specific and relevant to identified hazards. Measures to complement and be integrated with the facility and tenants Emergency Response Plans in place at site. Obtain information on existing emergency and evacuation plans from Departmental Representative and incorporate appropriate data.

.2 Communication Procedures:

.1 List of names and telephone numbers of designated officials, to be contacted should an incident or emergency situation occur, including the following.

.1 General Contractor and all Subcontractors.

.2 Federal and Provincial Departments and local emergency resources organizations, as resources organizations, as applicable laws and regulations.

.3 Officials from Parks Canada. Departmental Representative will provide list of names to be included.

.2 Procedures implemented at site to communicate and share information between workers, subcontractors, and General Contractor on work activities and in particular those which might endanger workers and Facility employees.

.3 Develop Health and Safety Plan in Collaboration with all subcontractors. Address all work and activities of subcontractors as they arrive on site. Immediately update Plan and submit to Departmental Representative.

.4 Implement, maintain and enforce compliance with requirements of the Health and Safety Plan until final completion of work and demobilization from site.

.5 As work progresses, review and update Plan addressing additional health risks and safety hazards identified by on-going hazard assessments.

.6 Submit revised versions of Plan to Departmental Representative.

.7 Post a typed written copy, including all updates of the Health and Safety Plan in a common visible location at work site.

.8 Submission of the Health and Safety Plan, and updates to the Departmental Representative is for review and information purposes only. Its submission shall not be construed to imply approval by Departmental Representative, be interpreted as a warranty of being complete, accurate and legislate compliant and shall not relieve the Contractor of his legal obligations for the provision Health and Safety of the Construction Project.

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

1.8 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 Comply with Occupational Health and Safety Act, Occupational Safety General Regulations, N.S. Reg. Reg. 52/2013 as amended to O.I.C. 2014-405.

.3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

.4 Carry out work placing emphasis on health and safety of the public, Parks Canada employees, site personnel and protection of the environment.

.5 The Contractor is responsible to manage safety of the work site to ensure that any persons, including but not limited to, the general public circulating adjacent to the work operations are protected against harm due to the extent that they may be affected by conduct of the work.

.6 Prior to commencement of work, provide site safety orientation sessions for all workers and other authorized persons.

.7 The Contractor is responsible to ensure Contractor employees and sub-contractors accessing the work site are in possession of and wear appropriate personnel protective equipment (PPE).

1.9 UNFORESEEN HAZARDS

.1 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 Departmental Representative verbally and in writing.

1.10 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have site-related working experience specific to activities associated with pavement rehabilitation projects completed with live traffic.

.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 and be under direction of site supervisor.

.2 The Health and Safety Co-ordinator shall be required to conduct regularly scheduled safety inspections of the work site as follows:

.1 Informal inspections on a minimum daily basis noting deficiencies and remedial actions taken in a log book or diary. Make the log book and/or diary available for the Departmental Representative’s viewing as requested.

.2 Formal inspections on a minimum weekly basis, and shall provide a written report to the Departmental Representative for each formal inspection, document deficiencies, remedial action needed and assign responsibility for rectification to the appropriate party.

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 Departmental Representative.

1.12 CORRECTION OF NON-COMPLIANCE

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

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

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

1.13 BLASTING

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

1.14 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.

1.15 SITE CONTROL AND ACCESS

.1 Control work site and entry points. Grant and allow entry to only workers and other persons so authorized. Immediately stop unauthorized persons from circulating within construction areas and remove from site.

.2 Implement procedures for granting permission to enter into work site to all persons who require access. Procedures to include the provision of a site safety orientation session.

.3 Delineate and isolate construction areas from other areas of site by use of appropriate means. Erect barricades, fences, hoarding and temporary lighting as required.

.4 Erect signage at entry points and at other strategic locations around site, clearly identifying construction area(s) as being "off limits" to unauthorized persons. Signage must be professionally made in both official languages or by use of well-understood graphic symbols.

.5 Secure site at night time or provide security guard(s) as deemed necessary to protect site against entry.

.6 Ensure persons granted access are fitted and wear appropriate personnel protective equipment (PPE). Be responsible for the provision of such PPE to persons who require access to conduct work or perform inspections.

1.16 PROTECTION

.1 Provide temporary facilities for protection and safe passage of public pedestrians and vehicular traffic around adjacent work site.

.2 Provide safety barricades, lights and signage on work site as required to provide a safe working environment for workers.

.3 Carry out work placing emphasis on health and safety of public, site personnel and protection of the environment.

.4 Should unforeseen or peculiar safety related hazard or condition become evident during performance of work, immediately take measures to rectify the situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

1.17 PERMITS

.1 Obtain permits, licenses and compliance certificates, at appropriate times and frequency as stipulated by authorities having jurisdiction.

.2 Where particular permit or compliance certificate cannot be obtained at the required stage of work, notify Departmental Representative in writing and obtain Departmental Representative's approval to proceed prior to carrying out that portion of the Work.

1.18 MINIMUM SITE SAFETY RULES

.1 Notwithstanding the requirement to abide by federal and provincial health and safety regulations, the following safety rules shall be considered minimum requirements at the work site and obeyed by all persons granted access:

.1 Wear personal protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat, safety vest and safety footwear. Wear eye protection where appropriate.

.2 Immediately report unsafe activities, conditions, near-miss accidents, injuries and damages.

.3 Maintain site in tidy condition.

.4 Obey warning signs and safety tags.

.1 Brief workers on site safety rules, and on the disciplinary measures to be taken for violation or non-compliance of such rules. Post such information on site.

1.19 TOOLS AND EQUIPMENT SAFETY

.1 Implement and follow a scheduled tool and equipment inspection/maintenance program at work site. Regularly check tools, equipment and machinery for safe operation and perform maintenance at pre-established time and frequency intervals as recommended by manufacturer. Include subcontractors' equipment as part of the inspection process.

.2 Use standardized checklists to ensure established safety checks are stringently followed.

.3 Immediately tag and remove items found faulty or defective off site.

.4 Maintain written documentation on each inspection. Make available to Departmental Representative upon request.

1.20 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information Systems (WHMIS).

.2 Keep MSDS data sheets on site. Provide copies of all data sheets to Departmental Representative upon receipt of materials on site.

.3 Put all MSDS data sheets on site, in a common area, visible to workers.

1.21 PROJECT / SITE CONDITIONS

.1 The following are known or potential project related safety hazards at site:

.1 Highway Traffic.

.2 Fractured and loose rock overhead. Contractor should be aware that the potential for falling rocks exists.

.2 Obtain from Departmental Representative, copy of MSDS Data sheets of existing hazardous materials stored on site or being used by Facility and Tenant personnel in the course of their operations.

.3 Above lists shall not be construed as being complete and inclusive of safety and health hazards encountered as a result of Contractor's operations during the course of work. Include above items into the hazard assessment program specified herein.

1.22 ACCIDENT REPORTING

.1 Investigate and report incidents and accidents as outlined in Provincial Occupational Safety and Health Act and Regulations.

.2 Investigate and immediately report to Departmental Representative incidents and accidents which results, or has the potential of resulting in:

.1 Injuries requiring medical aid.

.2 Property damage in excess of $5,000.00.

.3 Required notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable regulations.

1.23 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the 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 Definitions:

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.

.2 Erosion: A combination of processes in which materials of the earth's surface are loosened, dissolved, or worn away, and transported from one place to another by natural agents.

.3 Sedimentation: The addition of soils to water bodies by natural and human related activities.

.4 Storm Water Runoff: Precipitation that does not soak into the ground or evaporate, but flows along the ground surface as runoff.

.5 Erosion and Sediment Control Plan: Plan identifying the applicable stabilization and structural strategies that shall be employed to limit sediment and erosion during construction.

.6 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water and air; biological and cultural resources; and includes management of visual aesthetics, noise, solid, chemical, gaseous and liquid waste; radiant energy and radioactive material as well as other pollutants.

.7 Deleterious Substance: defined by the Fisheries Act as any substance that, if added to water, makes the water deleterious to fish or fish habitat or any water containing a substance in such quantity or concentration or has been changed by heat or other means, that if added to water makes that water deleterious to fish or fish habitat.

.8 Contaminant: means any solid, liquid, gas, micro-organism, odour, heat, sound, vibration, radiation or combination of any of them, present in the environment.

.9 Contaminants and Deleterious substances includes, but are not limited to: sediment or sediment-laden water, petroleum products, paints, thinners, heated water, concrete wash water, salt, heavy metals, wood preservatives, cleaning supplies, pesticides, wood and food waste, and fecal matter.

.10 Environmental incidents or emergencies include:

.1 Chemical or Petroleum spills;

.2 Poisonous or Caustic Gas Emission;

.3 Biological or Chemical Explosion;

.4 Hazardous Material Spill;

.5 Sewage Spill;

.6 Contaminated Water into Waterways;

.7 Explosion and Ammunition.

.2 Reference Standards:

.1 Parks Canada National Best Management Practices – Roadway, Highway, Parkway and Related Infrastructure.

.1 Document is included in Technical Specifications as Appendix A.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Prior to the pre-construction meeting, submit Environmental Protection Plan for review and approval by Departmental Representative.

.3 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

.4 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.5 Include in Environmental Protection Plan:

.1 Name of person responsible for ensuring adherence to Environmental Protection Plan.

.2 Name and qualifications of person responsible for manifesting hazardous waste to be removed from site.

.3 Name and qualifications of person responsible for training site personnel.

.4 Descriptions of environmental protection personnel training program.

.5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws.

.6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.

.1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.

.1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.

.12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste Water Management Plan identifying methods and procedures for management discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water and dewatering of ground water.

.14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

1.3 SENSITIVE AREAS

.1 Site clearing, ground disturbance, and heavy equipment traffic shall not occur within Sensitive Areas unless absolutely required and authorized by Departmental Representative.

.2 Contractors must make all efforts to prevent contaminants and deleterious substances arising from their work from directly or indirectly entering those areas indicated as sensitive areas on drawings (e.g. watercourses and wetlands). This may include mitigative measures such as altering; work schedules, methods of undertaking the work, materials used, and installation of mitigative structures (e.g. sediment control fence, check dams, mulching, etc.).

.3 Failure to comply can lead to charges under various legislation, including the federal Fisheries Act, and the Nova Scotia Water Resources Protection Act.

1.4 FIRES

.1 Fires and burning of rubbish on site is not permitted.

.2 Immediately report all fires to the Departmental Representative. The Contractor is held responsible to make all reasonable efforts to extinguish any fires on the site.

.3 The Contractor is required to comply with the Fire Protection Regulations of the National Parks Act.

.4 In accordance with these Regulations, the Park Superintendent may restrict activities, or access to work areas, in the interest of fire prevention.

.5 The Contractor's equipment must be in proper working condition, and be used in such a manner as to minimize the potential for ignition of vegetation.

.6 Vehicles and stationary equipment must be equipped with fire suppression equipment such as an operable fire extinguisher.

.7 If storage and/or operation of in-Park equipment during a high fire hazard season is of concern to the Park, the Contractor may be required to prepare and implement a Fire Suppression Contingency Plan.

1.5 DISPOSAL OF WASTES

.1 Littering is prohibited.

.2 Dispose of rubbish and waste materials at authorized site.

.3 Do not dispose of waste, volatile or deleterious materials into waterways, wetlands, storm or sanitary sewers.

.4 All refuse from demolition is the property of the Contractor and shall be removed and disposed of in a legal manner.

.5 All Hazardous materials shall be sealed as dictated by authorities having jurisdiction, and disposed of off-site, unless otherwise instructed by the Departmental Representative.

.6 Garbage must be collected and removed daily from the worksite to keep the site sanitary and to prevent unwanted interactions with Park fauna (e.g. bears).

1.6 DRAINAGE

.1 Provide temporary drainage and pumping required to keep excavations and site free from water.

.2 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.7 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties as indicated.

.2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.

.1 Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas designated by Departmental Representative.

1.8 WORK ADJACENT TO WETLANDS AND WATERCOURSES

.1 Construction equipment to be operated on land only.

.2 Use of borrow material from watercourses or wetlands is prohibited.

.3 Do not alter or draw any water from a watercourse or wetland without first obtaining necessary permits or approvals.

.4 Do not dump excavated fill, waste material or debris in watercourses or wetlands.

.5 Design and construct temporary crossings to minimize erosion to watercourse or wetland. All temporary crossings must be pre-approved by Departmental Representative prior to construction.

.6 Do not skid logs or construction materials across watercourses or wetland.

.7 Avoid indicated spawning beds when constructing temporary crossings of waterways.

.8 Do not blast under watercourses or wetland within 100 m of spawning beds without obtaining necessary permits or approvals.

.9 Provide a buffer zone in combination with appropriate erosion and sedimentation control when working adjacent to watercourses and wetlands. Consult with regulatory agencies.

1.9 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

.3 Prior to the pre-construction meeting, prepare an Environmental Protection Plan, which addresses procedures to follow in the event of a pollution incident and ensure all staff are aware of these procedures. Provide copy of contingency plan to the Departmental Representative.

.4 Maintain temporary erosion and pollution control devices installed under this contract until the Work is completed as specified in the Project Documents.

.5 Remove temporary erosion and pollution control measures just prior to project completion unless directed otherwise. Chemicals used in dust control must have prior approval of the Departmental Representative.

.6 Control emissions from equipment to requirement of authority having jurisdiction.

.7 Provide temporary enclosures to protect environment from effects of abrasive blasting.

.8 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

.9 Keep paved surfaces clean. Control dust by application of calcium chloride or water.

1.10 PETROLEUM, OIL AND LUBRICANT STORAGE

.1 Take precautions to avoid contamination of the site from Petroleum, Oil and Lubricants (POL’s).

.2 The management of POL’s and chemicals must meet with the requirements of the Nova Scotia Dangerous Goods and Hazardous Wastes Management Criteria and all other appropriate provincial and federal regulations to include but not be limited to the following:

.1 Temporary POL storage sites are to be located a minimum 200 m from any watercourse or wetland.

.2 Fuel storage containers must be accompanied by impermeable structures that would provide containment of 125% of the container capacity in the event of a leak or spill.

.3 The Departmental Representative must be immediately contacted after a spill of more than 10 L of fuel or lubricant, and after any amount of other chemical products has escaped.

.4 Storage of large amounts of fuel (more than 900 L) in the Park is not permitted.

.5 Storage of hazardous material, including explosives, shall not be permitted within the Park, except for quantities which shall normally be expected to be utilized in a day of Work, and which are not permitted to stockpile.

1.11 REFUELING AND SPILL CONTAINMENT

.1 Take precautions to avoid contamination of the site from fuel. Keep and maintain hydrocarbon containment and cleanup materials on site for the duration of construction activities. Ensure that Contractor's personnel are trained in the proper use of such materials.

.2 Establish suitable fueling and maintenance areas and obtain approval from the Departmental Representative.

.3 Do not refuel or maintain equipment adjacent to or within 200 meters of any sensitive areas.

.4 Monitor on site vehicles for fluid leaks. Implement a preventative maintenance program to keep vehicles free from leaks.

.5 Refueling of on-line equipment from storage facilities located outside Park boundaries is strongly preferred. Storage of any fuel has to occur only in previously approved locations, and with Departmental Representative consent. The Contractor must submit plans for fuel management and a Spill Contingency Plan seven days prior to the start of the Work. The Contractor is expected to be prepared to effect the containment and cleanup of all spills related to the Work.

.6 Emulsion storage tanker and transfer of emulsion from tanker to spray vehicle are not permitted within National Park.

1.12 EQUIPMENT MOVEMENT AND MAINTENANCE

.1 Maintenance work on Contractor/Sub-Contractor equipment is prohibited within National Park.

.2 Waste oil and solvents are to be properly contained until they are removed from the site by qualified companies for recycling or disposal.

.3 Any leaking equipment must be taken out of service until repaired.

.4 Limit the number and length of temporary access and construction roads.

1.13 AIRBORNE POLLUTION AND PARTICULATE CONTROL

.1 Keep dust and inconvenience to site occupants to a minimum.

.2 Control emissions from equipment to local emission requirements.

.3 Do grading activities to minimize dusting. Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

1.14 NOISE CONTROL

.1 Operate construction equipment to prevent excessive noise.

.2 To reduce potential negative impacts on Park fauna (especially moose), noise control measures, such as properly functioning mufflers on equipment, must be in place.

1.15 BLASTING

.1 Blasting is prohibited.

1.16 SEWAGE DISPOSAL

.1 Provide and maintain temporary sanitary facilities for site personnel.

.2 Obtain all approvals required for the disposal of sanitary waste from any facilities, including offices, washrooms, and temporary site trailers.

.3 Remove sanitary facilities from site when no longer required.

1.17 FISHERIES AND WILDLIFE

.1 Wildlife shall not be fed or harassed.

.2 All refuse shall be disposed of at an approved facility to avoid the attraction of nuisance animals.

.3 In case of persistent wildlife encounters, the Contractor shall inform the Departmental Representative, who will notify Parks Canada of the situation. Care shall be taken to avoid the animal.

.4 All observed fish shall be removed from the isolated reach of the channel prior to dewatering operations.

1.18 UNFORESEEN SITE STOPPAGES

.1 If contaminated sites, heritage sites, archeological resources, or other unforeseen site conditions are encountered in the work site area, work will immediately cease until investigations are completed and permission to continue is granted from the Departmental Representative.

1.19 HISTORICAL/ARCHAEOLOGICAL CONTROL

.1 Provide historical, archaeological, cultural resources, biological resources, and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.

.2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

1.20 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection Plan.

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

.1 Take action only after receipt of written approval by Departmental Representative.

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

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

1.21 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 SEDIMENT CONTROL FENCE

.1 Provide and maintain sediment control fence where required or as directed, prior to construction. Coordinate locations with Departmental Representative. Do not remove control features until authorized by the Departmental Representative.

.2 Sediment Control fence: preassembled sediment control fence with industrial woven geotextile fabric pre-stapled to wood posts spaced as indicated.

2.2 EROSION CONTROL STRUCTURES

.1 Provide and maintain erosion control structures where required or as directed, prior to construction. Coordinate locations with Departmental Representative. Do not remove control features until authorized by the Departmental Representative.

.2 Geotextile: non-woven, needle-punched polyester filter fabric.

.3 Random rip-rap shall be supplied in accordance with Section 31 37 00 – Rip-rap.

.4 Construct erosion control structures to the cross sections indicated on the Project Documents.

Part 3 Execution

3.1 EROSION AND SEDIMENT CONTROL

.1 Install sediment control fence as per the manufacturer's instructions.

.1 In areas of potential sheet flow runoff where construction activity may cause the drainage run-off to transport sediment(s), and the Contract Documents do not provide for sediment control fences in these areas, the Contractor shall ensure that sediment control fences are properly located for effective runoff control.

.2 Erosion and sediment control structures (e.g. sediment control fencing, check dams) shall be installed prior to site disturbance activities; continually maintained and shall not be removed until the area is stabilized (which may not be until after all site activities are complete).

.1 The Contractor shall immediately repair any damage to erosion and sediment control structures or parts thereof.

.3 Any exposed soils which may pose a sedimentation issue will be stabilized or protected before a rain event unless otherwise agreed to by the Departmental Representative.

.4 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 these changes as necessary to meet the environmental protection objectives. Do not remove control features unless authorized by the Departmental Representative.

.5 Inspections of the erosion and sediment control works and any other measures by the Contractor shall occur after each rainfall and at least daily during periods of prolonged rainfall. The inspection reports shall be submitted to the Departmental Representative within 24 hours of completion.

.6 Plastic film (polyethylene) may be placed on areas where immediate protection is required. Generally plastic is used for temporary stream diversions although it can also be used to cover small stockpiles.

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 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

.3 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
.2	Section 31 24 13	Roadway Embankments
.3	Section 32 01 16.13	Reshaping Asphalt Pavement
.4	Section 32 11 16.01	Granular Sub-base
.5	Section 32 11 23	Aggregate Base Courses
.6	Section 32 12 16	Asphalt Paving
.7	Section 33 42 13	Pipe Culverts
.8	Section 33 42 13.01	Precast Rigid Frame Culverts

1.2 INSPECTION

.1 Allow Departmental Representative access to Work. 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 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 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, Departmental Representative shall pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting 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 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 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 Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner 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 Departmental Representative.

1.7 REPORTS

.1 Submit 4 copies of inspection and test reports to 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.

1.9 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the 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 ACTION AND INFORMATIONAL SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.3 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.

.2 Provide and maintain scaffolding, ramps, ladders, platforms and temporary stairs as required.

1.4 HOISTING

.1 Provide, operate and maintain hoists required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.

.2 Hoists to be operated by qualified operator.

1.5 SITE STORAGE / LOADING

.1 Contractor's use of site storage and loading shall be limited to an area within limits of traffic diversion. Any conditional areas required shall be approved by Departmental Representative prior to use.

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

1.6 CONSTRUCTION PARKING

.1 Parking will be permitted in the area of the site provided it does not disrupt performance of Work and after obtaining agreement with the Departmental Representative.

.2 Provide and maintain adequate access to project site.

.3 Keep parking areas clean and maintained during period of Contract.

1.7 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

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

1.8 SANITARY FACILITIES

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

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.9 CONSTRUCTION SIGNAGE

.1 No other signs or advertisements, other than warning signs, are permitted on site.

.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 Departmental Representative.

1.10 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Refer to Section 01 35 00.06 – Special Procedures for Traffic Control.

1.11 CLEAN-UP

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

.2 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

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

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

1.12 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

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 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.3 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations and open edges of structures, or as indicated in Contract Documents.

.2 Provide as required by governing authorities and as directed.

1.4 ACCESS TO SITE

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

1.5 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent Traffic Control Persons, traffic control signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

.2 Contractor to provide automated temporary traffic control signals at all times during lane closures (24 hours a day, 7 days a week).

.3 One lane to remain open at all times during construction with concrete jersey barriers along edge of excavation and embankment.

1.6 FIRE ROUTES

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

1.7 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.

1.8 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the 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 Within text of each specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.5 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

1.2 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions.

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.8 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

.2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

1.6 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.8 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

1.9 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.10 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

1.11 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the 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 Owner's identification of existing survey control points and property limits.

1.2 QUALIFICATION OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in Province of Nova Scotia, acceptable to Departmental Representative.

1.3 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 Departmental Representative.

.3 Report to 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.

1.4 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 Provide survey layout with stakes on both sides of the road/alignment at 20 metre station intervals (top of back slope, toe of slope, subgrade, granulars, shoulders, etc.) with centreline offset.

.4 Establish pipe invert elevations and location of any exposed pipe not being removed under this contract.

.5 Record elevation and location of all existing and installed end caps of abandoned underground services.

1.5 EXISTING SERVICES

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

1.6 RECORDS

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

.2 On completion of site works, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

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

1.7 SUBMITTALS

.1 Submit name and address of Surveyor to Departmental Representative.

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

1.8 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the 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 PROJECT CLEANLINESS

.1 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

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

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

.4 Dispose of waste materials and debris off site.

.5 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.6 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

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

.8 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

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 other than that caused by Owner or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

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

.7 Sweep and wash clean paved areas.

1.3 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 CLEANING DURING CONSTRUCTION

.1 The Contractor shall ensure that adequate dust control is provided at all times during the Contract to avoid any hazardous situations and shall immediately implement any measures as directed by the Departmental Representative to control dust problems. Any damages or costs incurred as a result of excessive dust shall be paid for by the Contractor.

END OF SECTION

Part 1 General

1.1 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 Departmental Representative's inspection.

.2 Departmental Representative 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 English that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with Contract Documents.

.2 Defects: corrected and deficiencies completed.

.3 Certificates required by jurisdictional authorities have been submitted.

.4 Work is complete and ready for Final Inspection.

.3 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

1.2 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the 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 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 Convene meeting one week prior to contract completion with Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:

.1 Verify Project requirements.

.2 Review warranty requirements.

.2 Departmental Representative to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.2 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, in addition to requirements in General Conditions, at site for 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 and samples in field office apart from documents used for construction.

.1 Provide files, racks, and secure storage.

.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 and samples available for inspection by Departmental Representative.

1.3 RECORD DRAWINGS

.1 Departmental Representative will provide two sets of white prints for record drawing purposes.

.2 Maintain project record drawings and record accurately deviations from Contract documents.

.3 Record changes in red. Mark on one set of prints and at completion of project and prior to final inspection, neatly transfer notations to second set and submit both sets to the Departmental Representative.

.4 Record following information:

.1 Field changes of dimension, detail and elevation.

.2 Changes made by Change Order or Field Order.

.3 Other significant deviations which are concealed in construction and cannot be identified by visual inspection

.5 At completion of project and prior to final inspection, neatly transfer “as-recorded” records to second set of white prints using fine, red marker. Neatly print lettering and numbers in size to match original. Lines may be drawn free-hand but shall be neat and accurate. Add at each drawing title block note: “AS-RECORDED”. Also, circle on List of Drawings each title and number of drawing marked with “as-recorded” records.

.6 Submit this set of “as-recorded” drawings to Departmental Representative.

.7 At the completion of construction the Contractor shall complete a topographic as-recorded survey of the project areas and submit the survey data in an acceptable form to the Departmental Representative.

.8 If project is completed without significant deviations from contract drawings, declare this in writing and submit to Departmental Representative in lieu of record drawings.

.9 The Departmental Representative will review the progress of the record drawings as part of each payment certificate authorization. Should the drawings not be properly updated, payment will be withheld for each payment certificate until the work is completed to the satisfaction of the Departmental Representative.

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

.11 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish road elevation.

.2 Measured horizontal and vertical locations of underground utilities, guiderail 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.

1.4 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.

1.5 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the 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 RELATED REQUIREMENTS

.1 Section 31 23 33.01 Excavating, Trenching and Backfilling

1.2 REFERENCES

.1 Definitions:

.1 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well-being or environment if handled improperly.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.

.2 Scheduling: meet project time lines without compromising specified minimum rates of material diversion.

.1 Notify Departmental Representative when unforeseen delays occur.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial regulations.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 35 43 - Environmental Procedures.

.2 Storage and Protection.

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

.2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.

.3 Remove and store materials to be salvaged, in manner to prevent damage.

.4 Store and protect in accordance with requirements for maximum preservation of material.

.5 Handle salvaged materials as new materials.

1.7 SITE CONDITIONS

.1 Site Environmental Requirements.

.1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.

.2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

.3 Do not dispose of waste or volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.

.1 Ensure proper disposal procedures are maintained throughout the project.

.4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities as directed by Departmental Representative.

.6 Protect trees, plants and foliage on site and adjacent properties where indicated.

.2 Existing Conditions.

.1 Remove contaminated or hazardous materials as defined by authorities having jurisdiction from site, prior to start of demolition Work, and dispose of in safe manner in accordance with applicable regulatory requirements.

1.8 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 EQUIPMENT

.1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

Part 3 Execution

3.1 PREPARATION

.1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies before starting demolition.

.4 The Contractor shall advise the Departmental Representative at least 48 hours in advance of carrying out the cold milling operation.

3.2 REMOVAL OF HAZARDOUS WASTES

.1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

3.3 REMOVAL OPERATIONS

.1 Remove items as indicated.

.2 Do not disturb items designated to remain in place.

.3 Excavate at least 300 mm below pipe invert, when removing pipes under existing or future pavement area.

.4 Culverts, pipe sewers, drains and catch basins removed shall become property of the Contractor and shall be disposed of outside the work site.

.5 Backfill:

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

3.4 REMOVAL OF GUIDE RAIL

.1 Guide rail, offset blocks, hardware and delineators shall be dismantled to individual components.

.2 The dismantling and removal shall be carried out in a manner so as to avoid damage to the adjacent and surrounding roadway.

.1 The Contractor shall be responsible, at their own expense, to repair any such damage resulting from the work.

.3 Dismantled guide rail, hardware and delineators shall become property of the Contractor and shall be disposed of outside the work site.

.4 The Contractor shall organize the work such that the removal and replacement of any length of guide rail section is completed in the same day.

3.5 REMOVAL OF GUIDE POSTS

.1 The removal shall be carried out in a manner so as to avoid damage to the adjacent and surrounding roadway.

.1 The Contractor shall be responsible, at their own expense, to repair any such damage resulting from the work.

.2 All materials shall become property of the Contractor and shall be disposed of outside the work site.

.3 The Contractor shall be responsible to completely backfill the hole resulting from the guide post removal with compacted NSTIR Type 1S gravel, compact during placement and shall finish the backfilled area to match the surrounding grade.

.1 The Contractor shall fill and compact all holes left from post removal with before nightfall.

.4 The Contractor shall shape and grade the shoulder by removing excess materials that have accumulated over time and shall leave the work site in a uniform and consistent grade matching the adjacent surface.

3.6 STOCKPILING

.1 Label stockpiles, indicating material type and quantity.

.2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.

.3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.

.4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

3.7 REMOVAL FROM SITE

.1 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project.

.2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.

3.8 RESTORATION

.1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

.2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.9 CLEANING

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

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

.2 Remove debris, trim surfaces and leave work site clean, upon completion of Work

.3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

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

3.10 PROTECTION

.1 Repair damage to adjacent materials or property caused by selective site demolition.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

1.2 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 EQUIPMENT

.1 The cold milling equipment shall be automatically controlled for grade and slope during the asphalt concrete removal operation. The surface remaining after cold milling shall have a constant and continuous cross fall matching the intended surface course cross fall and shall have an even texture free of grooves and/or ridges in all directions.

.2 Saw-cutting equipment capable of creating smooth face.

Part 3 Execution

3.1 PREPARATION

.1 Prior to beginning removal operation, inspect and verify with Departmental Representative, areas, depths and lines of asphalt pavement to be removed.

.2 Protection: protect existing pavement not designated for removal, signs, guiderail and structures from damage. In event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.

3.2 REMOVAL OF ASPHALT CONCRETE

.1 The Contractor shall advise the Engineer at least 48 hours in advance of carrying out the cold milling operation. The cold milling operation shall be carried out in such a manner as to maintain an uninterrupted flow of traffic at all times.

.2 The cold milling operation shall be carried out in such a manner as to maintain an uninterrupted flow of traffic at all times.

.3 Remove existing asphalt pavement to lines and grades as indicated.

.4 The cold milling equipment shall be automatically controlled for grade and slope during the asphalt concrete removal operation.

.1 When existing pavement has been removed in advance of paving the joint area, the Contractor shall construct a smooth taper at the joint area to a slope of at least 50 horizontal to 1 vertical (50H:1V). The taper may be placed on tar paper and shall be removed just prior to paving the keyed area or as directed by the

Departmental Representative. The transverse joint shall be straight and have a vertical face when the taper is removed.

.2 The lanes shall be completed to the same location at the end of the day's cold milling.

.5 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.

.6 The Contractor shall take care in full depth removal not to contaminate the reclaimed asphalt pavement with the underlying aggregate materials or other materials.

.7 Suppress dust generated by removal process.

.8 The Contractor shall provide for the drainage of water from the cold milled surfaces as determined by the Departmental Representative.

.9 The surface remaining after cold milling shall have a constant and continuous cross fall matching the intended surface course cross fall and shall have an even texture free of grooves and/or ridges in all directions.

.10 Immediately following the cold milling operation and prior to the traffic being allowed on the cold planed surface, the Contractor shall sweep the surface and remove any bonded asphalt concrete material left by the cold planning machine.

.1 All loose material remaining after cold milling shall be swept to a granular shoulder or picked up from paved shoulders, gutter and from under guiderail before reopening the work area to traffic.

.11 The Contractor shall continuously maintain the Work Site free of potholes and standing water and in a condition providing for the safe and efficient flow of traffic, from the time of removal, until such time as the new asphalt pavement is placed.

.1 Hot mixed asphalt pavement shall be placed in the potholes; cold mix or reclaimed asphalt pavement are acceptable only as a temporary repair.

.12 Proper stockpiling procedures shall be used and care taken not to contaminate or consolidate the reclaimed asphalt pavement stockpile.

.13 If the contract documents specify that the reclaimed asphalt pavement is to be used in a hot recycled asphalt mix, the reclaimed asphalt pavement shall be weighed prior to placement in the stockpile.

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 Immediately following the cold milling operation and prior to the traffic being allowed on the cold planed surface, the Contractor shall sweep the surface and remove any bonded asphalt concrete material left by the cold planning machine.

.1 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

.2 All loose material remaining after cold milling shall be swept to a granular shoulder or picked up from paved shoulders, gutters or from under guide rail before reopening the work area to traffic.

.4 Cold milled asphalt pavement which is to be recycled in hot mix asphalt concrete under this contract may be stockpiled at designated asphalt plant site.

.1 Any excess RAP materials remaining after recycling in the new asphalt concrete base pavement shall become property of the Contractor and shall be disposed of off-site.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1	Section 03 20 00	Concrete Reinforcing
.2	Section 03 30 00	Cast-in-Place Concrete
.3	Section 03 35 00	Concrete Finishing
.4	Section 33 42 13.01	Precast Rigid Frame Culverts

1.2 REFERENCES

.1 Reference Standards:

.1 CSA International

.1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.

.2 CSA O86, Engineering Design in Wood.

.3 CSA S269.1, Falsework for Construction Purposes.

.4 CAN/CSA S269.3, Concrete Formwork.

.5 CSA 0121, Douglas Fir Plywood.

.2 Council of Forest Industries of British Columbia (COFI)

.1 COFI Exterior Plywood for Concrete Formwork.

1.3 SHOP DRAWINGS

.1 Submit shop drawings for formwork and falsework for suspended slab formwork and supports in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangements of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA S269.3 for formwork drawings.

.3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.4 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

.5 Each shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in the Province of Nova Scotia.

1.4 RESPONSIBILITY

.1 Contractor to design for method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA S269.3 for formwork drawings.

.2 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms upon request from Departmental Representative.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste material.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.

.1 Use of sealers, form release and stripping agents within the inboard side of the weather barrier, including must comply with VOC limits as set by SCAQMD Rule 1113.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle and store formwork materials to prevent weathering, warping or damage detrimental to the strength of the materials or to the surface to be formed.

.2 Ensure that formwork surfaces which will be in contact with concrete are not contaminated by foreign matter. Handle and erect the fabricated formwork so as to prevent damage.

Part 2 Products

2.1 MATERIALS

.1 Formwork materials:

.1 Use wood and wood product formwork materials to CSA A23.1/A23.2 and CSA O121.

.2 Plywood and wood formwork materials to CSA O121, CAN3-O86.1, CAN3-O86.1S1, CSA O153.

.2 Falsework materials: to CSA S269.1.

.3 Form ties:

.1 Use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface. Holes are to be filled with non-shrink grout.

.2 Adjustable in lengths to permit tightening and alignment of forms.

.4 Form release agent: non-toxic, biodegradable, low VOC, chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.

.5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 to 24 mm^2/sat 40°C, flashpoint minimum 150°C, open cup.

Part 3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines and levels before proceeding with formwork/falsework and ensure dimensions agree with drawings. Review all drawings and check dimensions prior to construction for proper fit and report any discrepancies before proceeding with the work.

.2 Obtain Departmental Representative's approval for use of earth forms.

.3 Obtain Departmental Representative's approval before framing openings not indicated on drawings.

.4 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.5 Assemble formwork so that concrete is not damaged during its removal.

.6 Fabricate and erect falsework in accordance with CSA S269.1 and COFI exterior plywood for concrete formwork.

.7 Provide form finishes as per CSA A23.1/A23.2 and ACI 301 as follows:

.1 Top of footings: rough form finish to CSA A23.1.

.2 Repair all deficient areas prior to proceeding with other finishes.

.8 Do not place shores and mud sills on frozen ground.

.9 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.10 Fabricate and erect formwork in accordance with CAN/CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.

.11 Align form joints and make watertight. Keep form joints to minimum.

.12 Locate horizontal form joints for walls and pilasters below top of finished grade. Minimize vertical form joints for walls above top of finished grade.

.13 Form slots, openings, drips, recesses, expansion and control joints as indicated.

.14 Prior to placing concrete, the elevations of forms shall be checked to verify drainage slopes.

.15 Provide 48 hours' notice to Departmental Representative for inspection prior to concrete placement.

.16 Clean formwork as erection proceeds, to remove foreign matter. Remove cuttings, shavings and debris from within forms. Flush completely with water to remove remaining foreign matters. Ensure that water and debris drain to exterior through clean-out ports.

.17 During cold weather, remove ice and snow from within forms, do not use de-icing salts. Do not use water to clean out completed forms, unless formwork and concrete construction proceed within a heated enclosure.

.18 Patch all form tie holes and finish surface to remove all evidence of tie holes and/or patching.

.19 Construction Joints:

.1 Form construction joints where required and as approved.

.2 Build waterstops into forms, supported against displacement by pouring of concrete.

.3 Use preformed waterstop corners and intersections where they are available to suit conditions.

.4 Join waterstops to preformed corners and intersections, and between lengths with butted and welded connections in accordance with manufacturer's recommendations.

.20 Clean formwork in accordance with CSA A23.1/A23.2 before placing concrete.

.21 Apply form release agent to all formed surfaces prior to casting concrete.

3.2 REMOVAL AND RESHORING

.1 Notify Departmental Representative prior to form removal.

.2 Form removal times are dependent on proper curing as specified herein.

.3 Remove formwork progressively and in accordance with the reference code requirements, and so that no shock loads or imbalanced loads are imposed on the structure.

.4 Leave formwork in place for following minimum periods of time after placing concrete.

.1 3 days for footings and retaining walls.

.5 Re-use formwork and falsework subject to requirements of CSA A23.1/A23.2.

.6 Loosen forms carefully. Do not wedge pry bars, hammers or tools against concrete surfaces.

.7 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 Cast-in-Place Concrete

.2 Section 33 42 13.01 Precast Rigid Frame Culverts

1.2 REFERENCES

.1 American Concrete Institute (ACI)

.1 SP-66, ACI Detailing Manual.

.1 ACI 315, Details and Detailing of Concrete Reinforcement.

.2 ACI 315R, Manual of Structural and Placing Drawings for Reinforced Concrete Structures.

.2 CSA International

.1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete.

.2 CSA A23.3, Design of Concrete Structures.

.3 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.

.4 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.

.3 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 SUBMITTALS

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

.2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Nova Scotia.

.1 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacings and locations of chairs, spacers and hangers.

.2 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.

.1 Provide type B tension lap splices where indicated unless otherwise

1.4 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 00 - Quality Control.

.1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.

.2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with this Section and 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated areas.

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Departmental Representative.

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA G30.18, unless indicated otherwise.

.3 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.

.4 Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2.

.5 Mechanical splices: subject to approval of Departmental Representative.

.6 Smooth plain round bars: to CSA G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2, ANSI/ACI 315 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada. Shop fabricate and bend all reinforcing steel.

.1 ACI 315R unless indicated otherwise.

.2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

.4 Have welding performed by workers qualified under CSA W47.1.

.1 Welding of reinforcing steel to have prior approval of Departmental Representative.

.5 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

.1 Match dowels from footings to vertical reinforcing in wall above.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.

.2 Upon request inform Departmental Representative of proposed source of material to be supplied.

2.4 CLEANING

.1 Clean reinforcing to CSA A23.1/A23.2. All reinforcing bars are to be free of scale, rust, and contamination at time of placing in forms.

Part 3 Execution

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA A23.1/A23.2.

.2 Use plain round bars as slip dowels in concrete.

.1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.

.2 When paint is dry, apply thick even film of mineral lubricating grease.

.3 After reinforcing is placed and prior to closing of forms, obtain Departmental Representative's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

3.3 STORAGE

.1 Store reinforcing steel to prevent deterioration, contamination, or disfigurement.

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 REFERENCES

.1 Abbreviations and Acronyms:

.1 Cement: hydraulic cement or blended hydraulic cement (GUb - where b denotes blended).

.1 Type GU or GUb - General use cement.

.2 Reference Standards:

.1 ASTM International

.1 ASTM A615/A615M-12, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

.2 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.

.3 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.4 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.

.5 ASTM C1017/C1017M, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.2 CSA International

.1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.

.2 CSA A283, Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000-08, Cementitious Materials Compendium.

.4 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.

1.2 SUBMITTALS

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

.2 Provide testing inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.

.3 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

.4 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

.5 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 – Health and Safety Requirements and Section 01 35 43 - Environmental Procedures.

1.3 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 00 - Quality Control.

.2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.

.1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

.3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:

.1 Falsework erection.

.2 Hot weather concrete.

.3 Cold weather concrete.

.4 Curing.

.5 Finishes.

.6 Formwork removal.

.7 Joints.

.8 Backfilling.

.4 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

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, laboratory representative, and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Departmental Representative.

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

Part 2 Products

2.1 CONCRETE DESIGN CRITERIA

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

2.2 CONCRETE 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 CONCRETE MATERIALS

.1 Cement: to CSA A3001, Type GU to CSA A23.1/A23.2 and CAN/CSA A5.

.2 Hydraulic cement: Type GUb to CSA A3001.

.3 Water: to CSA A23.1.

.4 Aggregates: to CSA A23.1/A23.2. Coarse aggregates to be normal density.

.5 Admixtures:

.1 Air entraining admixture: to CSA A23.1/A23.2 and CAN3-A266.1.

.2 Chemical admixture: to CSA A23.1/A23.2 and CAN3-A266.4. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.3 Obtain authorization from Departmental Representative for use of super plasticizing admixture, water reducer, and/or other admixtures as approved by Departmental Representative to achieve designed concrete properties.

.6 Concrete shall be normal and shall have a unit weight of 2350 kg/m^3.

.7 Curing compound: to CSA A23.1/A23.2 white and ASTM C 309.

.8 Waterstops: Sodium Bentonite based (75%):

.1 Volclay Waterstop Rx or equal as approved by Departmental Representative.

.2 Install waterstops to provide continuous waterseal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace reinforcement when using waterstops. Use equipment to manufacturers' requirements to field splice waterstops.

.9 Premoulded joint fillers:

.1 Bituminous impregnated fiber board: to ASTM D 1751.

.2 Sponge rubber: to ASTM D 1752, Type I, flexible firm grade.

.3 Self-expanding Standard cork: to ASTM D 1752, Type II III.

.10 Weep hole tubes: plastic.

2.4 CONCRETE MIXES

.1 Performance Method for specifying concrete to meet Departmental Representative performance criteria and to CSA A23.1/A23.2.

.2 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.

.1 Provide concrete mix to meet following plastic state requirements:

.1 Uniformity: to CSA A23.1

.2 Workability: free of loss of mortar, segregation.

.3 Finishability: amount of bleeding.

.4 Set time: 2 hours maximum.

.2 Provide concrete mix to meet following hard state requirements:

.1 Durability and class of exposure: C-1.

.2 Compressive strength at 28 days: 35 MPa minimum.

.3 Intended application: footings and retaining wall.

.4 Aggregate size: 20 mm maximum.

.3 Provide mud slab mix to meet following requirements:

.1 Compressive strength at 28 days: 10 MPa minimum.

.3 Provide quality management plan to ensure verification of concrete quality to specified performance.

.4 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

Part 3 Execution

3.1 PREPARATION

.1 Obtain Departmental Representative's written approval before placing concrete.

.1 Provide 24 hours minimum notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 – Concrete Reinforcing.

.3 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete will be permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Protect previous Work from staining.

.8 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.9 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.

.1 Place steel dowels of deformed steel reinforcing bars and pack solidly with shrinkage compensating grout epoxy grout to anchor and hold dowels in positions as indicated.

.10 Do not place load upon new concrete until authorized by Departmental Representative. Backfilling of retaining walls is prohibited until authorized by Departmental Representative.

3.2 INSTALLATION / APPLICATION

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

.2 Sleeves and inserts:

.1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through walls except where indicated or approved by Departmental Representative.

.2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

.3 Sleeves and openings greater than 100 x 100 mm not indicated must be reviewed by Departmental Representative.

.4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.

.5 Confirm locations and sizes of sleeves and openings shown on drawings.

.6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Drainage holes and weep holes:

.1 Form weep holes and drainage holes in accordance with Section 03 10 00 – Concrete Forming and Formwork Accessories. If wood forms are used, remove them after concrete has set.

.2 Install weep hole tubes and drains as indicated.

.4 Finishing and curing:

.1 Finish concrete to CSA A23.1/A23.2.

.1 Schedule.

.2 Use procedures as reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.

.3 Use curing compounds compatible with applied finish on concrete surfaces. Applied finish on concrete: brushed on exposed pad footings. Provide written declaration that compounds used are compatible.

.5 Waterstops:

.1 Install waterstops to provide continuous water seal.

.2 Do not distort or pierce waterstop in way as to hamper performance.

.3 Do not displace reinforcement when installing waterstops.

.4 Use equipment to manufacturer's requirements to field splice waterstops.

.5 Tie waterstops rigidly in place.

.6 Use only straight heat sealed butt joints in field.

.7 Use factory welded corners and intersections unless otherwise approved by Departmental Representative.

3.3 SURFACE TOLERANCE

.1 Concrete tolerance to CSA A23.1 Straightedge Method.

3.4 FIELD QUALITY CONTROL

.1 Site tests: conduct tests as follows in accordance with Section 01 45 00 – Quality Control and submit report as described in PART 1 - SUBMITTALS.

.1 Concrete pours.

.2 Slump.

.3 Air content.

.4 Compressive strength at 3, 7, 28 and 56 days.

.5 Air and concrete temperature.

.6 Weather.

.2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.

.1 Ensure testing laboratory is certified to CSA A283.

.3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.

.1 Departmental Representative will pay for costs of tests.

.4 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.5 For compressive strength testing, a minimum of 3 cylinders and 2 field cured cylinders are required for:

.1 Each day's pour.

.2 Each type of grade of concrete.

.3 Each change of supplier.

.4 Each 40 cubic metre or fraction thereof for footings and foundation walls.

.5 Additional test specimens shall be taken whenever requested by the Departmental Representative to verify the concrete quality.

.6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.

.7 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.5 CLEANING

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

.2 Waste Management: separate waste materials for reuse and recycling:

.1 Divert unused concrete materials from landfill to local quarry facility after receipt of written approval from Departmental Representative.

.2 Provide appropriate area on job site where concrete trucks and be safely washed.

.3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.

.4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.5 Prevent admixtures and additive materials from entering drinking water supplies or streams.

.6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.

.7 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

3.6 CURING

.1 Ensure that freshly placed concrete is protected from freezing, dehydration, mechanical shock and contact with injurious substances.

.2 Do not use curing compounds that would have a detrimental effect on bonding, adhesion, curing, appearance, or similar qualities of materials applied to concrete surfaces. Use only moisture curing.

.3 Protect the concrete from premature drying and extremes of temperature.

.4 Cure, protect and finish concrete to CSA A23.1, CSA S269.1 and CAN/CSA S269.3. Curing type in accordance with specified exposure classification unless more stringent requirements are noted otherwise. Special curing and finishing requirements are as follows:

.1 Exterior concrete pads: curing "TYPE 2". Seven (7) days total at >10°C and for the time necessary to attain 70% of the specified concrete strength.

.5 Foot traffic shall be kept off curing concrete for 1 day.

.6 Vehicles shall be kept off concrete for 7 days.

3.7 DEFECTIVE WORK

.1 Repairs and classification of unacceptable concrete to be in accordance with CSA-A23.1/A23.2.

.2 Remove defective concrete and embedded debris and repair as directed by Departmental Representative.

.3 Excessive honeycomb or embedded debris in any concrete shall deem it defective. Remove and replace defective concrete.

.4 Remove to bare concrete curing compounds detrimental to application of specified finishes.

.5 Concrete to be supplied at the minimum strength requirement at 28 days. Tests indicating strengths lower than specified will necessitate further testing as required by the Departmental Representative. Cost for such testing to be at the Contractor's expense. Should further tests confirm low values, the Departmental Representative has the right to require strengthening of the affected area or removal and replacing of the weak concrete all to the Contractor's expense.

.6 Repair all shrinkage cracks in the completed concrete work employing a suitable epoxy injection technique acceptable to Departmental Representative to completely seal all such cracks.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1	Section 03 10 00	Concrete Forming and Formwork Accessories
.2	Section 03 20 00	Concrete Reinforcing
.3	Section 03 30 00	Cast-in-Place Concrete
.4	Section 32 32 34	Segmental Concrete Retaining Wall
.5	Section 33 42 13.01	Precast Rigid Frame Culverts

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-25.20, Surface Sealer for Floors.

.2 CSA International

.1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.

.1 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

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 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

.1 Submit written declaration that components used are compatible and will not adversely affect finished products and their installation adhesives.

2.2 SEALING COMPOUNDS

.1 Surface sealer: to CAN/CGSB-25.20, Type 1 -solvent-based Type 2 - water based, clear colour.

.2 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.3 Surface sealer: acrylic carnuba wax, colour.

.4 Surface sealers are not manufactured or formulated with aromatic solvents formaldehyde halogenated solvents mercury lead cadmium hexavalent chromium and their compounds.

2.3 CURING COMPOUNDS

.1 Select low VOC, water-based, organic-solvent free curing compounds.

2.4 MIXES

.1 Mixing ratios in accordance with manufacturer's written instructions.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that slab surfaces are ready to receive work and elevations are as indicated on shop drawings recommended by manufacturer's written instructions.

3.2 PREPARATION OF EXISTING SLAB

.1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.

.2 Saw cut control joints to CSA A23.1/A23.2, 24 hours maximum after placing of concrete.

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 Protect finished installation in accordance with manufacturer's instructions.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 32 34 — Segmental Concrete Retaining Wall

.2 Section 33 42 13.01 — Precast Rigid Frame Culverts

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

- .1 ASTM A775 / A775M, Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
- .2 ASTM A1064 / A1064M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .3 ASTM C260 / C260M, Standard Specification for Air-Entraining Admixtures for Concrete.
- .4 ASTM C877, Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.
- .5 ASTM C1433, Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers.
- .6 ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
- .7 ASTM D2240, Standard Test Method for Rubber Property - Durometer Hardness.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-1.40, Anticorrosive Structural Steel Alkyd Primer.
- .2 CAN/CGSB-1.181, Ready Mixed Organic Zinc-Rich Coating.

.3 CSA International

- .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.
- .2 CSA A23.3, Design of Concrete Structures.
- .3 CSA A23.4, Precast Concrete - Materials and Construction.
- .4 CAN/CSA A3000, Cementitious Materials Compendium.
- .5 CAN/CSA G30.18, Carbon-Steel Bars for Concrete Reinforcement.
- .6 CSA G40.20 / G40.21, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.
- .7 CSA S6, Canadian Highway Bridge Design Code.
- .8 CSA W47.1, Certification of Companies for Fusion Welding for Steel.
- .9 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
- .10 CSA W59, Welded Steel Construction (Metal Arc Welding).
- .11 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 The Master Painters Institute (MPI) - Architectural Painting Specification Manual (ASM) - February 2004

.1 MPI # 18, Organic Zinc Rich Primer.

.2 MPI # 23, Oil Alkyd Primer.

.5 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 DESIGN REQUIREMENTS

.1 Design precast elements to CSA-A23.3 and CSA-A23.4 to carry handling stresses.

.2 Design precast open span culverts and associated wingwalls to carry highway loads in accordance with Canadian Highway Bridge Design Code, CSA S6.

.3 Design connections/attachments of precast open span culverts and associated wingwalls to load/forces specified by Canadian Highway Bridge Design Code, CSA S6.

.4 Provide detailed design drawings for typical precast elements and connections as described in PART 1 - SUBMITTALS.

1.4 SUBMITTALS

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

.2 Submit WHMIS MSDS - Material Safety Data Sheets.

.3 Submit shop drawings in accordance with CSA A23.3 and CSA A23.4 and include following items:

.1 Details of pre-stressed and non-pre-stressed members, reinforcement and their connections.

.2 Camber.

.3 Finishing schedules.

.4 Methods of handling, erection and sealing.

.5 Openings, sleeves, inserts and related reinforcement.

.4 Shop Drawings: submit drawings stamped and signed by qualified professional engineer registered or licensed in Province of Nova Scotia, Canada.

1.5 QUALITY ASSURANCE

.1 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Departmental Representative verifying compliance that concrete provided meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.6 QUALIFICATIONS

.1 Fabricate and erect precast concrete elements by manufacturing plant certified in appropriate categories according to CSA A23.4.

.2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting tender and to specifically verify as part of tender that plant is currently certified in appropriate categories, (Structural).

.3 Only precast elements fabricated in such certified plants to be acceptable to Departmental Representative and plant certification to be maintained for duration of fabrication, erection until warranty expires.

.4 Welding companies certified to CSA W47.1.

1.7 DELIVERY, STORAGE AND HANDLING

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

.2 Protect unit corners from contacting earth to prevent from staining.

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

.1 Manufacture units in accordance with CSA A23.4.

.2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not be exposed.

.3 Provide hardware suitable for handling elements.

.4 Shop prime anchors and steel inserts after fabrication and touch up primer on anchors after welding. Do not apply primer to embedded portion of anchor or inserts.

.5 Precast rigid frame culverts: size as indicated.

.6 Precast wingwalls: geometry as indicated.

.1 Only proprietary engineered concrete retaining wall systems are acceptable.

.2 Provide Departmental Representative with one set of complete working drawings, and one copy of detailed design calculations, for review at least 4 weeks prior to beginning construction. Drawings shall indicate dimensions of units, wall elevations, sections and grade profile. Drawings and design calculations to bear signature and stamp of qualified professional engineer registered or licensed in province of Nova Scotia in Canada.

.3 Verify existing site conditions and ground elevations before preparing working drawings.

.4 Use only one type of proprietary engineered retaining wall system for Project. Do not substitute for any component normally supplied by supplier of proprietary engineered retaining wall system.

.5 Wall unit texture and pattern shall be continuous at all exposed wall areas.

2.2 FINISHES

.1 Finish units to standard grade to CSA A23.4.

.2 Exposed vertical end sections of the precast rigid frame structure and exposed wall areas of the segmental concrete retaining walls shall be provided with an ashlar stone relief profiles.

.1 The ashlar stone relief profile patterns/false joints to be aligned.

2.3 SOURCE QUALITY CONTROL

.1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CSA A23.4 and CSA G279.

.2 Provide records from in-house quality control program based upon plant certification requirements to Departmental Representative for inspection and review.

.3 Provide Departmental Representative with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.

.4 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, pre-stressing steel and provide to Departmental Representative for review upon request.

Part 3 Execution

3.1 ERECTION

.1 Erect, fasten and join precast elements in accordance with manufacturer's instruction, and as indicated on reviewed shop drawings.

.2 Do precast concrete work in accordance with CSA 23.4 CSA A23.3 and CSA S6.

.3 Do welding in accordance with CSA W59, for welding to steel structures and CSA W186, for welding of reinforcement.

.4 Non-cumulative erection tolerances in accordance with CSA A23-4.

.5 Set elevations and alignment between units to within allowable tolerances before connecting units.

3.2 VERIFICATION

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in Part 2 - Products, by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

3.3 CLEANING

.1 Use cleaning methods as reviewed by Departmental Representative before cleaning soiled precast concrete surfaces.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Manual of Uniform Traffic Control Devices for Canada (MUTCD-C).

.2 American Association of State Highway and Transportation Officials (AASHTO):

.1 Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

.3 ASTM International

.1 ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A276, Standard Specification for Stainless Steel Bars and Shapes.

.3 ASTM B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

.4 ASTM B210M, Standard Specification for Aluminum-Alloy Drawn Seamless Tubes (Metric).

.5 ASTM B211M, Standard Specification for Aluminum and Aluminum-Alloy Rolled Cold Finished-Bar, Rod and Wire (Metric).

.4 Canadian General Standards Board (CGSB)

.1 CGSB 62-GP-9M, Prefabricated Markings, Positionable, Exterior, for Aircraft Ground Equipment and Facilities.

.2 CGSB 62-GP-11M, Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing and Amendment.

.5 CSA International

.1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CSA O80 Series, Wood Preservation.

.3 CSA O121, Douglas Fir Plywood.

.4 CSA W47.2, Certification of Companies for Fusion Welding of Aluminum.

.5 CAN/CSA Z8098, Sustainable Forest Management.

.6 Master Painters Institute (MPI):

.1 Architectural Painting Specification Manual.

1.2 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 traffic signage, including product characteristics, performance criteria, physical size, finish and limitations.

.3 Sustainable Design Submittals:

.1 Wood Certification: submit manufacturer's Chain-of-Custody Certificate number for CAN/CSA Z809 or FSC or SFI certified wood.

.4 Indicate dimensions, sizes, assembly, anchorage and installation details for each furnishing specified.

1.3 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 Replace defective or damaged materials with new.

.4 Storage and Protection.

.1 Protect existing signs designated to be reused and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.

.2 Remove and store materials to be reused or salvaged, in manner to prevent damage.

.3 Store and protect in accordance with requirements for maximum preservation of material.

1.4 DESIGN REQUIREMENTS

.1 Sign supports to be capable of withstanding summation of following loads:

.1 Wind load in any direction of 0.60 kPa on signboards and 0.60 kPa on sign supports and appurtenances.

.2 Dead load of signboards, sign supports and appurtenances.

.3 Ice load of 0.25 kPa on one face of signboards and around surface of all structural members and appurtenances.

.2 Structural deflections and vibration in accordance with American Association of State Highway and Transportation Officials (AASHTO), " Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals".

1.5 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Sawn Timber Posts:

.1 Acceptable Material:

.1 Accepted species: Eastern Hemlock, Red Pine, Mixed Hardwood (Birch, Maple, Oak or Ash.

.2 Type: pressure treated in accordance with CSA O80 Series.

.3 Grade: in accordance NSTIR Standard Specification.

.2 Dimensions: As shown on Drawings.

.1 The tolerance on the cross-sectional dimensions of all timber posts shall be ± 2 mm.

.2 Fasteners: Bolts, nuts, washers and other hardware for roadside sign to be cast aluminum alloy, or galvanized steel.

2.2 SIGNBOARDS

.1 Aluminum sheet: to ASTM B209M, precut to required dimensions. Thickness to be 1.6 mm for signboards up to 750 mm wide. Thickness to be 2.1 mm for sign boards 750 - 1200 mm wide. Use 1.0 mm thickness for refurbishing existing sign panel.

.2 Aluminum extrusions: to ASTM B211M, 150 mm or 300 mm panels suitable for bolting together.

.3 T-shape stiffeners for signboards: to ASTM B210M.

.4 Connecting straps and brackets: to ASTM B209M.

.5 Aluminum materials: to ASTM B209M.

.6 Xylene thinner: to CAN/CGSB-1.94.

.7 Chemical conversion coating for aluminum: to CGSB 31-GP-101MA.

.8 Primer for aluminum: to CAN/CGSB-1.132.

.9 Finish paint: to CAN/CGSB-1.59.

.10 Silk screen ink.

.11 Transparent or opaque colours: to CGSB 1-GP-12C, and as indicated.

.12 Reflective sheeting and tape: to CAN/CGSB 62-GP-11M. Adhesive, class of reflectivity and colour as indicated.

.13 Transparent tape: flexible, smooth surfaced and moisture resistant tape.

2.3 FABRICATION

.1 Signboards:

.1 Aluminum blanks:

.1 Degrease, etch and bonderize with chemical conversion coating.

.2 Clean surfaces with xylene thinner. Dry.

.3 For non-reflective signs, spray face with one coat vinyl pretreatment coating and two finish coats of required colour.

.4 For aluminum signboards that are to be painted before installation, spray and bake face of signboards with two coats of enamel in accordance with CAN/CGSB-1.104.

.5 Cut and apply in accordance with manufacturer's instructions.

.6 Apply adhesive coated material with heat lamp vacuum applicator or by squeeze roll application method. Apply pressure sensitive material with roller or squeegee.

.7 Edge wrap sheeting on each extrusion prior to bolting extrusions. Match pieces of sheeting from different rolls for each signboard to ensure uniform appearance and brilliance by day and night.

.8 Reflective signboard faces may be prepared using silk screen transparent ink.

.2 Reflective background sheeting and lettering.

.3 Non-reflective lettering and symbols: cut from vinyl film as specified in CGSB 62-GP-9M, or paint using required colour of finish paint or silk screen transparent ink.

.4 Clean signboards completely and apply transparent tape over top edge and extending 25 mm minimum down back and front of signboard.

.2 Sign identification:

.1 Apply sign number and date of installation with 25mm high stencil painted black letters on lower left back face of each signboard.

.3 Hardware:

.1 All hardware and fasteners shall be double tip galvanized.

Part 3 Execution

3.1 INSTALLATION

.1 All regulatory and warning signs shall be new and mounted on new sign supports.

.2 All Parks Canada signs shall be salvaged and reposted on new sign supports.

.3 Vertical and lateral placement in accordance with MUTCD-C.

.4 Posts:

.1 Set posts by instrument for alignment, and locations as indicated and as directed by Departmental Representative.

.2 Excavate post holes to depths as indicated and to diameter of 360 mm ± 20 mm. Compact bottom to provide firm foundation. Set post plumb and square in hole.

.3 Backfill around posts using excavated material and compact in uniform layers not exceeding 150 mm compacted thickness.

.4 Cut off tops of posts as indicated, with tops parallel to grade of pavement edge.

.5 Worker protection: workers must wear gloves respirators dust masks long sleeved clothing eye protection protective clothing when handling, drilling, sawing, cutting or sanding preservative treated wood and applying preservative materials.

.6 Treat cut tops with two coats of 2% copper napthenate wood preservative.

.5 Signboard:

.1 Fasten signboards to supporting posts and brackets as indicated.

.2 Use T-shape aluminum stiffeners to join portions of sign panel on site. Cover face of T-stiffener with material identical to face of sign panel.

3.2 PROTECTION

.1 Place temporary covering on signboards where indicated. Covering to be capable of withstanding rain, snow, and wind and be non-injurious to signboard. Replace deteriorated covering and remove covers as directed by Departmental Representative.

3.3 CORRECTING DEFECTS

.1 Correct defects, identified by Departmental Representative, in sign message, consistency of reflectivity, colour or illumination. Correct angle of signboard and adjust luminaire aiming angle for optimum performance during night conditions to approval of Departmental Representative.

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 Remove debris, trim surfaces and leave work site clean, upon completion of Work

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

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by traffic signage installation and salvage operations.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 Aggregate materials shall be composed of crushed quarry stone. The materials shall be transported and placed upon the subgrade, subbase or shoulder and compacted as directed and in accordance with these specifications.

.2 The Contractor shall be responsible for Quality Control (QC) testing to ensure that all materials used meet the physical and production requirements of these specifications.

.3 The Department will conduct Quality Assurance (QA) testing for physical properties and production requirements.

1.2 RELATED REQUIREMENTS

.1	Section 31 24 13	Roadway Embankments
.2	Section 32 11 16.01	Granular Sub-Base
.3	Section 32 11 23	Aggregate Base Courses

1.3 REFERENCES

.1 Standard Specification – Highway Construction and Maintenance, Nova Scotia Department of Transportation and Infrastructure Renewal.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Samples:

.1 Provide Departmental Representative with access to source and processed material for sampling.

.2 The Contractor shall make available all equipment necessary for the Departmental Representative to obtain representative samples of the material proposed for supply. Allow continual sampling by Departmental Representative during production.

.3 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

Part 2 Products

2.1 MATERIALS

.1 Aggregate shall be composed of clean, hard, sound, durable, uncoated particles that do not contain friable, soluble or reactive minerals or other deleterious materials or conditions that would make the aggregate prone to decomposition or disintegration, or present any environmental hazard, from the presence of the parent material or its by-products, when exposed to the natural elements after placement in the Work.

2.2 BLENDING OF AGGREGATES

.1 Blending of aggregates shall be permitted to meet the grading requirements or increase the percentage of crushed particles.

.2 Blending shall not be permitted if required solely to improve the results of material quality tests (LA Abrasion, Plasticity Index and Micro-Deval).

.3 Blending shall be permitted only at the crusher, and the method and location of introducing the blending material into the crushing process shall be submitted in writing to the Departmental Representative for approval, prior to production of any blended product.

.4 The blending material shall be added such that the rate of blending is controlled and measurable.

.5 Blending materials shall be granular materials having a Dust content not exceeding 20% when tested in accordance with ASTM C117.

.1 The blending materials shall individually meet the LA Abrasion and Plasticity Index requirements of Section 32 11 23 – Aggregate Base Courses.

.6 Natural sand or gravel used as blending material in the production of the crushed rock aggregates shall not exceed 20% by mass of the blended aggregate produced.

.7 Blending of aggregates shall produce a consistently graded product.

2.3 SOURCE QUALITY CONTROL

.1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production.

.2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.

.3 Advise Departmental Representative 4 weeks minimum in advance of proposed change of material source.

.4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 PREPARATION

.1 Aggregate source preparation:

.1 Off-site quarry.

.2 Processing:

.1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

.2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.

.1 Use methods and equipment approved in writing by Departmental Representative.

.3 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.

.4 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.

.1 Use only equipment approved in writing by Departmental Representative.

.5 Stockpiling:

.1 Stockpiling of aggregates on-site will not be permitted unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.

.2 Stockpile aggregates in sufficient quantities to meet project schedules.

.3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

.4 Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.

.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.

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 DEFINITIONS

.1 Clearing: cutting, chipping and disposal of all designated trees and brush within the right-of-way and other areas as indicated including felled trees, previously up-rooted trees, and surface debris.

.2 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.

.3 Grubbing consists of excavation and disposal of stumps and roots, embedded timber, rock fragments, to not less than specified depth below existing ground surface.

1.2 QUALITY ASSURANCE

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.3 STORAGE AND PROTECTION

.1 Prevent damage to existing natural features, pavement, utility lines, site appurtenances, watercourses and root systems of trees which are to remain.

.1 Repair damaged items to approval of Departmental Representative.

.2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.4 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Soil Material for Fill:

.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.

.2 Remove and store soil material for reused.

Part 3 Execution

3.1 PREPARATION

.1 Inspect site and verify with Departmental Representative, items designated to remain.

.2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.

.2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.

.3 Notify utility authorities before starting clearing.

.4 Keep roads and walks free of dirt and debris.

3.2 CLEARING

.1 Areas to be cleared shall be clearly marked using high-visibility ribbons or similar means prior to work commencing.

.2 For the purpose of this Section, all timber with a butt diameter of 300mm or less shall be cleared by shredding or chipping.

.1 All timber with a butt diameter larger than this shall be cut into 2.5 metre lengths and delivered to a location designated by the Departmental Representative.

.3 Comply with conditions of all permits.

.4 Do not remove trees or brush from outside limits indicated except for any tree or branch considered unsafe.

.5 Cut trees and brush close to ground leaving no stump higher than 300 mm.

.6 Clearing shall not be permitted within 30 metres of a wetland unless work is underway on a permitted watercourse crossing or such areas are frozen hard, except to provide access through the buffers, as approved by the Departmental Representative.

.7 The Contractor shall not use heavy Equipment for clearing within 30 metres of stream banks or wetlands and shall do cutting herein by hand or by Equipment able to “reach in” and cut and yard out the timber.

.8 There shall be no long skids of timber on steep slopes adjacent to watercourses or wetlands, and no felling or skidding trees across a watercourse or wetland.

.9 All trees not felled by cutting may be chipped in place (to a stump height not higher than 300mm) using equipment designed for that purpose, but shall not be bulldozed down.

.1 No shredding, chipping or placement of shredded or chipped material shall occur within 30 metres of a watercourse or wetland.

.2 All other trees, and all brush and slash shall be shredded or chipped and evenly distributed over the ground within the clearing limits.

.10 Disposal by burning is not permitted.

3.3 GRUBBING

.1 Remove and dispose of roots, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 300 mm below ground surface.

.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m^3.

.4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

.5 No materials removed during grubbing shall be permitted to be placed within 30 metres of a watercourse or wetland.

.6 Grubbed materials shall only be stockpiled at locations approved by Departmental Representative.

.7 The Contractor shall be responsible, at his/her own expense, to carry out any remedial measures necessary to redress any areas grubbed beyond the specified limits, including but not limited to extra shaping, hydraulic seeding, and/or mulching of the exposed ground, and removal of trees which have fallen as a result of root severance due to the over-width grubbing.

3.4 FINISHED SURFACE

.1 Leave ground surface in condition suitable for [immediate grading operations to approval of Departmental Representative.

.2 Make good, to satisfaction of Departmental Representative, any area damaged during clearing and grubbing operation as directed by Departmental Representative

3.5 CLEANING

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

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1	Section 02 41 13	Selective Site Demolition
.2	Section 32 11 16.01	Granular Sub-base
.3	Section 33 42 13	Pipe Culverts
.4	Section 33 42 16	Precast Rigid Frame Culverts

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C117, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).

.5 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-A3000, Cementitious Materials Compendium.

.2 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete**.**

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 1.00 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 Topsoil:

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

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

.5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.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 C136: Sieve sizes to CAN/CGSB-8.2.

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

.7 Unshrinkable backfill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 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 clearance record from utility authority, as required.

.3 Samples:

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

.2 Inform Departmental Representative at least 2 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

1.5 EXISTING CONDITIONS

.1 Buried services:

.1 Before commencing work establish location of buried services on and adjacent to site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.

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

.4 Prior to beginning excavation Work, notify utility companies to establish location and state of use of buried utilities and structures. Utility companies to clearly mark such locations to prevent disturbance during Work.

.5 Confirm locations of buried utilities by careful test excavations.

.6 Maintain and protect from damage, water, electric, telephone and other utilities and structures encountered.

.7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing. Costs for such Work to be paid by Departmental Representative.

.8 Record location of maintained, re-routed and abandoned underground lines.

.9 Confirm locations of recent excavations adjacent to area of excavation.

.2 Existing buildings and surface features:

.1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, fencing, service poles, wires, pavement, survey bench marks 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.

.3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

1.6 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Backfill:

.1 NSTIR Type 2 gravel material in accordance with Section 32 11 16.01 – Granular Sub-Base.

.2 Unshrinkable backfill: proportioned and mixed to provide:

.1 The maximum percentage passing the 80 µm sieve shall not exceed 9%.

.2 The Portland cement content shall be 25 kg/m^3.

.3 The slump at point of discharge shall be minimum 150 mm.

.4 The specified compressive strength at 28 days shall be maximum 1.0 MPa.

.5 The use of fly ash, in addition to the noted Portland cement content, may be used in such proportion so as not to exceed the specified compressive strength.

.6 Coarse aggregates, if used in the mixture, are exempt from evaluation for contribution to alkali aggregate reactivity (AAR).

.3 Geotextiles: to Section 31 32 19.01 - Geotextiles.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction and sediment and erosion control plan, specific to site, whichever is more stringent.

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

.3 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 neatly along limits of proposed excavation in order that surface may break evenly and cleanly in accordance with Section 02 41 13 - Selective Site Demolition.

3.3 PREPARATION/PROTECTION

.1 Protect existing features in accordance applicable local regulations.

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

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

.4 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.

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

3.4 STOCKPILING

.1 Stockpile fill materials in areas designated by Departmental Representative.

.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from moisture and contamination.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements and Health and Safety Act for the Province of Nova Scotia.

.2 Obtain permit from authority having jurisdiction for temporary diversion of watercourse.

.3 Construct temporary Works to depths, heights and locations as indicated or directed by Departmental Representative.

.4 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.

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

.6 Upon completion of substructure construction:

.1 Remove cofferdams, shoring and bracing.

.2 Remove excess materials from site and restore watercourses as directed by Departmental Representative.

3.6 DEWATERING AND HEAVE PROTECTION

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

.2 Provide for Departmental Representative's approval 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 accordance with Section 01 35 43 - Environmental Procedures and 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.

3.7 EXCAVATION

.1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.

.2 Excavate to lines, grades, elevations and dimensions as specified or shown on the Drawings.

.3 Remove paving and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Site Demolition.

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

.5 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.

.6 Trenches for piping, conduit, and related excavations shall be of sufficient width and depth at all points to allow pipes to be laid, joints to be formed, and appurtenant structures to be built in a workmanlike manner, and when needed, to allow for sheeting and shoring, pumping, draining, and for removing and replacing all materials unsuitable for foundations.

.7 Excavate trenches so pipe can be laid to the alignment and depth required. Unless otherwise authorized by Departmental Representative in writing, excavation length to be not more than pipe length that can be laid and backfilled in one day. Brace and drain trench so workers may work safely and efficiently.

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

.9 Restrict vehicle operations directly adjacent to open trenches.

.10 Dispose of surplus and unsuitable excavated material off site.

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

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

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

.14 Obtain Departmental Representative approval of completed excavation.

.15 Found excavated surfaces on solid undisturbed ground. If the excavated surface is unsuitable, the Departmental Representative will determine what work is required to secure a proper foundation. If such work is due solely to the nature of the ground, then the Departmental Representative will measure the work, but if such work is due to any act or default of the Contractor in carrying out of the Works, resulting in disturbance of natural ground conditions, then the Contractor shall execute such work at no additional cost to the Contract.

.16 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.17 Correct unauthorized over-excavation with approved select backfill compacted to minimum of 95% of the maximum dry density in accordance with ASTM D698.

.18 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.

.19 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

3.8 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 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.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative.

.2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.

.5 Backfill trench from top of bedding to top of subgrade with layers of approved material.

.6 Place backfill in 150 mm layers and compacted to a minimum of 95% of the maximum dry density in accordance with ASTM D698. Thoroughly compact each layer before placing next layer.

.7 During backfilling, keep trenches free of water at all times and controlled so as to prevent surface water running into excavated areas. Remove silty materials, which become wetted and subsequently liquid or extremely plastic.

.8 Place unshrinkable backfill in areas as indicated. Consolidate and level unshrinkable backfill with internal vibrators.

.9 Install filter system in backfill as indicated as directed by Departmental Representative.

3.9 RESTORATION

.1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.

.2 Replace topsoil as directed by Departmental Representative.

.3 Reinstate pavements 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 backfill for initial 24 hours.

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

.7 Dispose of surplus material off-site, unless otherwise directed by the Project Documents.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 11 16.01 — Granular Sub-base

.2 Section 32 11 23 — Aggregate Base Courses

1.2 REFERENCES

.1 Definitions:

.1 Rock: in situ bedrock, and naturally occurring boulders that are 1 m^3 or larger in volume. Frozen material will not be classified as rock.

.2 Common material: excavated soil which is not rock, unsuitable or topsoil.

.3 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.

.4 Borrow Material: material obtained from areas off of Parks Canada property and required for construction of embankments or for other portions of work.

.5 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.6 Unsuitable material: all material which is not suitable for use in work and must be disposed of as directed by the Departmental Representative.

.7 Surplus material: excavated material not required for re-use.

.8 Subgrade: the surface of mass excavation and embankment finished to lines and elevations indicated.

.2 Reference Standards:

.1 ASTM International

.1 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort ((12,400ft-lbf/ft^3 (600kN-m/m^3)).

.2 Standard Specification - Highway Construction and Maintenance, Nova Scotia Department of Transportation and Infrastructure Renewal.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

Part 2 Products

2.1 MATERIALS

.1 Embankment materials require approval by Departmental Representative.

.2 Granular Sub-base – in accordance with Section 32 11 16.01 – Granular Sub-base.

.3 Aggregate Base – in accordance with Section 32 11 23 – Aggregate Base Courses.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that condition of substrate is acceptable for roadway embankment Work:

- .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.

3.2 COMPACTION EQUIPMENT

.1 Compaction equipment: vibratory rollers or vibrating plate compactors capable of obtaining required density in materials on project.

- .1 Demonstrate compaction equipment effectiveness on specified material and lift thickness by documented performance of test-strip before start of Work.
- .2 Replace or supplement equipment that does not achieve specified densities.

.2 Operate compaction equipment continuously in each embankment when placing material.

3.3 WATER DISTRIBUTORS

.1 Apply water with equipment capable of uniform distribution.

3.4 PREPARATION

.1 Temporary erosion and sedimentation control:

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction and sediment and erosion control plan, specific to site, that complies with requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Protection of in-place conditions:

- .1 Protect excavations from freezing.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.
- .4 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.

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

3.5 EXCAVATING

.1 Notify Departmental Representative when waste materials are encountered and remove to depth and extent directed.

.2 Excavate all types of materials to lines and elevations indicated and as necessary for construction.

.3 Notify Departmental Representative if in doubt as to definition of material.

.4 Select method of excavation, support, and dewatering unless otherwise indicated or directed. Protect property and structures from damage.

.5 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial regulations whichever is more stringent.

.6 Where Subgrade requires undercutting, sub-excavation shall be carried out to the specified depth below subgrade on a plane parallel to the Subgrade cross-slope.

.7 Excavate as required to carry out work.

.1 Do not disturb soil or rock below bearing surfaces.

.2 Notify Departmental Representative when excavations are complete.

.3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.

.8 Drainage:

.1 Maintain profiles, crowns and cross slopes to provide good surface drainage.

.2 Provide ditches as work progresses to provide drainage.

.3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.

.9 Handle materials in a manner that will not endanger the public, personnel, property or the work. Do not reduce sight distances, or obstruct roadways or utilities. Do not obstruct flow of surface drainage or natural watercourses

.10 Hauling of common excavation over Granular Sub-Base and Aggregate Base Courses shall not be permitted, unless authorized.

.11 The Contractor shall shape ditches to the lines and grades specified, and any grade conditions that would cause water to pond shall be removed.

.12 Take care to protect granular material from the elements.

.13 Prior to the placement of any fill, the exposed subgrade surface must be allowed to dry and shall be proof rolled and compacted. The subgrade preparation should occur during dry weather. The Contractor is expected to work the fill materials including scarifying and drying as required to achieve a moisture content sufficient to achieve the specified minimum compaction.

.14 All excavated materials shall become property of the Contractor and shall be disposed of outside the work site.

.15 Obtain appropriate permits and written approval of Departmental Representative before proceeding with blasting.

.16 Borrow Excavation:

.1 Completely use in embankments, suitable materials removed from right-of-way excavations before taking material from borrow areas.

3.6 DEWATERING

.1 Keep bottom of excavation free of water by draining or pumping.

.2 Dewater excavation in a manner which will not endanger stability of the work.

.3 Dispose of water from excavation in a manner that is not injurious to property, public health or any operation of the work. Prevent water pumped out of an excavation from entering a watercourse or wetland. Discharge from pumped water shall be in a well vegetated area in excess of 30 metres from a watercourse or wetland.

.4 Take precautions to prevent uplift of pipe or structures.

3.7 EMBANKMENTS

.1 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces.

.1 Method used to be to be pre-approved in writing by Departmental Representative.

.2 Break up or scarify existing road surface prior to placing embankment material.

.3 Do not place material which is frozen nor place material on frozen surfaces except in areas authorized by Departmental Representative.

.4 Maintain crowned surface during construction to ensure ready run-off of surface water.

.5 Drain low areas before placing materials.

.1 Place and compact to full width in layers not exceeding 200 mm loose thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.

.6 Where material consists of rock:

.1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1 m.

.2 Distribute rock material to fill voids with smaller fragments to form compact mass.

.3 Fill surface voids at subgrade level with rock spalls or selected material to form earth-tight surface.

.4 Do not place boulders and rock fragments with dimensions exceeding 200 mm within 300 mm of subgrade elevation.

.7 Deductions from excavation will be made for overbuild of embankments.

3.8 COMPACTION

.1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.

.2 Deposit, spread, and level, embankment material in layers 200 mm maximum thickness before compaction.

.1 Compact each layer of embankment until compaction equipment achieves no further significant consolidation.

.2 Ensure required compaction for each layer before placing any material for next layer.

.3 Use specialized compaction equipment supplemented by routing, hauling, and leveling equipment over each layer of fill.

.4 Obtain written approval from Departmental Representative before using specialized compaction equipment such as tamping rollers, vibratory rollers, or other alternate compaction equipment that produces the required results.

.5 Compact each layer to minimum 95% maximum dry density: ASTM D698 except top 150 mm of subgrade.

.1 Compact top 150 mm to 100% maximum dry density.

.6 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

3.9 PROOF ROLLING

.1 The subgrade shall be proof rolled by means of a vibratory roller with a minimum static mass of 8 tonnes and dynamic mass of 20 t.

.2 Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.

.1 If use of non-standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.

.3 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.4 Where proof rolling reveals areas of defective subgrade:

.1 Remove subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade with granular sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-Base.

.3 Replace with new materials in accordance with this Section at no extra cost.

3.10 FINISHING

.1 Finished subgrade surface to be within plus or minus 25 mm of established grade and cross section but not uniformly high or low.

.2 Finish slopes and ditch bottoms true to lines, grades and drawings where applicable. Scale slope by removing loose fragments, for cut slopes in bedrock steeper than 1:1.

.3 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.

.4 Hand finish slopes that cannot be finished satisfactorily by machine.

.5 Round top of backslope 1.5 m both sides of top of slope.

.6 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.

.7 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.

3.11 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.

3.12 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 24 13 Roadway Embankments

.2 Section 33 42 13 Pipe Culverts

1.2 REFERENCES

.1 ASTM International

.1 ASTM D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

.2 ASTM D4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

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

.4 ASTM D4716, Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

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

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

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-4.2 No. 11.2-M89, Textile Test Methods - Bursting Strength - Ball Burst Test.

.2 CAN/CGSB-148.1, Method of Testing Geosynthetics

.1 No.2, Methods of Testing Geosynthetics - Mass per Unit Area.

.2 No.3, Methods of Testing Geosynthetics - Thickness of Geotextiles.

.3 No.6.1, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.

.4 No.7.3, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.

.5 No. 10, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

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.

.3 Samples:

.1 Submit following samples 2 weeks prior to beginning Work.

.1 Minimum length of 1 m of roll width of geotextile.

.2 Methods of joining.

.4 Test and Evaluation Reports:

.1 Submit copies of mill test data and certificate at least 2 weeks prior to start of Work.

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 off ground and 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.

1.5 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIAL

.1 Geotextile: synthetic fibre fabric, supplied in rolls.

.1 Width: 4.69 m minimum.

.2 Composed of minimum 85% by mass of polypropylene and resistant to ultraviolet degradation and to biological and chemical environments normally found in soils.

.2 The plastic yarn of the geotextile and the threads used in sewing operations shall consist of a long chain synthetic polymer composed of at least 85% by mass of propylene, ethylene, ester, amide or vinylidene-chloride, and shall contain stabilizers or inhibitors added to the base plastic to make the filaments resistant to deterioration by ultraviolet and heat exposure.

.3 Thread for the seams shall be equal to or better than the geotextile in resistance to chemical and biological degradation and both factory and field sewn or sealed seams shall have a grab tensile strength equal to 90% of that of the geotextile.

2.2 WOVEN GEOTEXTILES

.1 Physical properties:

.1 Thickness to CAN/CGSB-148.1, No.3.

.2 Mass per unit area to ASTM D6261: minimum 203 g/m^2.

.3 Grab tensile strength and elongation in any principal direction to ASTM D4632

.1 Breaking force: minimum 1330 N, wet condition.

.2 Elongation at future: maximum 15%.

.3 Puncture resistance: 0.533 kN

.4 Tear resistance: 0.533 kN

.4 UV Stability: 70% @ 500h

.2 Hydraulic properties:

.1 Apparent opening size (AOS) to ASTM D4751, 0.425 mm.

.2 Filtration opening size (FOS) to CAN/CGSB-148.1 No.10.

.3 Permittivity to ASTM D4491, 0.05 sec^{-1}.

.4 Permeability: minimum 3.3 x 10^{-2} cm/sec.

2.3 NON-WOVEN GEOTEXTILES

.1 Physical properties:

.1 Thickness to CAN/CGSB-148.1, No.3.

.2 Mass per unit area to ASTM D6261: minimum 136 g/m^2.

.3 Grab tensile strength and elongation in any principal direction to ASTM D4632

.1 Breaking force: minimum 670 N, wet condition.

.2 Elongation at future: maximum 50%.

.3 Puncture resistance: 0.289 kN

.4 Tear resistance: 0.290 kN

.4 UV Stability: 70% @ 500h

.2 Hydraulic Properties:

.1 Permittivity to ASTM D4491, 1.6 sec^{-1}

.2 Apparent opening size (AOS) to ASTM D4751, 0.150 mm

.3 Water Flow rate to ASTM D4491, 75 l/sec/m^2

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 from Departmental Representative.

3.2 INSTALLATION

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

.2 The areas to be covered with geotextile shall be prepared by shaping the ground to present a uniform and regular surface free from bumps and depressions.

.1 Geotextile shall not be placed on stumps, brush, limbs, ice or other material that may tear or puncture the fabric.

.2 The geotextile shall be placed so as to create a surface that is 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 The manufacturer's installation procedures shall be the standard of installation that shall be applied except as follows:

.1 Where more than one width of fabric is used, the fabric shall be joined by sewing or by an overlap of at least 600 mm and all overlap joints shall be securely held in place.

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

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

.7 The Contractor shall immediately repair damaged geotextile to approval of Departmental Representative.

.1 The damaged area shall be covered with a patch of the same fabric type extending a minimum of one metre beyond the perimeter of the damaged area.

.8 Place and compact soil layers in accordance with Section 31 24 13 – Roadway Embankments.

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 31 32 19.01 Geotextiles

.2 Section 32 11 16.01 Granular Sub-base

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.

.2 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.2 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance, Division 3, Section 12.

1.3 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Hard, durable, field or quarry rock, free from splits, seams, or defects likely to impair its soundness during during handling or by the actions of water and ice. Shale, slate or rocks with thin foliations shall not be acceptable. The greatest dimension of each rock shall not exceed two times the least dimension. The minimum density of the rock shall be 2.650 kg/m^3, to meet following size distribution for use intended.

.2 Rock when tested by for abrasion in accordance with ASTM C131, shall have a Los Angeles abrasion loss not greater than 35%.

.3 Rock when tested by for absorption in accordance with ASTM C127, shall have a maximum absorption of 1.5%.

.4 Rip-rap:

Mass	**Approximate Diameter**	**Finer by Mass (%)**				
(kg)	(mm)	R-5	R-25	R-50	R-100	R-250
750	820					100
500	710					70 – 90
300	600				100	

250	570					40 – 55
200	530				70 – 90	
150	480			100		
100	420			70 – 90	40 – 55	
75	380		100			
50	330		70 – 90	40 - 55		
25	260		40 - 55			0 - 15
15	220	100				
10	190	70 – 90			0 - 15	
5	150	40 – 55		0 - 15		
2.5	120		0 - 15			
0.5	70	0 - 15				
Thickness (mm)		300	500	600	800	1100

.1 Armour Stone:

.1 Stone sizes in accordance with dimensions shown on Drawings.

.2 R2 to NSTIR Standard Specification.

.2 Supply rock spalls or cobbles to fill open joints.

2.2 RIP-RAP MIXED

.1 Rip-rap mixed shall be noted in the Contract Documents as R-#mixed and shall consist of a rip-rap material of the designated size (R-#) thoroughly mixed with a gravel subbase which shall conform with the requirements of Section 32 11 16.01- Granular Sub-base.

.1 Finely shattered rock which conforms to this Section may be substituted for gravel, subject to approval of the Departmental Representative.

.2 The Contractor shall produce a consistent mixed homogenous blended supply of the specified mixture mixed at the proportion of approximately 20% by weight to the rip-rap material indicated, to form a very dense material.

2.3 GEOTEXTILE FILTER

.1 Geotextile: in accordance with Section 31 32 19.01 - Geotextiles.

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 Tamp rip-rap mixed during placement.

.7 The Contractor shall place rip-rap material such that the underlying materials and any abutting structures are not damaged.

.1 The Contractor shall be responsible, at his/her own expense to repair any such damage to the work.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 11 23 Aggregate Base Courses

1.2 REFERENCES

.1 ASTM International

.1 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Granular base: material in accordance with Section 32 11 23 - Aggregate Base Courses.

.2 Water: in accordance with Departmental Representative's approval.

.1 All water for pulverization to be obtained outside of the Park Boundaries.

2.2 EQUIPMENT

.1 Pulverization will be by means of a traveling rotary reclaimer or equivalent machine capable of cutting through the existing asphalt at depths up to 300mm with one pass. The machine shall be self-propelled and equipped with an adjustable grading blade thus leaving its path generally smooth for traffic. Equipment such as road planers or cold milling machines, which are designed to mill or shred the existing bituminous concrete rather than to crush or fracture it, are not considered capable of achieving specification gradation. The required and necessary action of the reclaimer will increase the percentages of fine aggregate. Existing asphalt concrete and gravel base must be pulverized and mixed so as to form a homogeneous mass of uniformly processed base material, which will bond together when compacted.

.2 Compaction equipment must be capable of obtaining required densities in materials on project.

.3 Grader shall be equipped with automatic slope control.

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 reshaping asphalt pavement 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.

3.2 PULVERIZING AND RESHAPING

.1 All work shall be carried out to the full roadbed width to intercept the existing foreslopes.

.2 The Contractor shall carry out the work such that the pulverizing extends to a minimum depth of 100 mm into the granular sub-base layer.

.3 The Contractor shall make as many passes as required to uniformly mix the asphalt, existing sub-base, existing base course or combination thereof to the required thickness. Mixing of the different materials shall create a homogenous and loosened condition with all material sized such that 95% of the material passes the 37.5 mm sieve, when measured in accordance with ASTM C136.

.4 Where deficiency of pulverized material exists, add and blend in new granular base material as directed by Departmental Representative. Do not use frozen material.

.5 Oversize pieces remaining after pulverizing shall become property of the Contractor and shall be disposed of outside the work site.

.6 The Contractor shall shape the road with a grader to meet an acceptable crown and super elevation.

3.3 TEST STRIP

.1 The Contractor shall initially stabilize a test strip 0.5 km in length and one lane in width, to demonstrate their ability to produce a stabilized roadbed in conformance with this Section.

.2 The test strip must be free of visual defects after grading and compaction.

.3 If the test strip is not acceptable, as determined by the Departmental Representative, the Contractor shall rework the test strip.

3.4 COMPACTING

.1 Compact to a minimum of 100% of the maximum dry density as established by a “Control Strip”.

.1 A test strip shall be performed on a lift of placed material with density tests taken after each pass of a compactor until an in-situ maximum dry density (control

density) is achieved. The test strip determines the maximum number of passes, control density and field moisture content.

.2 To determine the Control Density, a minimum of six moisture and density tests shall be taken at random locations by the Departmental Representative, using nuclear equipment. Test results shall be averaged to determine the in-place maximum dry density.

.3 This procedure will continue until the density result:

.1 Increases by less than 10 kg/m^3;

.2 Continually decreases;

.3 Remains constant.

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

.3 Apply water as necessary during compacting.

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

3.5 FINISH TOLERANCES

.1 Reshape surface to within plus or minus 10 mm of elevation as indicated, but not uniformly high or low.

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

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 Protect and maintain reshaped asphalt pavement surface in condition conforming to this section until succeeding material is applied or until after receipt of written acceptance from Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 16 — Aggregate Materials

.2 Section 31 24 13 — Roadway Embankments

1.2 REFERENCES

.1 ASTM International

.1 ASTM C117, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.

.3 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.4 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.5 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

.6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Nova Scotia Department of Transportation and Infrastructure Renewal

.1 TPW TM-1, Test Method for the Resistance of Coarse Aggregate to Degradation in the Micro-Deval Apparatus.

.2 TPW TM-3, Test Method for the Determination of Percent Fractured Particles in Processed Coarse Aggregate.

.4 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance, Division 3, Section 12.

.5 Nova Scotia Department of Environment and Labour

.1 Pit and Quarry Guidelines.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with 31 05 16 - Aggregate Materials.

1.5 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Granular sub-base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 Approved hard, durable crushed quarried stones and sand particles.

.2 The aggregate shall be free from flat, elongated or other objectionable pieces and shall be approved by the Departmental Representative prior to utilization.

.3 Gradations to be within limits specified when tested in accordance with ASTM C117 and C136. Sieve sizes to CAN/CGSB-8.2.

.1 Gradation to:

Sieve Size, µm	Percent Passing
	NSTIR Type 2
80 000	100
56 000	70 – 100
28 000	50 – 80
14 000	35 – 65
5 000	20 – 50
160	3 – 10
80	2 – 5

.4 The gravel (NSTIR Type 2) shall have a fractured particle content of 50% (minimum), one face, when tested in accordance with TPW Test Method. The fractured particle shall have at least one well defined fresh face resulting from fracture, with the face comprising no less than 20% of the particle surface area. Particles with smooth faces and rounded edges, or with only small chips removed, are not considered fractured.

.5 Gravel materials shall conform to the following physical properties:

Property	Test Method	NSTIR Type 2
Absorption % max.	ASTM C127	1.75
LA Abrasion % max	ASTM C131	40
Plasticity Index max	ASTM D4318	3
Micro-Deval % max	TPW	20

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of existing substrate are acceptable for granular sub-base installation.

.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.

3.2 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.

.2 Construct granular sub-base to depth and grade in areas indicated.

.3 The Contractor shall satisfy himself that the existing grade has been constructed to the lines and grades as indicated in the Contract Documents prior to the commencement of the Work.

.4 Ensure no frozen material is placed.

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

.6 Aggregate materials shall not be placed on inundated, soft, muddy, potholed rutted or frozen surfaces. Any ruts or potholes which appear in advance of travel surface placement shall be eliminated by scarifying, shaping or compacting, or if necessary by excavating unsuitable material and placing and compacting new material of the same quality.

.7 Granular sub-base materials shall conform to the properties and specified gradation requirements for the class of material specified.

.1 If the material incorporated into the Work does not conform with the specified properties and/or gradation, the Contractor shall cease hauling from the source of supply and shall immediately rectify the problem to the satisfaction of the Departmental Representative.

.2 Any material found to be non-conforming to the specified material shall be removed from the Work.

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

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

.10 Granular sub-base materials shall be shaped with a blade grader while being compacted.

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

.1 Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.

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

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

3.3 COMPACTION

.1 Compaction Equipment:

.1 Ensure compaction equipment is capable of obtaining required material densities.

.2 Compact to a minimum of 100% of the Standard Proctor Density in accordance with ASTM D698.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-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 in writing 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 The top of granular sub-base shall be proof rolled using a standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.

.2 Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.

.1 If use of non-standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.

.3 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.4 Where proof rolling reveals areas of defective granular sub-base:

.1 Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade and sub-base with granular sub-base materials and compact in accordance with this Section.

.3 Excavate and replace with new materials in accordance with this Section at no extra cost.

3.5 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 25 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 sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 16 — Aggregate Materials

.2 Section 31 24 13 — Roadway Embankments

.3 Section 32 11 16.01 — Granular Sub-base

1.2 REFERENCES

.1 ASTM International

.1 ASTM C117, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.

.3 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.4 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.5 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

.6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 Nova Scotia Department of Transportation and Infrastructure Renewal

.1 TPW TM-1, Test Method for the Resistance of Coarse Aggregate to Degradation in the Micro-Deval Apparatus.

.2 TPW TM-3, Test Method for the Determination of Percent Fractured Particles in Processed Coarse Aggregate.

.4 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance, Division 3, Section 12.

.5 Nova Scotia Department of Environment and Labour

.1 Pit and Quarry Guidelines.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with 31 05 16 - Aggregate Materials.

1.5 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Aggregate base and shoulder material: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:

.1 Approved hard, durable crushed quarried stones and sand particles.

.2 The aggregate shall be free from flat, elongated or other objectionable pieces and shall be approved by the Departmental Representative prior to utilization.

.3 Gradations to be within limits specified when tested in accordance with ASTM C117 and C136. Sieve sizes to CAN/CGSB-8.2.

.1 Gradation to:

Sieve Size, µm	Percent Passing	
	NSTIR Type 1	NSTIR Type 1S
28 000	-	-
20 000	100	100
14 000	50 – 85	50 – 90
5 000	20 – 50	30 – 55
1 250	-	-
160	5 – 12	7 – 20
80	3 – 5	5 – 12

.4 The gravels (NSTIR Type 1 and NSTIR Type 1S) shall have a fractured particle content of 80% (minimum), one face, when tested in accordance with TPW Test Method. The fractured particle shall have at least one well defined fresh face resulting from fracture, with the face comprising no less than 20% of the particle surface area. Particles with smooth faces and rounded edges, or with only small chips removed, are not considered fractured.

.5 Gravel materials shall conform to the following physical properties:

Property	Test Method	NSTIR Type 1	NSTIR Type 1S
Absorption % max.	ASTM C127	1.75	1.75
LA Abrasion % max	ASTM C131	40	40
Plasticity Index max	ASTM D4318	3	3
Micro-Deval % max	TPW	20	35

Part 3 Execution

3.1 AGGREGATE BASE (NSTIR TYPE 1) PLACING

.1 Place aggregate base after sub-base surface is inspected and approved in writing by Departmental Representative.

.2 Construct aggregate base to depth and grade in areas indicated.

.3 The Contractor shall satisfy himself that the existing grade has been constructed to the lines and grades as indicated in the Contract Documents prior to the commencement of the Work.

.4 Ensure no frozen material is placed.

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

.6 Aggregate materials shall not be placed on inundated, soft, muddy, potholed rutted or frozen surfaces. Any ruts or potholes which appear in advance of travel surface placement shall be eliminated by scarifying, shaping or compacting, or if necessary by excavating unsuitable material and placing and compacting new material of the same quality.

.7 Aggregate base materials shall conform to the properties and specified gradation requirements for the class of material specified.

.1 If the material incorporated into the Work does not conform with the specified properties and/or gradation, the Contractor shall cease hauling from the source of supply and shall immediately rectify the problem to the satisfaction of the Departmental Representative.

.2 Any material found to be non-conforming to the specified material shall be removed from the Work.

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

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

.10 Aggregate base materials shall be shaped with a blade grader while being compacted.

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

.1 Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.

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

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

3.2 COMPACTION

.1 Compaction Equipment:

.1 Ensure compaction equipment is capable of obtaining required material densities.

.2 Compact to a minimum of 100% of the Standard Proctor Density in accordance with ASTM D698.

.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 in writing 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 The top of aggregate base course shall be proof rolled using a standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.

.2 Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.

.1 If use of non-standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.

.3 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.4 Where proof rolling reveals areas of defective aggregate base course:

.1 Remove base, sub-base and subgrade materials to depth and extent as directed by Departmental Representative.

.2 Backfill excavated subgrade and sub-base with granular sub-base materials and compact in accordance with Section 32 11 16.01 - Granular Sub-base.

.3 Backfill excavated base with aggregate base course materials and compact in accordance with this Section.

.4 Excavate and replace with new materials in accordance with Section 32 11 16.01 - Granular Sub-base and this Section at no extra cost.

3.4 SHOULDER MATERIAL (NSTIR TYPE 1S) PLACEMENT

.1 The placement of shoulder material shall be carried out in a manner so as to avoid damage to the adjacent and surrounding roadbed.

.1 The Contractor shall be responsible, at their expense, to repair any damage to the adjacent and/or abutting finished surfaces resulting from this work.

.2 Shoulder material shall be placed by equipment specifically designed for that purpose.

.1 Any shoulder spreader considered for the work shall be constructed so that it shall not place any shoulder material on the pavement.

.2 Shoulder material shall not be bladed onto the roadway foreslope.

.3 Shoulder material shall be compacted to a minimum of 100% of the Standard Proctor Density in accordance with ASTM D698 and shall be shaped with a blade grader while being compacted.

.4 On secondary roads with narrow shoulders it may be not be safe or practical to utilize standard compaction equipment.

.1 At the discretion of the Departmental Representative, alternate methods of compaction and/or target densities may be approved for shoulder material in these situations.

.5 Shoulder material placed by the Contractor in the vicinity of guide rail posts and sign posts shall be hand raked to the satisfaction of the Departmental Representative.

.6 The shaping of the material shall be continued until it is well compacted, free from ruts, waves and undulations.

3.5 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.

3.6 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 base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 12 16 Asphalt Paving

1.2 REFERENCES

.1 ASTM International

.1 ASTM D140/D140M, Standard Practice for Sampling Bituminous Materials.

.2 ASTM D244, Standard Test Methods and Practices for Emulsified Asphalts.

.3 ASTM D977, Standard Specification for Emulsified Asphalt.

.4 ASTM D2397, Standard Specification for Cationic Emulsified Asphalt.

.2 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance, Division 4, Section 1.

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 asphalt tack coat and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit two - 4 L samples of asphalt tack coat material proposed for use in new, clean, airtight, sealed, wide mouth jars to Departmental Representative, at least 2 weeks prior to beginning Work.

.2 Sample asphalt tack coat material to: ASTM D 140.

.3 Provide access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work to ASTM D 140.

1.4 QUALITY ASSURANCE

.1 Upon request from, submit manufacturer's test data and certification that asphalt tack coat material meets requirements of this Section.

.2 Any contamination of the emulsified asphalt and/or deviation from this specification shall be corrected to the satisfaction of the Departmental Representative and at no cost to the Owner.

.3 Such deficiencies may be noted from samples of emulsified asphalt taken by the Departmental Representative. Any necessary remedial measures shall be done by the Contractor at no expense to Parks Canada and to the satisfaction of the Departmental Representative.

1.5 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 in clean, dry, well-ventilated area.

.2 Store and protect asphalt tack coat.

.3 Replace defective or damaged materials with new.

.4 Deliver, store and handle materials in accordance with ASTM D 140.

.5 Provide, maintain and restore asphalt storage area.

1.6 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Tack coat shall conform to the specifications for RS-1 as detailed in NSTIR Standard Specification, Division 4, Section 1, Table 4.1.1.

2.2 EQUIPMENT

.1 Equipment required for Work of this Section to be in satisfactory working condition and maintained for duration of Work.

.2 Pressure distributor:

.1 Shall be a self-powered pressure asphalt distributor, capable of applying the asphalt tack coat uniformly, at the established rate, in one application, over the full required width. It shall consist of a fully insulated tank, permanently and rigidly mounted on a truck or trailer, capable of accurately maintaining any speed required for spraying.

.2 The distributor shall be provided with the following minimum equipment:

.1 Proper hand spray attachments to uniformly apply emulsion to any areas missed by the distributor.

.2 An efficient and positive means of heating the asphalt tack coat uniformly to any selected temperature up to 100ºC, and maintaining the contents constantly at this temperature without any local overheating and including a satisfactory method of circulating the contents during the entire heating process.

.3 An approved thermometer with a minimum range of 10ºC to 100ºC, graduated in intervals of not more than 10ºC, so placed as to accurately

show the temperature of the distributor contents, and to be accessible to the Departmental Representative.

.1 An approved tachometer, driven from a fifth wheel, mounted so that it is readily visible to the driver so that it clearly and accurately registers distances traveled when spraying emulsion, and so that it enables the driver to maintain a constant speed required to ensure the specified rate of application of the emulsion.

.4 A pressure gauge indicating the pressure in the spray bar within 15 kPa.

.5 A rear mounted spray bar set parallel to the surface to be sprayed, and capable of adjustment to provide any required spraying widths from 2.5 m to 3.5 m. The distributor shall be equipped with a spray bar heating and circulating device, to ensure uniform viscosity and pressure of the emulsified asphalt at each nozzle, both before and during spraying operations. The spray bar shall be provided with a positive shut-off to prevent dripping

.3 The circulating system shall also be provided with a strainer to prevent clogging of the bar and nozzles. The spray bar height shall be adjustable and shall be set at such a height that the spray fan from any nozzle overlaps the spray fan from the adjacent nozzle by two-thirds for triple-lap so that a uniformly sprayed surface will result. This height shall be set when the distributor is one-half full, and shall be changed only when permitted by the Departmental Representative.

.4 Spray bar nozzles shall be designed and set so as to ensure uniform fan shaped sprays. The nozzles shall not be set so as to produce such a fine mist that the asphalt tack coat will blow away and not provide an even spread. All spray nozzles shall be of the same shall be provided with valves capable of instant full opening and positive cut-off. All spray nozzles shall be set in the bar so that the nozzle slots make the same horizontal angle (30º) with the longitudinal axis of the bar. Before work commences, and periodically as required during spraying operations, the nozzles on the spray bar shall be removed, cleaned sufficiently to remove all congealed asphalt and to free the nozzle opening. Each nozzle shall be inspected and approved by the Departmental Representative and reinstalled on the spray bar at the correct angle.

.5 A strainer shall be provided in the filling line to prevent entry of foreign material into the tank.

.6 A sampling cock shall be fitted on the spray bar or circulating line, and shall be readily accessible to allow samples of the emulsion to be obtained directly from the distributor.

.7 The distributor shall be checked for calibration by the Departmental Representative before being used on the work.

.8 An alternate means of application may be permitted for small or isolated areas at the discretion and approval of the Departmental Representative.

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 asphalt tack coat 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.

3.2 APPLICATION

.1 Apply asphalt tack coat only on clean and dry surface.

.1 Immediately prior to the application of the asphalt tack coat, the Contractor shall clean surfaces to be tacked by means of a rotary power broom or hand brooms to remove all dirt, sand, dust or other objectionable matter.

.2 Apply asphalt tack coat only on unfrozen surface.

.3 The Contractor shall apply a uniform cover of the RS-1 asphalt tack coat with a distributor at a rate of 140 ml/m^2, or as directed by the Departmental Representative, and at a temperature not less than 20ºC nor more than 70ºC.

.4 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.

.5 The Contractor may place the bituminous tack coat by brushing or spraying at longitudinal and transverse joint locations.

.6 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Departmental Representative.

.7 Hot mix asphalt shall not be placed upon the asphalt tack coated areas until the asphalt tack coat has dried to a condition of tackiness.

.8 No more tack coat shall be applied than can be covered with asphalt concrete wearing surface in any one day.

.9 Asphalt tack coat application widths shall be such that approximately one-half the pavement width is left open to traffic with no tack coat applied.

.1 Asphalt tack coat applications shall be strictly limited in length, to minimize the inconvenience to the public and shall be kept within the asphalt concrete work area.

.2 The Contractor shall be responsible to reinstate any asphalt tack coat surface which becomes fouled due to weather and/or traffic.

.3 Control traffic in accordance with Section 01 35 00.06 - Special Procedures for Traffic Control.

.10 Keep traffic off tacked areas until asphalt tack coat has set.

.11 Re-tack contaminated or disturbed areas as directed by Departmental Representative.

.12 Submit summary report within 7 days minimum of date of application and include information as follows:

.1 Total area tack coated.

.2 Quantity of tack coat used.

.3 Mean application rate.

.4 Actual product quantity used when using equipment on pressure distributors.

.5 Dipstick measurements or electronic printouts are acceptable.

.13 Carry out measurements in presence of Departmental Representative upon request.

.14 The Contractor shall protect through traffic and adjacent highway/structure appurtenances from any asphalt tack coat overspray.

.1 The Contractor shall be responsible to remove any asphalt tack coat adhering to these surfaces.

.15 Inspect tack coat application to ensure uniformity.

.1 Re-spray areas of insufficient or non-uniform tack coat coverage as directed by Departmental Representative.

.2 Ensure tack coating performed using hand held devices is consistent in appearance with adjacent areas of machine applied material

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.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section covers asphalt concrete paving on reconstructed and asphalt cold milled roadbeds and shall meet the general requirement of Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) Type "B-HF" and "D-HF" except where noted. It also covers the construction of asphalt concrete gutters and other required asphalt work.

.2 Paving operations shall be completed no later than September 1, 2017 and may only extend beyond this date if weather and temperature conditions permit and only if authorized by the Departmental Representative.

1.2 RELATED REQUIREMENTS

.1	Section 02 41 13.14	Asphalt Paving Removal
.2	Section 31 05 16	Aggregate Materials
.3	Section 32 01 16.13	Reshaping Asphalt Pavement
.4	Section 32 12 13.16	Asphalt Tack Coat

1.3 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

.1 Where reclaimed asphalt pavement (RAP) is to be incorporated into mix, use only material obtained from this contract in accordance with Section 02 41 13 - Selective Site Demolition.

1.4 REFERENCES

.1 American Association of State Highway and Transportation Officials (AASHTO)

- .1 AASHTO M156, Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
- .2 AASHTO MP1, Standard Specification for Performance Graded Asphalt Binder.
- .3 AASHTO PP6, Standard Practice for Grading or Verifying the Performance Grade of an Asphalt Binder.
- .4 AASHTO T245, Standard Method of Test for Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus.
- .5 AASHTO T283, Standard Method of Test for Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage.

.2 Asphalt Institute (AI)

- .1 AI MS-2, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.

.3 ASTM International

- .1 ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.

.2 ASTM C117, Standard Test Method for Material Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.

.3 ASTM C123, Standard Test Method for Lightweight Particles in Aggregate.

.4 ASTM C127, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.

.5 ASTM C128, Standard Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate.

.6 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.7 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.8 ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes.

.9 ASTM D75, Standard Practice for Sampling Aggregates.

.10 ASTM D140,Standard Practice for Sampling Bituminous Materials.

.11 ASTM D2041, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.

.12 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

.13 ASTM D2726, Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.

.14 ASTM D2950, Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.

.15 ASTM D3549, Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.

.16 ASTM D3665, Standard Practice for Random Sampling of Construction Materials.

.17 ASTM D4469, Standard Practice for Calculating Percent Asphalt Absorption by the Aggregate in an Asphalt Pavement Mixture.

.18 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

.19 ASTM D6926, Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus.

.20 ASTM D6927, Standard Test Method for Marshall Stability and Flow of Asphalt Mixtures.

.21 ASTM D7113, Standard Test Method for Density of Bituminous Paving Mixtures in Place by the Electromagnetic Surface Contact Methods.

.22 ASTM E178, Standard Practice for Dealing With Outlying Observations.

.4 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance, Division 4 - Pavements.

.5 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance, Division 4, Section 2 – Performance Graded Asphalt Binder (PGAB).

.6 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance, Division 4, Section 19 – Asphalt Concrete End Product Specification (EPS).

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit viscosity-temperature chart for asphalt cement to be supplied showing Kinematic Viscosity in centistokes, temperature range 105 to 175°C 4 weeks prior to beginning Work.

.2 At least 4 weeks before commencing work, submit refinery's test data and certification that asphalt cement meets requirements of this section which also includes the specific gravity of the asphalt cement.

.3 Samples:

.1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks prior to beginning Work.

.2 Submit samples of following materials proposed for use 4 weeks prior to beginning Work.

.1 One 5 L container of asphalt cement.

.2 50 kg of each aggregate to be used in the asphalt mix.

.4 Test and Evaluation Reports:

.1 Submit manufacturer's test data and certification that asphalt cement meets specification requirements.

.2 Submit asphalt concrete mix design and trial mix test results to Departmental Representative for approval at least 4 weeks prior to beginning Work.

1.6 SUBMISSION OF MIX DESIGN

.1 Samples of aggregate for mix design shall be derived from stockpiles not less than 1000 tonnes of each of fine and course aggregate.

.2 The Contractor will submit, in writing, asphalt concrete mix design and trial mix test results to Departmental Representative for review at least 4 weeks prior to commencing work. The mix design shall contain the job mix formula which shall include the following:

.1 Type and specific gravity of asphalt cement.

.2 Asphalt cement content.

.3 Specific gravity and absorption of each aggregate.

.4 Percentage of each aggregate.

.5 Gradation of Job Mix Formula.

.6 Marshall Stability and flow, kN.

.7 Bulk Specific Gravity, kg/m^3.

.8 Maximum theoretical density, kg/m^3.

.9 Percentage voids in mineral aggregate.

.10 Percentage air voids.

.11 Percentage voids filled with asphalt.

.12 Percentage of absorbed asphalt cement.

.13 TSR (AASHTO T283).

1.7 DELIVERY, STORAGE AND HANDLING

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

.2 Deliver and stockpile aggregates in accordance with Section 31 05 16 - Aggregate Materials. Stockpile minimum 50% of total amount of aggregate required before beginning asphalt mixing operation.

.3 When necessary to blend aggregates from one or more sources to produce required gradation, do not blend in stockpiles.

.4 Stockpile fine aggregate separately from coarse aggregate, although separate stockpiles for more than two mix components are permitted.

.5 Provide approved storage, heating tanks and pumping facilities for asphalt cement.

.6 Submit to Departmental Representative copies of freight and waybills for asphalt cement as shipments are received.

.7 Stockpile crushed RAP separately in accordance with Section 31 05 16 - Aggregate Materials.

.8 Protect and cover stockpiles of crushed RAP from rain to approval of Departmental Representative in accordance with erosion and sedimentation control plan.

.9 There will be no separate payment for mobilization and demobilization to site.

1.8 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Performance graded asphalt cement: to AASHTO PP6, PG 58-28 Grade.

.2 The Contractor may incorporate RAP into the Type “B-HF” asphalt mix:

.1 RAP shall be free of contamination and shall be processed in such a manner that all particles pass the 20 mm sieve before mixing.

.2 RAP stockpiles shall conform to the following requirements:

.1 Stockpiles shall be constructed in a conical manner to reduce moisture accumulation.

.2 Material handling equipment shall not be permitted to operate on the stockpile.

.3 Stockpiles shall be constructed on a properly prepared sloped surface in order to provide positive drainage.

.3 RAP shall be stored in a separate bin.

.4 A maximum of 25% RAP may be incorporated into the Type "B-HF" asphalt mix.

.5 Only RAP produced from this project is permitted in the mix.

.3 The physical requirements of asphalt concrete containing RAP shall conform to the Nova Scotia Department of Transportation and Infrastructure Renewal's Standard Specification for Asphalt Type "B-HF" as outlined in Division 4 Section 4 – Asphalt Concrete Hot Mixed, Hot Placed.

.4 Aggregate shall be crushed quarried stone.

.5 Aggregate: The aggregate shall meet the following gradation requirements:

Sieve Designation	Cumulative % Passing Surface, Type D-HF	Cumulative % Passing Base, Type B-HF
28 000		100
20 000		95 – 100
14 000	100	70 – 90
10 000	95 – 100	60 – 75
5 000	55 – 70	45 – 70
2 500	25 – 55	25 – 45
315	5 – 20	3 – 20
80	2 – 7	2 – 6.5

.1 Coarse aggregate is aggregate retained on 5000 µm sieve and fine aggregate is aggregate passing 5000 µm sieve when tested to ASTM C136.

.2 When dryer drum plant or plant without hot screening is used, process fine aggregate through 5000 µm sieve and stockpile separately from coarse aggregate.

.3 Fine Aggregate Angularity: AASHTO TP33, Min 45%.

.4 Sand equivalent: to ASTM D2419, Min: 50.

.5 Sodium Sulphate soundness: to ASTM C88, Max % loss by mass:

.1 Coarse aggregate: 15.

.2 Fine aggregate: 10.

.6 Los Angeles abrasion: ASTM C131. Max % loss by mass, 30.

.7 Absorption: to ASTM C127. Max % by mass:

.1 Coarse aggregate: 1.75.

.2 Fine aggregate: 2.00.

.8 Flat and elongated particles: ASTM D 4791 (with length to thickness ratio greater than 4): Max % by mass 10%.

.9 Crushed fragments: at least 100% of particles by mass to have at least 2 freshly fractured faces. Material to be crushed from quarried aggregate source.

.10 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.

.11 Petrographic Analysis: TPW TM-2 Modified Petrographic Analysis, maximum 135.

.6 Mineral Filler:

.1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.

.2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.

.3 Mineral filler to be dry and free flowing when added to aggregate.

.7 Anti-Stripping Agents:

.1 Do not use anti-strip agent without the approval of the Departmental Representative.

.2 Approval for the use of a liquid anti-stripping agent will only be granted should the testing (AASHTO T283) yield a long term TSR of the mix with anti-stripping is equal to or greater than 0.80:

.1 Requirements for Liquid anti-stripping agent will also be based on past history of aggregates, and visual examination of test specimens.

.2 No additional payment shall be made for the use of anti-stripping agent in the mix.

.8 Water: to approval of Departmental Representative.

2.2 EQUIPMENT

.1 General: All equipment used on this project shall be in top operating condition because the project is located on a roadway with very steep grades and sharp curves.

.2 Pavers: mechanical grade controlled self-powered pavers capable of spreading asphalt concrete within specified tolerances, true to line, grade and crown indicated.

.1 Pavers to be equipped with automatic screed controls, as recommended by manufacturer for control on longitudinal grade and transverse slope.

.2 Pavers to be equipped with joint matching shoe to operate with longitudinal grade control.

.3 Transverse slope control shall be capable of operating from either side of paver.

.4 Pavers to be equipped with an approved 12 m ski:

.1 Where such ski is a flexible unit, it shall be equipped with a spring tensioned wire extending between brackets fitted on and slightly above each end of ski.

.2 Sensing grid shall ride on wire and not on ski.

.3 Equivalent paving technology may be submitted for approval by Departmental Representative.

.3 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.

.4 Vibratory rollers:

.1 Drum diameter: 1200 mm minimum.

.5 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:

.1 Boxes with tight metal bottoms.

.2 Vehicles shall be equipped with tarpaulins of water repellant material with a maximum mesh size of 0.5 mm when stretched, a minimum melting point of 200°C and of sufficient size to completely cover truck bodies from edge of box to edge of box and overlap the tailgate. Tarps shall be in good condition and shall have no holes or tears. The tarps shall be securely tied down so there is no visible opening between the truck box and tarp.

.3 Vehicles shall also be equipped with wind deflectors at the front of the truck box. If it is raining or if the temperature of the asphalt concrete drops more than 10°C between the time of leaving the plant and placing on the road, tarpaulins shall be used. Tarpaulins shall be used at any other time at the Engineer's request

.4 Use only trucks which can be weighed in single operation on scales supplied.

.6 Hand tools:

.1 Lutes or rakes with covered teeth for spreading and finishing operations.

.2 Tamping irons having mass 12 kg minimum and bearing area not exceeding 310 cm^2 for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Departmental Representative, may be used instead of tamping irons.

.3 Straight edges, 4.5 m in length, to test finished surface.

.7 Material Transfer Vehicle: Transfer asphalt concrete from haul units to spreader with an approved Material Transfer Vehicle.

2.3 MIX DESIGN

.1 Mix design and Job Mix Formula to be provided by Contractor.

.2 Mix design: by Marshall Method to requirements below and as directed by Departmental Representative:

.1 Compaction blows on each face of test specimens: 75.

.1 Design of Mix: by the Marshall Method to the requirements below and submit to the Departmental Representative for approval:

Property	Surface, Type D-HF	Base, Type B-HF
Marshall Stability kN (min)	7.5	7.5
Marshall Flow Value, mm	2 – 4	2 – 4
Air Voids, %	2.5 – 4.0	2.5 – 4.0
Voids in Mineral Aggregate, %, min	15	13
VFA %, min	65 – 78	65 – 78
Stripping Test, % min	80	80

.2 Asphalt cement content shall be determined by mix design.

.3 On this contract, the Contractor may incorporate 20 ± 5% RAP into the Asphalt Concrete Type B-HF:

.1 Preparation and submission of an Asphalt Design Mix Formula (including all supporting documentation) for the asphalt mixture containing RAP, is the responsibility of the Contractor.

.2 The Contractor shall use professional engineering services and a qualified testing laboratory to assess the aggregate materials, asphalt binders, blending sands, mineral fillers, anti-stripping agents and asphalt cement rejuvenation agents proposed for use and to carry out the design of the asphalt concrete mix.

.3 RAP from this project to be used.

.4 Measure physical requirements as follows:

.1 Marshall stability and flow value: to ASTM D6927.

.2 Compute void properties on basis of bulk specific gravity of aggregate (to ASTM D2041 and ASTM D4469). Make allowance for volume of asphalt cement absorbed into pores of aggregate.

.3 Air voids: to ASTM D3203.

.4 Stripping: to AASHTO T283.

.5 Do not change job-mix without prior approval of Departmental Representative. Should change in material be proposed, submit new to Departmental representative for approval. When change in material source proposed, new job-mix formula to be approved by Departmental Representative.

.6 Return plant dust collected during processing to mix in quantities acceptable to Departmental Representative.

.3 Mix design to be approved in writing by Departmental Representative.

2.4 PLANT AND MIXING REQUIREMENTS

.1 Feeder lines for loading asphalt cement to the asphalt tanks shall be elevated and drained and the use of diesel fuel to clean asphalt cement pump feeder lines is not permitted. When necessary to use diesel to flush lines and pump, all flushed material shall be collected and not permitted to enter asphalt cement tanks or dumped on the ground.

.2 Individual cold feed bins are required for the RAP and no intermingling of materials shall be permitted.

.3 RAP shall not be directly exposed to open flame during and/or after introduction into the plant.

.4 Batch and continuous mixing plants:

.1 Heat asphalt cement and aggregates to mixing temperatures specified as per the approved mix design. Do not heat asphalt cement above 160°C.

.2 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders.

.1 Do not load frozen materials into bins.

.3 Feed cold aggregates to plant in proportions to ensure continuous operations.

.4 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.

.5 Before mixing, dry aggregates to a moisture content not greater than 0.5% by mass or to a lesser moisture content if required to meet mix design requirements. Heat to temperature required to meet mixing temperature after combining with RAP.

.6 Where RAP is to be incorporated into mix:

.1 Feed from separate cold feed bin specially designed to minimize consolidation of material.

.1 Provide 50 mm scalping screen on cold feed to remove oversized pieces of RAP.

.2 Ensure positive and accurate control of RAP cold feed by use of hydraulic motor or electric clutch and equip with anti-rollback device to prevent material from sliding backward on feed belt.

.3 Combine RAP and new aggregates in proportions as specified. Dry mix thoroughly, until uniform temperature within ± 5°C of mix temperature is achieved prior to adding new asphalt cement.

.1 Do not add new asphalt cement where temperature of dried mix material is above 160°C.

.5 Based on current asphalt cement viscosity and specific gravity data measured at the plant, the required temperature of completed asphalt at the plant and at the paver is to be determined based on the consideration of current hauling and placing conditions.

.6 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders. Aggregate will not be fed directly to the plant from the crusher.

.7 Feed cold aggregates to plant in proportions that will ensure continuous operations.

.8 Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job-mix requirements.

.9 Store hot screened aggregates in a manner to minimize segregation and temperature loss.

.10 Maintain temperature of materials within plus or minus 5°C of specified mix temperature during mixing.

.11 Mixing time:

.1 In batch plants, wet mixing shall continue as long as necessary to obtain a thoroughly blended asphalt concrete but not less than 30 s or more than 75 s.

.2 In continuous mixing plants, mixing time shall be not less than 45 s.

.3 Do not alter mixing time unless directed by Departmental Representatives.

.12 Dryer drum mixing plant:

.1 Feed aggregates to burner end of dryer drum by means of a multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.

.2 Where RAP is to be incorporated into mix, dryer drum mixer is to be designed to prevent direct contact of RAP with burner flame or with exhaust gases hotter than 180°C.

.3 Meter total flow of aggregate and RAP by an electronic weigh belt system with an indicator that can be monitored by plant operator and which is interlocked with asphalt pump so that proportions of aggregate, RAP and asphalt cement entering mixer remain constant.

.4 Provide for easy calibration of weighing systems for aggregates without having material enter drum.

.5 Make provisions for conveniently sampling the full flow of aggregate from the cold feed.

.6 Provide screens or other suitable devices to reject oversize particles or lumps of aggregates from cold feed prior to entering drum.

.7 Provide a system interlock which will stop all feed components if either asphalt or aggregate from any bin stops flowing.

.8 Accomplish heating and mixing of asphalt concrete in an approved parallel flow dryer-mixer in which aggregate and asphalt cement enter drum at burner end and travel parallel to flame and exhaust gas stream. Control heating to prevent fracture of aggregate or excessive oxidation of asphalt cement. Equip systems with automatic burner controls and provide for continuous temperature sensing of asphalt concrete at discharge, with a printing recorder that can be monitored by plant operator. Submit printer record of mix temperatures at end of each week.

.9 Mixing period and temperature to produce a uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves plant to be less than 0.5%.

.10 For drum mix plants processing RAP, the mixing time shall be adjusted so that all heat transfer occurs in the drum.

.13 Temporary storage of hot asphalt concrete:

.1 Provide storage of sufficient capacity to permit continuous operation and designed to prevent segregation.

.2 Do not keep in storage bins in excess of 3 hours.

.14 While producing asphalt concrete for this project, do not produce it for other users unless separate storage and pumping facilities are provided for materials supplied to this project.

.15 Mixing tolerances:

.1 Permissible variation of asphalt cement from Job Mix Formula:

.1 0.40% (B-HF).

.2 0.30% (D-HF).

.3 Permissible variation of asphalt concrete temperature at discharge from plant, 5°C.

2.5 ASPHALT GUTTER

.1 When gutter mix is placed in conjunction with road paving using the road spreader or spreader attachment the asphalt binder type and amount will be as specified for the Type B-HF or Type D-HF mix.

.2 The production, transportation and placement of the asphalt concrete shall conform to the requirements of this Section.

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 asphalt paving.

.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 PREPARATION

.1 Reshape granular roadbed, asphalt pavement and shoulders in accordance with Section 32 01 16.13 - Reshaping Asphalt Pavement.

.2 When paving over existing asphalt surface, clean pavement surface to approval of Departmental Representative.

.1 When levelling course is not required, patch and correct depressions and other irregularities to approval of Departmental Representative before beginning paving operations.

.3 Apply tack coat in accordance with Section 32 12 13.16 - Asphalt Tack Coat prior to paving.

.4 Prior to laying mix, clean surfaces of loose and foreign material.

3.3 TRANSPORTATION OF MIX

.1 The Contractor shall use a Material Transfer Vehicle (MTV) for the placement of all asphalt concrete.

.1 No unit cost adjustments will be applied to asphalt concrete placed using a material transfer vehicle.

.2 Material transfer vehicles shall be self-propelled equipment capable of transferring asphalt concrete from the hauling equipment into the paver, and shall have the following characteristics:

.1 Minimum storage capacity of 20 t;

.2 A conveyor system to transfer asphalt concrete from the hauling equipment to the paver hopper insert; and

.1 An auger system in the MTV or paddle mixers in the hopper insert to remix the asphalt concrete prior to discharge from the hopper insert.

.2 Transport mix to job site in vehicles cleaned of foreign material.

.3 Paint or spray truck beds with limewater, soap or detergent solution, or non-petroleum based commercial product, at least daily or as required.

.1 Raise truck bed and thoroughly drain, and ensure no excess solution remains in truck bed.

.4 Schedule delivery of material for placing in daylight, unless Departmental Representative approves artificial light for night placing.

.5 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation.

.1 Do not dribble mix into trucks.

.6 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.

.7 Deliver loads continuously in covered vehicles and immediately spread and compact.

.1 Deliver and place mixes at temperature within range not less than 135°C.

.8 Tarpaulins or other coverings for trucks must be of sufficient mass to prevent rapid cooling of asphalt concrete surface

3.4 PLACING

.1 Obtain Departmental Representative's approval of existing surface prior to placing asphalt.

.2 Place asphalt concrete to thicknesses, grades and lines as directed by Departmental Representative.

.3 Placing conditions:

.1 Place asphalt concrete only when air temperature is above 5°C and rising.

.2 When temperature of surface on which material is to be placed falls below 10°C, provide extra rollers as necessary to obtain required compaction before cooling.

.3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

.4 Place asphalt concrete in compacted lifts of thickness as indicated on Drawings.

.5 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.

.6 Place individual strips no longer than 500 m unless approved by Departmental Representative.

.7 Spread and strike off mixture with self-propelled mechanical finisher.

.8 Place individual mats so that the days paving leaves minimal exposed longitudinal cold joint (<10m).

.9 Construct longitudinal joints and edges true to line markings. Lines for paver to follow will be established by Departmental Representative parallel to centreline of proposed pavement. Position and operate paver to follow established line closely.

.10 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.

.11 Correct irregularities in alignment left by paver by trimming directly behind machine.

.12 Correct irregularities in surface of pavement course directly behind paver.

.1 Remove excess material forming high spots using shovel or lute.

.1 Fill and smooth indented areas with hot mix.

.2 Do not broadcast material over such areas.

.2 Do not throw surplus material on freshly screeded surfaces.

.1 The forward speed of the paver shall be regulated by capacity of the plant and the rollers but shall not exceed a forward speed of 10m/min.

.13 When hand spreading is used:

.1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section.

.1 Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

.2 Distribute material uniformly without broad casting material.

.3 During spreading operation, thoroughly loosen and uniformly distribute asphalt concrete by lutes or covered rakes.

.1 Reject asphalt concrete that has formed into lumps and does not break down readily.

.4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.

.5 Provide heating equipment to keep hand tools free from asphalt.

.1 Control temperature to avoid burning material.

.2 Do not use tools at higher temperature than temperature of mix being placed.

.14 Irregularities in the horizontal alignment and grade along the outside edge of the asphalt concrete shall be corrected by the addition or removal of mix before the edge is rolled.

.15 Paving of intersections, extra widths and other variations from standard lane alignment and as defined in the Contract, whether by hand spreading or machine laying, shall be carried out concurrently with the machine laying operation of the regular mat, unless otherwise approved by the Departmental Representative.

3.5 COMPACTING

.1 Compact asphalt concrete continuously using established rolling pattern.

.2 Do not change rolling pattern unless mix changes or lift thickness changes.

.1 Inform Departmental Representative prior to making changes to rolling pattern.

.3 General:

.1 Provide at least three rollers and as many additional rollers as necessary to achieve specified pavement density.

.2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.

.3 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 8 km/h for finish rolling.

.4 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 25 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.

.5 Overlap successive passes of roller by by at least one half width of roller and vary pass lengths.

.6 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water and do not use diesel fuel.

.7 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.8 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.9 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.

.1 Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.

.10 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

.11 Do not refuel rollers on fresh asphalt concrete.

.4 Breakdown rolling:

.1 Begin breakdown rolling with vibratory roller immediately following rolling of transverse and longitudinal joint and edges.

.2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.

.3 Operate breakdown roller with drive roll or wheel nearest finishing machine. Exceptions may be made when working on steep slopes or super-elevated sections.

.4 Use only experienced roller operators.

.5 Intermediate rolling:

.1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.

.2 Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.

.3 Conduct rolling operations in close sequence.

.6 Finish rolling:

.1 Use static finish roller to remove roller marks and achieve smooth driving surface.

.7 All asphalt concrete shall be compacted to 92.5% of Theoretical Maximum Relative Density (TMRD) in accordance with ASTM D3203.

.8 The Contractor will supply additional compaction equipment if required density is not achieved.

.9 Gutters will be compacted with vibratory compactors which operate perpendicular to the direction of the gutter.

.10 Upon completion of placing and shaping, the asphalt concrete for gutter shall be compacted to 94% of the theoretical maximum relative density or to the satisfaction of the Departmental Representative.

3.6 JOINTS

.1 General:

.1 Trim vertical face to provide true surface and cross section against which new pavement may be laid. Remove loose particles.

.2 Paint joint face with tack coat emulsified asphalt cement prior to placing of fresh asphalt concrete.

.3 Overlap previously laid strip with spreader by 100 mm.

.4 Rake fresh asphalt concrete against joint and thoroughly tamp and roll.

.5 Remove surplus material from surface of previously laid strip. Dispose of surplus material as directed by Departmental Representative.

.6 Do not throw surplus material on freshly screened mat surface.

.7 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 Transverse joints:

.1 Carefully construct and thoroughly compact transverse joints to provide a smooth riding surface.

.2 Hold transverse joints to a minimum. When paving single width and maintaining traffic, construct one lane no farther than one-half total paving day.

.3 Stagger joint locations 1.5 to 3.0 m. Schedule each day's paving operation to terminate adjacent lanes in any one area to within above specified joint locations.

.4 Offset transverse joint in succeeding course by at least 600 mm.

.3 Longitudinal joints:

.1 Before rolling, carefully remove with a lute or rake and discard coarse aggregate in asphalt concrete overlapping joint.

.2 Roll longitudinal joints directly behind paving operation.

.3 When rolling with static roller, shift roller cover onto previously placed lane in order that no more than 150 mm of roll rides on edge of newly laid lane, then operate roller to pinch and press fines gradually across joint. Continue rolling until a thoroughly compacted neat joint is obtained.

.4 When rolling with vibratory roller, have most of drum width ride on newly placed lane with remaining 100 to 150 mm extending onto previously placed and compacted lane.

.5 When abutting lane is not placed in same day, or when joint is distorted during day's work by traffic or other means, carefully trim edge of lane to line and paint with a thin coating of asphalt tack before abutting lane is placed.

.6 Ensure joints are offset at least 150 to 200 mm from those in lower layers.

3.7 FINISH TOLERANCES

.1 Finished asphalt surface to be within 6 mm of design elevation but not uniformly high or low.

.2 Finished asphalt concrete not to have irregularities exceeding 6 mm when checked with a 3 m straight edge placed in any direction.

3.8 TEMPORARY MARKINGS

.1 The Contractor shall place temporary pavement markings before sunset following each day's work. Marking material, spacing and type shall be approved by the Departmental Representative.

3.9 SURFACE DEFECTS

.1 The finished surface of any pavement course shall have a uniform texture and be free of visible signs of poor workmanship and bumps and/or dips exceeding 3 mm as measured with a 3 m straight edge.

.2 Any obvious defects, as determined by the Departmental Representative, shall be cause for rejection of the pavement course.

.1 Multiple defects within a 10 metre section shall be considered as one defect.

.2 If a defect is continuous beyond 10 metres it shall be considered as one defect.

.3 Defects shall include but not necessarily be limited to the following:

.1 Segregated areas;

.2 Ravelling;

.3 Roller marks;

.4 Cracking or tearing;

.5 Improper matching of longitudinal and transverse joints;

.6 Tire marks;

.7 Sampling locations not properly reinstated;

.8 Improperly constructed patches;

.9 Contaminant on the mat;

.10 Flushed areas; and

.11 Pneumatic-tired roller pickup.

.4 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.

3.10 DEFECTIVE WORK

.1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form a true and even surface and compact immediately to specified density.

.2 Repair areas showing checking or rippling. Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

3.11 QUALITY ASSURANCE/PAYMENT ADJUSTMENT

.1 Quality Assurance testing for payment adjustment to be performed by Departmental Representative.

.2 Smoothness:

.1 Rate adjustment for smoothness will be based on average IRI measured per 100 m per lane on surface course of asphalt concrete.

.2 Smoothness testing will be performed by Departmental Representative, using a Class 1 Inertial Laser Profiler.

.3 Rate adjustments will be applied to 100 m sections as follows.

IRI (mm/m)	Rate Adjustment ($/100m Section)
0.00 – 0.30	$400
0.31 – 0.50	$350
0.51 – 0.60	$300
0.61 – 0.70	$250
0.71 – 0.80	$200
0.81 – 0.90	$-200
0.91 – 1.00	$-250
1.01 – 1.10	$-490
1.11 – 1.20	$-760
1.21 – 1.30	$-1,040
1.31 – 1.40	$-1,350
1.41 – 1.50	$-1,700
1.51 – 1.60	$-2,110
1.61 – 1.70	$-2,630
1.71 – 1.80	$-3,800
1.81 – 1.90	$-4,690
1.91 – 2.00	$-4,700
> 2.00	Mandatory Repair

.4 Any 100 m having an average IRI above 1.25 mm/m is deemed an optional repair and the Departmental Representative will decide on course of action.

.5 Any 100 m section having an average IRI above 2.00 mm/m is considered a mandatory repair.

.6 Repair will consist of milling and replacing the full depth of the surface, as determined by Departmental Representative. Repairs due to smoothness deficiencies are not paid by the Owner.

.3 Mix Tolerance:

.1 Loose mix samples will be collected every 800 tonnes by Departmental Representative, with a minimum of one (1) per day.

.2 Mix tolerances as per Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance, Division 4, Section 19, Clause 3.2, if two consecutive samples deviate from the tolerances set forth in Section 3.2, the Departmental Representative may direct Contractor to cease production until corrective action is taken to remedy production problems.

.3 Departmental representative will determine sampling locations.

.4 Asphalt Compaction:

.1 Compaction will be based on the average compaction of three (3) cores from stratified random locations each day of paving as determined by the Departmental Representative.

.2 Theoretical maximum density will be based on the average of the day's loose mix samples.

.3 Payment adjustment as per the following table.

Average Compaction (% of maximum theoretical density)	Adjustment $/Tonne
> 93.0	+0.50
92.5 – 93.0	+0.25
92.5	0.00
92.0 – 92.4	-0.25
91.5 – 91.9	-1.00
91.0 – 91.4	-2.00
90.5 – 90.9	-4.00
90.0 – 90.4	-6.00
89.5 – 89.9	-11.00
89.0 – 89.4	-16.00
< 89.0	Reject

.4 Rejected hot mix asphalt will not be paid by the Department and Contractor will bear the cost of repairs. Only original contract quantity will be paid.

.5 Rejected hot mix asphalt will not be paid by the Department and Contractor will bear the cost of repairs.

3.12 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.

3.13 ASPHALT GUTTER

.1 The Contractor shall construct asphalt concrete gutter as and where directed according to the Drawings or to such other dimensions approved by the Departmental Representative.

.2 Where the gutter is to be placed on a granular base the base material shall be graded to the shape of the gutter and then compacted as detailed in Section 32 11 23 – Aggregate Base Courses.

.3 In areas where the gutter is to be placed subsequent to road surface paving, tack coat conforming to the requirements of Section 21 12 13.16 – Asphalt Tack Coat shall be applied to the edge of the previously placed asphalt concrete pavement at a rate of 500 to 800 ml/m^2 before the asphalt concrete gutter is placed.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 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.

.1 Supply calcium chloride in quantities and at times as directed by Departmental Representative.

.2 Deliver calcium chloride to site in moisture-proof bags. Indicate name of manufacturer, name of product, net weight or mass, and percentage of calcium chloride guaranteed by manufacturer.

.3 Storage and Handling Requirements:

.1 Store bags of calcium chloride in weather-proof enclosures.

1.4 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Calcium chloride, Type I: to CAN/CGSB-15.1, flake or 35% aqueous solution.

.2 Water: in accordance with Departmental Representative's approval.

.1 All water for dust control to be obtained outside of the Park Boundaries.

Part 3 Execution

3.1 APPLICATION

.1 Apply calcium chloride and water with equipment approved by Departmental Representative at rate of 1 l/m^2 for liquid when directed by Departmental Representative.

.2 Apply water with distributors equipped with means of shut-off and with spray system to ensure uniform application.

.3 Failure to provide adequate dust control measures resulting in suspension of the Work will be the responsibility of the Contactor.

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 REFERENCES

.1 ASTM International

.1 ASTM D711, Standard Test Method for No-Pick-Up Time of Traffic Paint.

.2 ASTM D868, Standard Practice for Determination of Degree of Bleeding of Traffic Paint.

.3 ASTM D1155, Standard Test Method for Roundness of Glass Spheres.

.4 ASTM D1210, Standard Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage.

.5 ASTM D1214, Standard Test Method for Sieve Analysis of Glass Spheres.

.6 ASTM D1309, Standard Test Method for Settling Properties of Traffic Paints during Storage.

.7 ASTM E1347, Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry.

.2 Canadian General Standards Board

.1 CGSB 1-GP-1-71, Method of Testing Paints and Pigments

.3 Nova Scotia Temporary Workplace Traffic Control Manual.

.4 Transportation Association of Canada, Manual of Uniform Traffic Control Devices for Canada.

.5 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

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

.2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Samples:

.1 Submit to Departmental Representative following material sample quantities at least 3 weeks prior to commencing work.

.1 A one litre sample of each of the yellow and white paint, in sealed air tight containers, and a 25 kg bag of the reflectorizing glass beads. Once the Contractor has selected the paint and glass bead suppliers and the Departmental Representative has approved the materials to be used, the

Contractor shall be responsible for additional testing costs should they change suppliers.

.2 Samples may be taken from shipments at any time. At the discretion of the Departmental Representative, the samples may be tested and analysed by an independent authority or otherwise. Results obtained from the analysis showing non-conformity to this specification shall be cause for rejection of all or a portion of the shipment.

.2 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, MPI specification number and formulation number and batch number.

1.3 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 in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Disposal of empty containers according to Environmental Regulations shall be the responsibility of the Contractor.

1.4 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Paint:

.1 To Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance, Division 6, Section 6.

.2 Glass Beads:

.1 The beads shall be true spheres and their surface shall be smooth, lustrous and free from cavities and scratches. The beads shall be manufactured from glass of a composition designed to be resistant to the effects of traffic wear and weathering. No foreign material shall be contained in or among the beads.

.2 The glass beads shall be colourless to the extent that they do not impart a noticeable hue to the paint.

.3 The index of refraction of the glass beads shall not be less than 1.50 when tested in accordance with Method 49.1 of CGSB 1-GP-71.

.4 A minimum of 75% by mass of the glass beads shall be true spheres. The percentage of true spheres shall be determined by one of the following methods:

.1 by counting the beads under 50X and 100X magnification as follows:

.1 Glass beads larger than #50 sieve size inclusive shall be counted under 50X magnification (see gradation requirements).

.2 Glass beads smaller than #50 sieve size shall be counted under 100X magnification.

.3 Approximately 1000 beads contained loosely in a culture dish shall be counted under reflected light for each sieve specified to determine the percentage by mass of perfectly round spheres.

.4 by ASTM D1155.

.2 Failure to meet roundness requirements by either method will be cause for rejection.

.5 The surface of the beads shall be smooth, lustrous and free from film scratches and pits. Not more than 25% of the true spheres shall have imperfections in the form of milkiness, air inclusions, dark specks and incipient fractures. These properties shall be determined using Method 149.1 of CGSB 1-GP-71.

.6 The glass beads shall meet the following gradation requirements:

.1 Gradation to:

Sieve Opening, µm	Percent Passing
850	100
600	80 – 100
300	20 – 35
150	0 – 8
75	0 – 2

.2 Tests for gradation shall be made in accordance with ASTM D1214. The sample size shall not be less than 50 g or more than 100 g.

.7 The beads shall not agglomerate during storage and application. They shall be treated in such a manner as to overcome the effect of water, both as a vapour and a liquid, on the beads before the beads are added to the paint stripe. They shall flow freely from dispensing equipment at any time when surface and atmosphere conditions are satisfactory for painting. Moisture resistance shall be tested by the method described as follows:

.1 A 100 g sample of glass beads shall be placed in a 500 ml beaker and an equivalent volume of distilled water shall be added to the beaker. The beaker shall then stand for 5 minutes at the end of which time the water shall be carefully poured off and the glass beads transferred to a clean dry beaker and allowed to stand for 5 minutes. The beads shall then be poured slowly into a standard 125 mm glass funnel having a stem of 125 mm length and 10 mm inside diameter.

.2 The beads shall flow through the stem without stoppage. Slight initial agitation to start the flow through the funnel at the beginning of the test is permissible.

.8 When the glass beads are exposed to atmospheric conditions, humidity, diluted acid or alkali solutions or paint film constituents, there shall be no dulling of the surface which would adversely affect reflective properties of the beads.

.1 Calcium chloride resistance shall be determined in the following manner:

.1 Place 10 g of beads in a 100 ml beaker;

.2 Cover the sample with 500 ml of calcium chloride (1.0 Normal Solution);

.3 Let the beads soak for three hours;

.4 Rinse the beads three times with 100 ml of distilled water and dry;

.5 Examine the beads under a microscope and compare them with an untreated sample.

.2 Dulling of the surface or other detrimental effects shall constitute failure of this test.

.9 The glass beads shall be furnished in clean, durable, waterproof bags containing 25 kg each. Bags shall be of one of the following types:

.1 woven polypropylene, lined inside with a sprayed polyethylene coating of 0.25 mm thickness

.2 285 gram jute, with polyethylene liner of 0.50 mm

.3 22.67 kg basis weight, multi-walled kraft paper, with polyethylene liner of 0.50 mm thickness.

.4 These bags shall be able to withstand handling and storage between packaging and application of the beads, and shall be constructed so as to avoid contamination of the beads with foreign materials. Both ends of the bags shall be securely sealed to prevent leakage.

.5 Bags of glass beads shall be supplied on nonreturnable wood pallets, 40 - 60 bags per pallet, and shall be lashed or secured to the pallet.

Part 3 Execution

3.1 PAVEMENT MARKING DRAWINGS

.1 Where a pavement marking drawing is provided, the Contractor is required to paint markings as indicated on the Drawing. Where a pavement marking drawing is not provided, the Contractor is to accurately inventory existing markings by topographic survey methodologies. Departmental Representatives' approval of the Contractor's inventory drawing is required prior to the cold milling or pulverization of the existing asphalt pavement. In locations where a pavement marking drawing is not provided, the following shall apply to assist the Contractor in establishing uniformity in the development of pavement marking drawings/descriptions. This checklist should be used as a guide to ensure that all of the basic elements are covered.

.1 For locations which require a <u>scaled and surveyed drawing</u>:

.1 The Contractor shall submit a pavement marking drawing that is to a 1:500 scale. Drawings shall be submitted in PDF form and printed to

either an 11 x 17 or A-1 size. The pavement marking drawing shall be produced from a survey and shall inventory the existing pavement markings. The Contractor shall be responsible for including any revisions as directed by the Departmental Representative. The inventory shall include pavement markings at the project limits, except for continuous center or lane lines.

.2 The pavement marking drawing shall be submitted no later than 10 business days before scheduled cold milling or pulverization.

.3 The pavement marking drawing shall include:

.1 Project name, highway, limits, tender number and date.

.2 Indicate north arrow and scale.

.3 Use a legend to define all symbols.

.4 Show colours, sizes and configurations of existing pavement markings (arrows, solid/dashed lines, hatching, bicycle symbols, etc.).

.5 Dimension individual lane widths, bike lane widths, length/width of hatching, stop bar setbacks, etc.

.6 Layout pavement markings in accordance with the Manual of Uniform Traffic Control Devices for Canada, unless otherwise indicated.

3.2 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings previously installed under other Sections or Contracts are acceptable for product installation in accordance with MPI instructions prior to pavement markings installation.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.

.2 Proceed with Work only after unacceptable conditions have been rectified.

3.3 EQUIPMENT REQUIREMENTS

.1 The Contractor shall supply a mobile highway striping truck which is capable of striping centre, lane and edge lines and of applying overlay-type glass beads to the wet painted line by means of pressurized bead dispensers. The truck shall be fitted with a paint heater capable of heating paint to any temperature up to 80ºC and maintaining a constant temperature during spraying operations.

3.4 APPLICATION

.1 Pavement markings: layout by Contractor.

.2 Traffic line painting shall include centerline painting, lane line painting and edge line painting. The term centerline shall be used to describe any of the standard line combinations separating opposing traffic lanes on two-lane, two-way traffic highways and shall include the following:

.1 Single skip lines;

.2 Single skip and single solid lines;

.3 Double solid lines;

.4 Single solid line (Occasionally a narrow local low volume road may have a single solid centerline).

.3 All such centerlines shall be yellow in colour.

.4 The term lane line shall be used to describe any line separating lanes of traffic travelling in the same direction and may be either a single white skip line or a single white solid line.

.5 The term edge line shall be used to describe any line which defines the shoulder edge of the outside traffic lanes. On two-lane highways, edge lines shall be white in colour. On divided highways the edge line on the right in the direction of traffic flow shall be a single solid white line, the one on the left a single solid yellow line.

.6 Symbols, hatching and letters to dimensions and colours indicated.

.7 The width of painted lines shall be 11.5 cm. Paint shall be heated to a temperature sufficient to enable it to dry when applied to the road, in a time frame short enough to avoid the use of traffic cones for protection of vehicles and the painted line itself. Paint shall be applied at a rate to achieve in one pass a minimum dry film thickness (dft) of 255 µm. Overlay-type reflectorizing glass beads shall be dispensed from the paint striping truck by means of a pressurized bead dispenser to the wet painted line at the rate of 700 g/L of paint applied.

.8 All lines are to be true with clearly defined edges and without noticeable overspray of adjacent road surfaces.

.9 No painting shall be carried out when visible moisture is present on the road surface.

.10 Lines not painted in accordance with these specifications shall be repainted by the Contractor at the expense of the Contractor.

.11 The Contractor shall inform the Department's Representative of the Contractor's daily schedule to enable the representative to be present as they deems it necessary during loading and painting operations.

3.5 TRAFFIC CONTROL

.1 Traffic Control shall be the responsibility of the Contractor and shall be carried out in accordance with the NSTIR's Temporary Workplace Traffic Control Manual.

3.6 TRAFFIC LINES

.1 All pavement lines and markings shall be in accordance with the Transportation Association of Canada's Manual of Uniform Traffic Control Devices for Canada (MUTCDC).

3.7 TOLERANCE

.1 Paint markings: within plus or minus 12 mm of dimensions indicated.

.2 Remove incorrect markings in accordance with Section 32 01 11.01 - Pavement Cleaning and Marking Removal.

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.

3.9 PROTECTION OF COMPLETED WORK

.1 Protect pavement markings until dry.

.2 Repair damage to adjacent materials caused by pavement marking application.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 — Cast-in-Place Concrete

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

.3 Section 31 32 19.01 — Geotextiles

1.2 REFERENCES

.1 ASTM International

.1 ASTM C1372, Standard Specification for Dry-Cast Segmental Retaining Wall Units.

.2 CSA International

.1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with this Section and 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 culverts from damage.

.3 Prevent chipping and cracking of segmental retaining wall units.

.4 Prevent staining or other defacement of front surfaces of facing panels during storage and handling.

.5 Replace defective or damaged materials with new.

1.5 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 DESIGN CRITERIA

.1 Design code: CSA S6.

.2 Design of the segmental retaining wall system will be the responsibility of the Contractor in association with the manufacturer.

.3 Consider both internal and external stability of wall system in design. External stability to include safety against sliding, overturning, bearing failure and slip circle failure.

.4 Minimum factors of safety for working stress design:

.1 Pullout resistance: 1.5.

.2 Sliding: 1.5.

.3 Overturning: 1.5.

.4 Bearing capacity: 2.0.

.5 Overall slope stability: 1.5.

.5 Required geometry:

.1 Elevation top of wall as indicated on the Drawings.

.2 Elevation top of levelling pad as indicated on the Drawings.

.3 Finished slope of wall facing: near vertical with nominal setback per course.

.4 Embedment depth of levelling pad: as indicated on drawings.

.5 Segmental retaining wall units: solid concrete construction (i.e., not hollow construction with granular infill) using knob and groove interlocking construction.

2.2 WALL SYSTEMS

.1 Only proprietary wall systems are acceptable.

.2 Provide Departmental Representative with six (6) sets of complete working drawings, and one copy of detailed design calculations, for review at least 4 weeks prior to beginning construction. Drawings shall indicate dimensions of segmental retaining wall units, wall elevations, sections and grade profile. Drawings and design calculations to bear signature and stamp of qualified professional engineer registered or licensed in Province of Nova Scotia.

.3 Verify existing site conditions and ground elevations before preparing working drawings.

.4 Use only one type of proprietary wall system for the structure. Do not substitute for any component normally supplied by supplier of proprietary wall system.

.5 Exposed face of segmental wall units must have a cut stone finish. Finish to be approved by Departmental Representative.

2.3 MATERIALS

.1 Granular backfill: refer to Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.2 Concrete mixes and materials:

.1 Concrete shall have a minimum compressive strength of 35 MPa at 28 days.

.2 The maximum nominal coarse aggregate size to be 20mm.

.3 The aggregates used in the wall units to be non-reactive as determined by CSA A23.1/A23.2.

.4 The maximum water to cementing materials ratio shall be 0.40.

.5 The limits for slump and total air content shall be 80 mm ± 20 mm and 6% ± 1% respectively.

.6 The minimum cementitious content shall be 320 kg per cubic metre of concrete.

.7 Any additives including retarding agents or accelerating agents containing chlorides are not to be used.

.3 Wall units:

.1 Exterior block dimensions to be uniform and consistent. Maximum dimensional deviations to be 1% excluding the architectural surface. Maximum width (face to back) deviation including the architectural surface to be 25mm.

.2 Exposed face to be finished as specified. Other surfaces to be smooth form type. Dime-size bug holes on the block face are to be patched and/or shake-on color stain can be used to blend into the remainder of the block face.

.4 Leveling pad and free draining backfill:

.1 Leveling pad to be crushed stone. See drawings defining drain placement in the bottom of the foundation leveling pad.

.2 Free draining backfill material is to be washed stone and placed to a minimum of 300mm width behind the back of the wall and shall extend vertically from the Leveling Pad to an elevation 100mm below the top of wall.

.3 Backfill material to be approved by the Departmental Representative. Site excavated soils may be used if accepted by the Departmental Representative, unless otherwise shown on the drawings. Unsuitable soils, organic soils and frost susceptible soils will not be used within a 1 to 1 influence area.

.4 Place non-woven geotextile cloth between the free draining backfill and retained soil, if required.

.5 Where additional fill is needed, submit sample and specifications to the Departmental Representative for approval.

.5 Drainage:

.1 Evaluate internal and external drainage and be responsible for the final wall design.

Part 3 Execution

3.1 EXCAVATION

.1 Excavate to the lines and grades shown on the construction drawings.

3.2 FOUNDATION

.1 Compact native foundation soil to a minimum of 95% of the maximum dry density in accordance with ASTM D698 prior to placement of the leveling pad material.

.2 Examine in-situ foundation soil to ensure that the actual foundation soil strength meets or exceeds assumed design strength. Remove soil not meeting the required strength and replace with acceptable, compacted material.

3.3 LEVELING PAD

.1 Place leveling pad as shown on the construction drawings.

.2 Place leveling pad on undisturbed native soils or suitable replacement fills.

.3 Compact leveling pad to a minimum 95% of the of maximum dry density in accordance with ASTM D698 to ensure a level, hard surface on which to place the first course blocks. Pad shall be constructed to the proper elevation to ensure the final elevation shown on the plans.

.4 Leveling pad to have a 150mm minimum depth for walls under 2.5m in height and a 300mm minimum depth for walls over 2.5m. Extend pad dimensions beyond the blocks in all directions to a distance at least equal to the depth of the pad or as determined by the design.

3.4 UNIT INSTALLATION

.1 Place the first course of wall units on the prepared leveling pad with the aesthetic surface facing out and the front edges tight together. Check all units for level and alignment as they are placed.

.2 Confirm that units are in full contact with leveling pad. Take proper care to develop straight lines and smooth curves on base course as per wall layout.

.3 Place the backfill in front and back of entire base row and compacted to firmly lock them in place. Check all units again for level and alignment. Sweep all excess material from top of units.

.4 Install next course of wall units on top of base row. Position blocks to be offset from seams of blocks below. Place blocks fully forward so knob and groove are engaged. Check each block for proper alignment and level. Backfill to 300mm width behind block with free draining backfill. Spread backfill in uniform lifts not exceeding 230mm. Employ methods using lightweight compaction equipment that will not disrupt the stability or batter of the wall. Hand-operated plate compaction equipment shall be used around the block and within 1m of the wall to achieve consolidation. Compact backfill to a minimum of 95% of the maximum dry density in accordance with ASTM D698.

.5 Install each subsequent course in like manner. Repeat procedure to the extent of wall height.

.6 Allowable construction tolerance at the wall face is 2 degrees vertically and 1 in 120 horizontally.

.7 Install all walls in accordance with local building codes and requirements.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 33 42 13 Pipe Culverts

.2 Section 33 42 13.01 Precast Rigid Frame Culverts

1.2 REFERENCES

.1 Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification – (Latest Edition) – Division 7 – Environmental Protection, Section 5 – Hydroseeding.

.2 Nova Scotia Department of Transportation and Infrastructure Renewal - Standard Specification – (Latest Edition) – Division 7 Section 6 – Dry Mulching.

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.

.2 Submit 2 copies of WHMIS MSDS in accordance with Sections 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.

.3 Submit in writing 7 days prior to commencing work:

.1 Volume capacity of hydraulic seeder in litres.

.2 Amount of material to be used per tank based on volume.

.3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.

.4 Samples:

.1 Submit 0.5 kg container of each type of fertilizer used.

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

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

.7 If compost is used, the Contractor shall provide documentation certifying the origin of the feedstocks, its class, nutrient analysis and weed free status. It shall conform to NSDEL’s Compost Guidelines.

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

.2 Store and protect guide rails from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.5 WARRANTY

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

.2 Contractor hereby warrants that hydroseeding will remain free of defects in accordance with General Conditions CCDC GC 12.3, but for 1 full growing season.

.3 End-of-warranty inspection will be conducted by Departmental Representative.

1.6 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 SEED mix shall consist of the *Nova Scotia Highway Seed Mix* which includes the following species:

.1 40% Creeping Red Fescue;

.2 15% Timothy;

.3 15% Tall Fescue;

.4 10% Kentucky Blue Grass;

.5 10% Alsike Clover;

.6 5% Red Top;

.7 5% Perennial Rye

.3 An equivalent mix of perennial grasses and legumes may be used as approved by the Departmental Representative. Nitrogen fixing legumes such as Clovers, Birdsfoot Trefoil or Vetches shall be included in the mix. Any changes to the *Nova Scotia Highway Seed Mix* shall be approved by the Departmental Representative prior to hydroseeding. Wildflower or other seed may be added as required or at the discretion of the Departmental Representative. Nurse grasses such as winter rye and winter barley may be added in fall seedings.

.4 The application rate for the seed mix shall be a minimum of 100 kg/ha.

.5 Fertilizer shall be formulated 15-25-15 for seeding done April 15 to September 1st and 10-20-20 thereafter. Fertilizer shall conform to the Canada Fertilizer Act and Regulations.

.6 The application rate for fertilizer shall be a minimum of 625 kg/ha.

.7 Lime shall be agricultural quality lime. The lime shall be free flowing and free of lumps.

.8 Binder (organic tackifier) acts as an adhesive to bind soil, fiber and seed particles together and to temporarily control the effects of wind and water erosion during seed germination and plant establishment. It may be supplied in liquid or powder form and shall be applied at the manufacturer's recommended application rate. It shall not contain any toxic or growth inhibiting chemicals or compounds.

.9 Organic amendments to enhance germination or growth may be used at the discretion of the Departmental Representative. This includes compost.

.10 Water shall be free of any impurities which would inhibit seed germination or seedling growth.

.11 Bags of seed and fertilizer shall be labeled, identifying mass (kg), mix components and percentages, date of bagging and supplier's name. Alternatives to the specified seed and fertilizer mixes will not be accepted without prior approval of the Departmental Representative. The Departmental Representative may sample the seed and fertilizer for analysis and verification.

.12 Seed and fertilizer shall be kept dry and protected from sunlight, heat or other detrimental conditions. Seed or fertilizer that have been subjected to moisture before use will not be accepted for use.

.13 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% ± 0.5%.

.3 Value of pH: 6.0.

.4 Potential water absorption: 900%.

.2 Type II mulch:

.1 Made from straw, processed to produce fibre lengths of 15 mm minimum and 25 mm maximum. Greater proportions of ingredients to be straw.

.3 Tackifier: water soluble vegetable carbohydrate powder.

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

.5 Fertilizer:

.1 To Canada "Fertilizers Act" and "Fertilizers Regulations".

.2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.

.6 Inoculants: inoculant containers to be tagged with expiry date.

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 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.

3.2 INSTALLERS

.1 The Contractor shall be a member in good standing of Landscape Nova Scotia.

3.3 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.

3.4 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 or temperatures which inhibit seed germination unless otherwise approved by the Departmental Representative.

.2 Final dressing of slopes shall include removal of deleterious materials such as sticks, roots or large rocks; loosening of the top 50 mm of soil; and scarification to minimize runoff velocities.

.1 Scarifications shall be parallel to the contour of the slope with a minimum indentation (high to low) of 25 mm and at a maximum spacing of 150 mm. Scarifying can be made by means of dozer treads or any other mechanical means such that scarifications meet the above noted specifications. If topsoil is to be utilized it shall be placed in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.

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

.4 The Departmental Representative shall be given a minimum of 24 hour notice before hydroseeding is to commence.

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

.6 Hydroseeding shall be carried out as soon as possible after the completion of the surface preparation. Final dressing of the slopes shall be done as areas are completed to enable

hydroseeding to be done in stages as work progresses, in accordance with the Work Progression Schedule of the contract.

3.5 HYDRAULIC SEEDING

.1 The hydraulic mulch, seed, fertilizer, lime (if required), organic amendments (if required) and binder or tackifier shall be thoroughly mixed with water in a hydroseeding tank capable of continually agitating the mixture during the hydroseeding operation to ensure that a homogeneous slurry is produced. The hydroseed mix shall be prepared on site and applied immediately. It shall not be left in the tank for longer than 6 hours before being used.

.2 Binder shall be used for all hydroseeding work. Application rates may vary ± 10% depending on ground conditions, at the discretion of the Departmental Representative.

.3 The Contractor shall proportion the ingredients in the hydroseeding tank according to the size of the tank and the area anticipated to be covered with each tankful of mix, so that the materials are applied at the prescribed rates. The Contractor shall adjust the quantities of ingredients per tankful as required if the actual coverage (m^2/tank) is different from that anticipated.

.4 The mixture shall be applied uniformly onto prepared surfaces from a hydroseeder which shall be capable of spraying the extremities of slopes or other areas of exposed ground, whether through the towergun nozzle or extension hose.

.5 Straw or hay dry mulch or erosion control blankets shall be applied within 24 hours of seeding. Areas that cannot be dry mulched or provided with an erosion control blanket within 24 hours shall not be seeded.

.6 No hydroseeding shall be carried out after the week of September 30th without the prior approval of the Departmental Representative.

3.6 MULCH

.1 Dry mulch in accordance with the Nova Scotia Transportation and Infrastructure Renewal Standard Specification (Latest Edition). Dry Mulch shall be applied through blowing.

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 Ensure maintenance is carried out under supervision of certified Landscape Maintenance Supervisor.

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

.3 Grass Mixture:

.1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.

.2 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.

3.10 ACCEPTANCE

.1 Seeded areas will be accepted by Departmental Representative provided that:

.1 Grass is uniformly established.

.2 Area is free of bare and dead spots.

.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 Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 16 — Aggregate Materials

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

.3 Section 32 11 16.01 — Granular Sub-Base

1.2 REFERENCES

.1 AASHTO

.1 AASHTO M196, Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains.

.2 ASTM International

.1 ASTM C76M, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).

.2 ASTM C443M, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).

.3 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

.4 ASTM F667, Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings.

.5 ASTM F679, Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

.6 ASTM F794, Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

.7 ASTM F949, Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings.

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

.3 CSA International

.1 CAN/CSA A3000, Cementitious Materials Compendium.

.2 CAN/CSA A257 Series, Standards for Concrete Pipe and Manhole Sections.

.3 CAN/CSA B182.2, PSM Type Polyvinylchloride (PVC) Sewer Pipe and Fittings.

.4 CAN/CSA B182.4, Profile Polyvinylchoride (PVC) Sewer Pipe and Fittings.

.5 CAN/CSA B182.8, Profile Polyethylene (PE) Storm Sewer and Drainage 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 pipes and bedding and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Inform Departmental Representative at least 2 weeks before beginning Work, of proposed source of bedding materials and provide access for sampling.

.4 Certification: to be marked on pipe.

.5 Test and Evaluation Reports:

.1 Submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with this Section and 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 pipes from damage.

.3 Replace defective or damaged materials with new.

1.5 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 CORRUGATED ALUMINUM ALLOY PIPE

.1 Corrugated aluminum alloy pipe shall conform to AASHTO M196.

.2 The nominal wall thickness for corrugated aluminum alloy pipe shall be:

Diameter (mm)	Wall Thickness (mm)
300	2
300	2
500	2
600	2
800	2.8
900	2.8
1000	2.8
1200	3.5

.3 The couplers shall be corrugated band couplers or universal dimple couplers complete with angle flanges and bolted connectors. Couplers shall be 600mm wide for all pipe sizes. If corrugated couplers are used the pipe ends shall be recorrugated to accept the coupler.

2.2 CONCRETE PIPE

.1 Reinforced concrete pipe: to CAN/CSA A257 and shall be one of three classes: 65D, 100D or 140D as specified in the contract tender items.

.2 Rubber gaskets for joints: to CAN/CSA A257.

.3 Pipe up to 1800 mm nominal ID shall have a minimum 70 mm diameter lift hole at the centre of gravity, and shall be equipped with a tapered concrete or rubber plug that does not protrude beyond the inside wall of the pipe.

2.3 CORRUGATED HIGH-DENSITY POLYETHYLENE PIPE

.1 High Density Polyethylene (HDPE) Pipe shall be double walled, with a smooth interior surface, conforming to CAN/CSA-B182.8.

.1 HDPE shall have a minimum stiffness of 320 kPa.

.2 HDPE Pipe supplied for use as Driveway Culvert Pipe shall have an open end area equivalent to or greater than the open end area for the corresponding diameter of corrugated steel pipe.

.2 Joints: Bell and spigot with integrated gasket.

2.4 POLYVINYL CHLORIDE (PVC) Pipe

.1 Pipe: To CAN/CSA-B182.2 and B182.4, ASTM D3034, F679, F794 and F949.

.2 PVC pipe shall not be utilized for culvert installations.

.3 Joints: Bell and spigot with locked-in rubber gaskets.

2.5 GRANULAR BEDDING

.1 Granular bedding and backfill material to Section 31 05 16 - Aggregate Materials and following requirements:

.1 NSTIR Type 2 gravel material in accordance with Section 32 11 16.01 – Granular Sub-Base.

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 pipe culvert 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.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties, according to requirements of authorities having jurisdiction and sediment and erosion control plan or requirements of authorities having jurisdiction, whichever is more stringent.

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

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

3.3 TRENCHING

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

.2 Obtain Departmental Representative's approval of trench line and depth prior to placing bedding material or pipe.

3.4 BEDDING

.1 Dewater excavation, as necessary, to allow placement of culvert bedding in dry condition.

.2 Place 200 mm minimum thickness of approved granular material on bottom of excavation and compact to 95% minimum of maximum density to ASTM D698.

.3 Shape bedding to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding and to camber as indicated or as directed by Departmental Representative, free from sags or high points.

.4 Place bedding in unfrozen condition.

3.5 LAYING CORRUGATED ALUMINUM ALLOY CULVERTS

.1 Begin pipe placing at downstream end.

.2 Ensure bottom of pipe is in contact with shaped bed or compacted fill throughout its length.

.3 Lay pipe with outside circumferential laps facing upstream and longitudinal laps or seams at side or quarter points.

.4 Do not allow water to flow through pipes during construction except as permitted by Departmental Representative.

3.6 JOINTS: CORRUGATED ALUMINUM ALLOY CULVERTS

.1 Corrugated aluminum alloy pipe:

.1 Match corrugations or indentations of coupler with pipe sections before tightening.

.2 Tap couplers firmly as they are being tightened, to take up slack and ensure snug fit.

.3 Insert and tighten bolts.

3.7 LAYING CONCRETE PIPE CULVERTS

.1 Pipes shall be joined in a straight line using standard industry methods, proceeding from the downstream end of culvert with bell end of first pipe section facing upstream. Each pipe section shall be set into place and positioned together as recommended by the lifting device manufacturer.

.2 The maximum joint gap between pipe sections shall be 13 mm for pipes up to 1500 mm diameter and 20 mm for pipes of 1800 mm diameter and larger.

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

.4 Allow water to flow through pipes during construction only as permitted by Departmental Representative.

.5 Lifting anchor recesses shall be entirely grouted in with non-shrink grout.

3.8 JOINTS: CONCRETE PIPE CULVERTS

.1 Joints may be made with rubber gaskets.

.1 Rubber gasket joints:

.1 Install in accordance with manufacturer's written recommendations.

.2 Ensure that tapered ends are fully entered into flanged ends.

3.9 LAYING PVC AND CORRUGATED HIGH-DENSITY POLYETHYLENE PIPE CULVERTS

.1 Begin laying at downstream end of culvert.

.2 Install pipe in trench by lowering.

.3 Ensure bottom of pipe is in contact with shaped bedding throughout pipe length.

.4 Allow water to flow through pipes during construction only as permitted by Departmental Representative.

3.10 JOINTS FOR HIGH-DENSITY POLYETHYLENE CULVERTS

.1 Install couplings in accordance with manufacturer's instructions.

3.11 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 03 30 00	Cast-In-Place Concrete
.2	Section 03 41 00	Precast Structural Concrete
.3	Section 31 05 16	Aggregate Materials
.4	Section 31 23 33.01	Excavating, Trenching and Backfilling
.5	Section 31 24 13	Roadway Embankments
.6	Section 32 11 16.01	Granular Sub-Base

1.2 REFERENCES

.1 ASTM International

.1 ASTM C1433, Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers.

.2 ASTM C877, Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.

.3 ASTM C117, Standard Test Method for Materials Finer Than 75 µm (No. 200) Sieve in Mineral Aggregates by Washing.

.4 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.5 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.

.6 ASTM D698, 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, Sieves, Testing, Woven Wire, Metric.

.3 CSA International

.1 CAN/CSA S6, Canadian Highway Bridge Design Code.

1.3 SUBMITTALS

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

.2 Inform Departmental Representative at least four (4) weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.

.3 Submit manufacturer's test data and certification at least four (4) weeks prior to beginning Work. Refer to Section 03 41 00 - Precast Structural Concrete.

.4 Certification: to be marked on culvert.

.5 Shop drawings in accordance with Section 03 41 00 - Precast Structural Concrete.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with this Section and 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 culverts from damage.

.3 Replace defective or damaged materials with new.

1.5 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 DESIGN CRITERIA

.1 Live Loading: CL-625 Truck.

.2 Design unit weight of soil of 22 kN/m^3.

.3 Span (bottom): as indicated. Rise: as indicated.

.4 Seismic acceleration ratio = 0.10g.

.5 Design height of cover as indicated, considering both finished road grade and temporary travel grades.

.6 Finish on the precast rigid frame culvert to match the segmental concrete block retaining walls.

2.2 PRECAST UNITS

.1 Only proprietary precast rigid frame culverts are acceptable.

.2 Provide Departmental Representative with six (6) sets of complete working drawings and one (1) copy of design calculations for review at least four (4) weeks prior to construction. Drawings at design calculations to bear signature and stamp of qualified professional engineer registered in Nova Scotia.

.3 Provide the following information on the working drawings:

.1 Plan layout of wall.

.2 Profiles.

.3 Developed wall elevations (elevations of top and bottom of wall to be identified) and lengths of walls.

.4 Wall cross-sections showing the supported structures, beam seat configuration, required finished grades, location and slope of surcharge on top of the wall structure and maximum water table elevation behind wall.

.5 Design Codes.

.6 Traffic Surcharge (kPa).

.7 The magnitude and location of all loads to be carried by Structure.

.8 Seismic acceleration coefficient value (a/g).

.9 Internal angle of friction for the backfill material (minimum 34 degrees), backfill behind the reinforced soil zone (30 degrees) and foundation material under backfill (30 degrees).

.10 Unit mass (t/m^3) for the backfill and backfill behind the reinforced soil zone.

.11 The allowable bearing capacity of the foundation soil under the backfill.

.12 The total and differential settlement.

.13 All information on the stability of the foundation soils if slope stability is a concern.

.14 Details of all joints and connections to other structures.

.15 A statement that bearing resistance, internal stability and external stability are satisfactory.

.16 Detail showing the year of fabrication embedded in the inlet and outlet sections.

.17 Service life for the structure to be 75 years.

2.3 FOUNDATION BEDDING AND BACKFILL

.1 Concrete mixes and materials for foundation bedding, cradles, encasement, supports to Section 03 30 00 - Cast-in-Place Concrete.

.2 Granular bedding and backfill material to Section 31 05 16 - Aggregate Materials and following requirements:

.1 NSTIR Type 2 gravel material in accordance with Section 32 11 16.01 – Granular Sub-Base.

2.4 WATERPROOFING

.1 The waterproofing system shall be a manufactured waterproofing membrane system consisting of a primer, a membrane, a mastic and a protection board and shall be used on precast rigid frame structures. The waterproofing shall cover the full length of the structure and wrap over the top of the footings.

.1 Protection board shall be Vibraflex Type 70 or IKO 1/8” Protecto Board or approved equivalent and having a maximum absorption of 3%.

Approved Waterproofing Systems

Manufacturer	Product
W. R. Grace & Co. of Canada	Bituthene 4000
Soprema Inc.	Colphene 3000
Royston Laboratories	H P Membrane
Protecto Wrap Company	Jiffy Seal 140/160

.2 Materials shall be stored at least 100mm off the ground in a weatherproof enclosure.

Part 3 Execution

3.1 MANUFACTURER'S RECOMMENDATIONS

.1 Install precast culvert units in accordance with manufacturer's recommendations. Manufacturer's representative is to visit site to verify Contractor's installation methods.

3.2 EXCAVATION

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

.2 Obtain Departmental Representative's approval of excavation extents and depth prior to placing foundation or culvert.

.3 Dewater excavation, as necessary, to allow placement of culvert in dry condition.

3.3 FOOTING

.1 Connect or anchor culvert and wingwalls to cast-in-place concrete foundation in accordance with manufacturer's instructions.

.2 Footings to be founded on competent bearing stratum consisting of dry base of compact to dense glacial till or bedrock. Footings to be underlain directly by layer of backfill in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.3 Bearing stratum to be inspected by professional geotechnical engineer designated by Departmental Representative, as required.

.4 Shape bedding to fit footing or lower segment of culvert exterior, free from sags or high points.

.5 Place bedding on a firm, dry base, in lifts not exceeding 300 mm and compacted to a minimum of 100% of maximum dry density in accordance with ASTM D698.

3.4 PLACING CULVERT UNITS

.1 Begin at downstream end of culvert with first culvert section.

.2 Ensure leg of each unit is in contact with footing throughout its length.

.3 Use temporary measures to hold precast unit in place during installation.

.4 Supply and place non-shrink grout in the footing key way in accordance with manufacturer's instructions

.5 Connect precast units together in accordance with manufacturer's recommendations.

.6 Joints between units to be waterproofed.

.7 Do not allow water to flow through culvert during construction except as permitted by Departmental Representative.

3.5 WATERPROOFING

.1 All concrete surfaces shall be dry and free of foreign materials prior to priming.

.1 Any primed surfaces left overnight shall be re-primed prior to membrane application.

.2 The Contractor shall prepare the area and install the waterproofing system in accordance with the manufacturer's installation specifications and instructions.

.3 For all waterproofing applications, the following shall apply:

.1 The membrane shall be protected with the specified protection board, adhered to the waterproofed surface.

.2 Any protection board which is to be left exposed for more than 48 hours shall be protected from sunlight exposure in accordance with the manufacturer's instructions.

.3 All exposed edge terminations shall receive a trowelled bead of mastic.

.4 For precast rigid frame culverts:

.1 The membrane shall be applied in strips perpendicular to the long axis of the culvert.

.2 The protection board shall be applied over the top of the waterproofing system, on both the top and sides and adhered to the membrane by placing gobs of the mastic at 600mm centres between the two surfaces.

.3 Apply a neoprene strip over the joints once they are waterproofed to protect them from puncture when backfilled.

.4 The protection boards shall be butted tightly and shall be oriented vertically when coverage of the sides is specified and in all cases shall completely cover the applied waterproofing system.

3.6 BACKFILLING

.1 Backfilling: as specified in Section 31 23 33.01 – Excavating, Trenching and Backfilling.

3.7 RIP RAP AND ARMOUR STONE

.1 Provide hand placed rip rap and armour stone carefully around the culvert structure, as shown on the Drawings.

.2 Ensure backfilling procedure and temporary roadway locations are in accordance with design calculations.

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 REFERENCES

.1 American Association of State Highway and Transportation Officials (AASHTO)

.1 AASHTO M180, Standard Specification for Corrugated Sheet Steel Beams for Highway Guardrail.

.2 ASTM International

.1 ASTM A123/A123M-[09], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

.3 ASTM A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

.3 CSA International

.1 CAN/CSA O80 Series, Wood Preservation.

.2 CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CAN/CSA S136, North American Specification for the Design of Cold-formed Steel Structural Members.

.4 CSA W59, Welded Steel Construction (Metal Arc Welding).

.4 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber.

.5 American Wood Preservers' Association (AWPA)

1.2 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 guide rail, wood, and coatings and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit product name and manufacturer's specification for the preservative to be applied to the post field cuts and zinc-rich paint to repair minor damage to galvanized coating, and to coat cut ends and field drilled holes.

.3 Submit manufacturer's certification, for all galvanized metals, that the materials supplied meet the specified requirements.

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

.2 Store and protect guide rails from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.4 MEASUREMENT FOR PAYMENT

.1 See Section 01 29 00 – Payment Procedures.

Part 2 Products

2.1 MATERIALS

.1 Steel W-beam guide rail as indicated and as follows:

.1 Steel rail and terminal sections: manufactured from open hearth, electric furnace or basic oxygen semi-spring steel sheet and hot dip galvanized after fabrication.

.1 To AASHTO M180, class A Type 2 zinc coated.

.2 The steel beam shall be in accordance with the cross-section and dimensions as shown on the contract drawings.

.2 Rails shall be punched for splice and post bolts in strict conformity with the AASHTO Standard to the designated number and centre-to-centre spacing of posts. No punching, cutting or welding will be permitted on site.

.3 Bolts, nuts and washers: to ASTM A307, hot dip galvanized to CSA G164.

.4 If any guide rail installation requires curved W-beam rails, the Contractor shall form these to the radius specified by the Departmental Representative prior to galvanizing.

.5 Each beam element shall be identified by the following marking in accordance with AASHTO M 180:

.1 Name or brand of manufacturer,

.2 Identification symbols or code for heat,

.3 Number and coating lot,

.4 AASHTO specification number, and

.5 Class, type, and thickness

.6 The rails and terminal elements shall be manufactured according to the following standards:

.1 Mechanical properties of the base metal for the rails shall conform to the following requirements:

.1 Minimum Yield Point: 345 MPa

.2 Minimum Tensile Strength: 483 MPa

.3 Minimum Elongation: 12% in 50 mm length

.2 Sheet thickness shall be in accordance with Table 2 (Class A, Type 2) of AASHTO Standard M180 of the latest edition, with a nominal base metal thickness of 2.82 mm (2.59 mm minimum).

.7 Welding for the fabrication of terminal elements shall conform to the requirements of CSA-W59.

.2 Posts and Blocks as indicated and as follows:

.1 The acceptable species for guide rail posts and blocks shall be:

.1 Eastern hemlock

.2 Red Pine

.2 The posts shall be sound and rot-free, and shall conform with the requirements for No. 1 Structural Posts and Timbers, graded in accordance with the National Lumber Grading Authority (NLGA) Standard Grading Rules for Canadian Lumber. Posts and blocks shall be subject to inspection by the Departmental Representative when the bundles are opened immediately prior to use.

.3 The dimensions of eastern hemlock or red pine (softwood) guide rail posts shall be 200 x 200 x 2100 mm. Matching softwood blocks shall be 200 x 200 x 440 mm. The tops of wooden posts shall be cut as specified.

.4 Post delineators shall be supplied by the Contractor.

.5 Prior to pressure-treating, posts and blocks shall be incised on all four sides and dried to their fibre saturation point of 25 to 30% at 25 mm depth.

.6 For pressure treating, preservative treatment of posts and blocks shall be chromated copper arsenate (CCA). For field cut surfaces, preservative shall be 2% copper napthenate wood preservative, applied in two coats.

.7 Treatment shall be completed in accordance with requirements of CSA-080. The penetration and retention of preservatives shall conform to the requirements of CSA Standard O80.14, Table 1, Minimum Retention of Preservatives in Pressure Treated Wood for Highway Construction, under the headings “Post-Guardrail, Guide, Sign and Sight” for posts, and “Bridge Hand Rails, Guard Rails and Posts” (not in contact with ground or water). The Departmental Representative may verify the penetration and retention of the preservative by the assay method.

.3 Channel:

.1 The steel channel shall be manufactured to the cross-section and dimensions as shown on NSTIR Standard Drawing HS523. The channel shall be a cold-rolled steel section, manufactured from base metal with a minimum thickness of 3.8 mm and conforming to CAN/CSA S136 and providing at least 345 MPa yield strength. Sections shall be hot-dip galvanized according to CAN/CSA G164.

.1 If any guard rail installation requires curved channels, the Contractor shall form these to the radius specified by the Engineer prior to galvanizing.

.4 Bolts, Nuts and Washers:

.1 All bolts, nuts and washers shall conform to ASTM A307 and shall be hot dip galvanized conforming to CAN/CSA G164.

.5 Hot Dip Galvanizing:

.1 Hot dip galvanized coating shall be smooth, free of beading or sharp projections at edges. Coating adherence shall prevent the peeling of any portion of the zinc coating so as to expose the base metal by cutting or prying with a stout knife under considerable pressure (bond check). A magnetic gauge will be used for checking thickness, in accordance with ASTM E316.3.

.2 Warped or otherwise deformed rails and terminal elements will be rejected, as will those with injurious defects or excessive roughness of the zinc coating. When the rail is laid on a flat surface, the warpage shall not be greater than 50 mm.

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 guide rail 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 Prior to commencing work, the Departmental Representative shall locate in the field all proposed areas for installing new guide rail including special or curved installations. These locations shall be reviewed by the Contractor, with the Departmental Representative, to confirm locations and extents. The Contractor shall contact the Departmental Representative 24 hours prior to any work being done.

3.2 ERECTION

.1 Set posts by instrument for alignment, and locations as indicated and as directed by Departmental Representative.

.2 The Contractor shall erect steel guide rail in accordance with the following NSTIR Standard Drawings:

.1 HS518 Guard Rail and Post Details

.2 HS519 Guard Rail Post Details

.3 HS520 Steel Beam Guard Rail Buried End Treatment

.4 HS521 Roadside Barrier at Concrete Bridge Approach

.5 HS522 Michigan Shoe Detail

.6 HS523 Guardrail Channel Detail

.7 HS525 Guardrail Anchor Base on Concrete

.3 The W-beam railing shall be blocked out at posts in accordance with NSTIR Standard Drawing HS519.

.4 To maintain consistency throughout a project, only one size post and block shall be used on any one section of a contract. 200 x 200 x 440 mm blocks shall only be used with 200 x 200 x 2100 mm posts.

.5 Unsuitable material at the bottom of the holes excavated for guide rail shall be replaced with granular material, as directed by the Departmental Representative. The Contractor shall thoroughly compact the bottom of the hole. The guide rail posts shall rest directly and solidly on the bottom of the hole at the time of installation.

.6 Excavated material which is unsuitable for use as a backfill shall be substituted with granular material, as directed by the Departmental Representative. Backfill shall be thoroughly compacted, in layers not exceeding 150 mm, for the full depth of the excavation. For augured post installation, hand compaction of backfill in layers not exceeding 150 mm is acceptable.

.7 Care shall be taken during the transport, treatment and handling of posts and blocks to prevent damage. Any damage occurring to the posts and blocks prior to delivery and during delivery and installation shall be repaired to the satisfaction of the Departmental Representative and shall be considered as incidental to construction for the purpose of payment.

.8 No alterations to treated posts and blocks shall be permitted without the approval of the Departmental Representative. Blocks shall not be manufactured from posts. Any exposed cuts shall be treated with two coats of 2% copper napthenate wood preservative. Field applied wood preservative which comes in contact with any galvanized components shall be removed immediately.

.9 Guide rail and guide posts shall be installed plumb, and set according to alignment and grade, regardless of the material encountered, as shown on the drawings or as directed by the Departmental Representative. The rail elements shall be erected to produce a smooth continuous rail paralleling the line and grade of the highway surface as directed by the Departmental Representative. All rail elements shall be lapped in the direction of traffic.

.10 Standard W-beam rail sections shall not be modified to suit post locations; posts shall be located to match W-beam pre-punched bolt hole locations. If Contractor wishes to use two crews, on a given section, the crews shall work from the middle of the job outwards to avoid modifications of standard W-beam rail sections due to varying post spacings. Only at the approval of the Departmental Representative, can holes be drilled or cuts be made to W-beam rail sections. Holes and cut ends shall be treated with a zinc-rich paint that has been approved by the Departmental Representative. Bolts shall be tightened to a torque of 100 Nm.

.11 Two 50 mm x 75 mm delineators are required for each post. A white delineator shall be placed on the side of the post facing traffic; a yellow delineator shall be placed on the opposite side. The delineators shall be located at the edge of the post nearest the road, vertical, with the top 75 mm below the lowest point of the guide rail panel. The delineators shall be attached with galvanized nails.

.12 All damage to pavement, shoulders, ditches, slopes, lawns and any other surfaces and areas within or outside of the project limits, arising from the Contractor’s work, shall be repaired to the satisfaction of the Departmental Representative, within five working days, at the expense of the Contractor.

.13 Surplus excavated material and debris shall be removed from the site by the Contractor, at his expense.

.14 The guide rail shall be connected to new or existing bridge walls or parapets as shown on the Drawings.

.15 All end termination of guide rail installations shall be buried as shown on NSTIR Standard Drawing HS520 in these specifications, unless attached to structure with Michigan Shoe as indicated on Drawings, or otherwise directed by the Departmental Representative.

3.3 TOUCH UP

.1 The Contractor shall take all necessary precautions to eliminate damage to galvanizing.

.2 Galvanized steel-touch up:

.1 Cut ends, field drilled holes (permitted on bridge approach/departure elements only) and other areas where the galvanizing has minor damage shall be repaired with a minimum of two coats of zinc-rich paint according to ASTM A780, at no additional cost to the Contract. The coating thickness for the repair shall at least comply with the requirements of AASHTO M180 respecting hot dip galvanizing. Major abrasions shall be repaired by re-galvanizing. The method to be used for repair of any damage shall be approved by the Departmental Representative before such work is commenced. The Contractor, at his cost, shall carry out the repair or replace components to the satisfaction of the Departmental Representative.

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.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by guide rail installation.

END OF SECTION

Part 1 General

1.1 ENVIRONMENTAL REQUIREMENTS

.1 Operation of construction equipment in water is prohibited.

.2 Do not operate construction equipment in or adjacent to watercourses or wetlands.

.3 Do not alter or draw any water from a watercourse or wetland without first obtaining necessary permits or approvals.

.4 Do not use watercourse beds or banks or wetlands for borrow material.

.5 Do not dump excavated fill, waste material or debris in watercourses or wetlands.

.6 Design and construct temporary crossings to minimize erosion to watercourse or wetland. All temporary crossings must be pre-approved by Departmental Representative prior to construction.

.7 Do not skid logs or construction materials across watercourses or wetland.

.8 Avoid spawning beds when constructing temporary crossings of watercourses without obtaining written approval of the Departmental Representative.

.9 Underwater blasting within 100 m of indicated spawning beds is not permitted.

.10 Provide a buffer zone in combination with appropriate erosion and sedimentation control when working adjacent to watercourses and wetlands. Consult with regulatory agencies.

1.2 MEASUREMENT FOR PAYMENT

.1 The work for this Section will not be measured for payment, but will be incidental to the work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 EXISTING CONDITIONS

.1 Maintain existing flow pattern in natural watercourse and wetland systems.

.2 In natural systems maintain existing riffle pool and step pool patterns.

.3 In wetland systems, maintain existing hydrological conditions.

3.2 SITE CLEARING AND PLANT PROTECTION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties, according to requirements of authorities having jurisdiction and sediment and erosion control plan, specific to site, whichever is more stringent.

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

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

.2 Minimize disturbance to vegetated buffer zones and protect trees and plants on site and adjacent properties where indicated.

.3 Wrap trees and shrubs adjacent to construction work, storage areas and trucking lanes in burlap.

.4 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.

.1 Avoid unnecessary traffic, dumping and storage of materials over root zones.

.5 Leave cuttings from trees and other vegetation on site as brush piles to allow for natural degradation.

.1 Secure large piles with degradable materials to prevent interference with watercourse.

.6 Remove only trees that may offer future blockage problems as instructed by Departmental Representative.

.7 Leave roots mass and stumps in place.

.8 Maintain temporary erosion and pollution control features installed under this contract.

3.3 DRAINAGE AND PUMPING

.1 Pumping water containing suspended materials into watercourse or wetland is prohibited. Discharge location shall be minimum 30 metres from any watercourse or wetland unless pumped through a filter bag connected to the pump discharge.

.2 Establish rock chute spillways to accommodate safe surface water entry to watercourse or wetland as directed by Departmental Representative.

.3 Install drop pipe inlet system as instructed by Departmental Representative.

.4 All fish occupying a reach of watercourse to be dewatered or abandoned must be rescued and relocated out of harm’s way prior to any permanent or temporary dewatering operation in accordance with regulatory guidelines.

3.4 SITE RESTORATION

.1 Establish vegetated buffer zones with suitable vegetation to minimum 3 m along edge of watercourse banks as determined by Departmental Representative.

.2 Plant vegetation natural to area, suitable for application without requirement for fertilizers, pesticides and other chemicals.

.3 Control stream bank erosion in lower section of watercourse with irregular shaped rip rap underlain with non-toxic recycled content of size determined by Departmental Representative.

.4 Control stream bank erosion in upper section of watercourse by planting suitable vegetation as directed by Departmental Representative.

.1 Ensure planting occurs within 15 days after work on watercourse is complete.

END OF SECTION

APPENDIX A

Parks Canada National Best Management Practices
– Roadway, Highway, Parkway and Related Infrastructure

Parks Canada Parcs Canada

Parks Canada National Best Management Practices

Roadway, Highway, Parkway and Related Infrastructure

Canada

May 2015

Parks Canada National Best Management Practices for Roadway, Highway, Parkway and Related Infrastructure

Approved by

Original signed by Mike Wong

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Mike Wong, Executive Director Natural Resource Conservation Branch

Original signed by Kalvin Mercer

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Kalvin Mercer, Associate Vice-President Asset Management and Project Delivery

July 23, 2015

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Date

Contents

Introduction

The Parks Canada National Best Management Practices for Roadway, Highway, Parkway and Related Infrastructure will allow an identified suite of project activities to be undertaken in such a manner that there will not be resulting significant adverse environmental effects.

The Best Management Practice (BMP) pathway is applied when there is a suite of routine, repetitive projects (e.g. paving) or activities (e.g.de-watering), with well understood and predictable effects. This fulfils Park's Canada's obligations under the *Canadian Environmental Assessment Act 2012* as a manager of federal land, see the Guide to the Parks Canada EIA Process. The BMP maximizes efficiency through creation of a pre-approved impact assessment for the defined suite of projects, to which standard mitigation and environmental management measures can be applied.

The impact assessment officer (IAO) will review a proposed project and advise the functional manager of the project if and how this BMP should be applied. The IAO's advice will be based on whether the project falls within the scope of the BMP, and whether application of the mitigation measures in the BMP will adequately address potential adverse effects of the project.

Project Managers are responsible to ensure all mitigation measures applicable to the project are added to the terms and conditions of any permits or contracts issued for the project.

The Impact Assessment Officers must ensure the project, EIA pathway applied and determination are recorded in the Parks Canada National Impact Environmental Assessment Tracking System.

Scope of Application

This BMP outlines the impact assessment of repetitive and routine projects on roadways, highways and parkways. If a project involves some or all of below activities, and the initial assessment of site and project indicate "the project is unlikely to result in significant adverse environmental effects" the BMP can be applied. Projects that this BMP would likely be applied to include:

- The proposed maintenance or repair of an **existing** sidewalk, or parking lot.
- The proposed maintenance or repair of an **existing** road, including pull-off areas, that would be carried out on the existing right of way[1].

Activities included in the scope of this BMP are:

1. Project Design
2. General Activities
    - Worksite Conditions/Staging/Laydown
    - Equipment operations
    - Fuel storage and refueling

[1] Highway Footprint or Right of Way (ROW): The permanent physical intrusion of a highway or freeway, including the road surface, shoulders, side slopes, drainage ditches and/or storm drainage ponds (Transport Canada, 2008).

- Site Clean Up/Waste Disposal

3. Asphalt Production and Handling
    - Asphalt Plant Operation
    - Gravel Crushing and Washing
    - Oiling of Truck Boxes
    - Clean Up and Disposal of Waste Products
4. Concrete Handling
    - Operation, maintenance and inspection of Onsite Temporary Concrete Washout Facility
    - Removal of Temporary Concrete Washout Facilities
    - Onsite concrete management
5. Paving, Resurfacing and Grading
    - Grading
    - Paving and Resurfacing
    - Pavement Marking and Barrier and Guardrail Reinstatement
6. Barriers and Guardrails
    - Repair, replacement and upgrades of barriers and guardrails
7. Vegetation Removal
    - Vegetation Removal
    - Grubbing
    - Brushing
    - Disposal of Vegetation Debris
    - Integrated Pest Management
8. Excavation, Soil Stripping and Overburden Removal
    - Excavation
    - Soil Stripping
    - Topsoil Salvage
    - Excavated Material Storage
    - Excess Material and Waste (overburden removal)
9. Slope Stabilization, Drilling and Blasting
    - Slope stabilization-scaling, hydraulic hammers
    - Drilling and blasting for Slope Stabilization and Geotechnical Investigations
10. Soil and Vegetation Restoration
    - Topsoil Replacement
    - Soil Amendments
    - Seedbed Preparation
    - Species Selection
    - Seed Lot Selection
    - Seed Mixture Composition
    - Seeding
    - Alternatives to Seeding
    - Reclamation Standards
    - Reclamation Plot Evaluation
    - Time Limits

10. Drainage Structures
    - Drainage structures
    - Culverts
11. Bridge Maintenance
    - Bridge Cleaning
    - Bridge Repairs Using Treated Wood Products
    - Bridge and Structure Painting
12. Water Withdrawal and Dewatering
    - Water Withdrawal
    - Pump Screens
    - Dewatering

Exceptions

This BMP is not suitable for the following project activities as they would require supplemental assessment and/or mitigations:

- Work that may impact aquatic or terrestrial wildlife habitat connectivity, such as fences or culverts;
- Elongation of culverts; realigning water courses; dredging; or work below the high water mark of a fish bearing water body;
- Bridge projects needing work to occur below the High-Water Mark[1], with permanent; alteration to the water course, such as replacement of piers/abutments or permanent installation of structures on the bed of a water body;
- Greater than 10% increase in land use footprint (e.g. gravel pit expansion); and,
- Work which might adversely impact any potential or established Aboriginal and Treaty rights or traditional use[2].

If the project has the potential to have an adverse effect on the critical habitat of a species at risk (with endangered, threatened, or extirpated status) this BMP does NOT apply. The project will require a separate environmental impact analysis.

If the project has the potential for **residual** adverse effects on a listed species at risk (including effects to individuals and residence of the individuals) this BMP does NOT apply, the project will require a separate environmental impact analysis.

Note: If there is any uncertainty regarding potential adverse effects to species at risk, consult a member of the National Office Species Conservation team.

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[1] High-water Mark is the usual or average level to which a body of water rises at its highest point and remains for a sufficient time so as to leave a mark on the land. (Fisheries and Oceans, 2015). Upper Controlled Water Elevation (UCWE) is used as definition of High-water Mark in managed waterways.

[2] Parks Canada must engage in additional and separate consultations with Aboriginal groups if there is a possibility of a project adversely affecting established or potential Aboriginal or Treaty rights. This is required to fulfill federal government responsibilities in upholding the honour of the crown. If there is uncertainty regarding the need for Aboriginal consultation with respect to a project, refer the matter to Parks Canada Legal Services for advice. Guidance on consultation may be sought from the Aboriginal Affairs Secretariat and from the guidance document "A Handbook for Parks Canada Employees on Consultation with Aboriginal Peoples".

Approved geographic area of application

This BMP is intended for use in all Parks Canada administered protected heritage places with roadways, highways and parkways.

Components of the environment that may be affected

Potential effects from projects of this type are well understood and predictable. They include:

Water Resources:

- Adverse modifications to surface drainage patterns
- Reduced water quality due to increased erosion, sedimentation, transportation of debris and contamination (i.e. from leaks and accidental spills, etc.)

Soil/Land Resources:

- Change in slopes, landforms, and landscape
- Soil compaction and rutting
- Slope instability, due to increased soil exposure and improper excavation and storage
- Soil contamination

Air quality:

- Decreased ambient air quality (i.e. from dust, equipment emissions, etc.)
- Increased ambient noise levels
- Temporary increased levels of CO_2 and other pollutants
- Temporary increased localized temperatures from paving and equipment operation.

Flora and Fauna:

- Damage to and/or removal of vegetation in immediate or adjacent areas
- Introduction of non-native species populations, or expansion of existing populations
- Wildlife sensory disturbance causing displacement/preferred habitat avoidance
- Wildlife habituation/attraction to artificial food sources
- Impeded/altered wildlife movement
- Damage to nests/disruption of nesting animals
- Mortality from project activities

Cultural Resources:

- Adverse effects on the heritage value or character-defining elements of a cultural resource
- Impacts to archaeological resources (known or potential)

Mitigation Measures

To use the document efficiently, keep the activity mitigation lists that apply to the project expanded and collapse the other activities by clicking on the section titles, print this as a pdf or

paper document and include with the EIA determination record. This will reduce the overall size and scope of the mitigations to present to contractors and project managers.

Choose all that apply to project. Each title is hyperlinked to the related section.

Module	
1.	Project Design
2.	General Activities
3.	Asphalt Production and Handling
4.	Concrete Handling
5.	Paving, Resurfacing, Grading
6.	Barriers and Guardrails
7.	Vegetation Removal
8.	Excavations, Soil Stripping and Overburden Removal
9.	Slope Stabilization, Drilling and Blasting
10.	Soil and Vegetation Restoration
11.	Drainage Structures
12.	Bridge Maintenance
13.	Water Withdrawal and Dewatering

1. Project Design

When upgrades to infrastructure are planned opportunities to decrease the environmental impacts of long term operation should be considered in the engineering design. Some examples are: directing runoff into vegetated areas rather than directly into surface waters to decrease pollution in surface waters, increasing the span length of bridges during replacements to allow for terrestrial wildlife passage underneath and converting smaller culverts to larger culverts or clear span bridges to allow for better fish passage and less restricted flows.

2. General Activities Mitigations Module

Construction activities involve the use of laydown/staging areas, equipment operations, storage and handling of hazardous materials. Potential adverse effects include: destruction of vegetation, erosion and sedimentation, constriction for wildlife movements and introduction/spread of non-native vegetation.

Work Site Conditions/Staging/Laydown

2.1. All employees must attend a briefing with an Impact Assessment Officer (IAO) or Surveillance Officer (SO) before beginning work at the site review and explain the mitigations that are conditions of the project approvals.

2.2. Minimize vegetation-clearing activities and ground disturbance by staging on existing hardened areas wherever possible.

2.3. Avoid or terminate activities on site that attract or disturb wildlife. Vacate the area and stay away from the immediate location if wildlife display aggressive behaviour or persistent intrusion.

2.4. Control materials that might attract wildlife (e.g. petroleum products, human food and garbage).

2.5. Notify the SO immediately about dens, litters, nests, carcasses (road kills), wildlife activity or encounters on or around the site or crew accommodation. Other wildlife-related encounters are to be reported to SO within 24 hours.

2.6. Delineate the work zone; clearly mark the limits to active construction and the access and egress locations.

2.7. When work involves the disturbance of soils or the use of erodible materials (e.g. sands, topsoil), prevent the transport of sediment by the installing of appropriate erosion and sediment control.

2.8. An Erosion and Sedimentation Management Plan shall be prepared for the components of the work undertaken in proximity to watercourses, wetlands or riparian environments. If sediment ponds are required, they shall be designed to settle all sediment particles 0.02 mm or larger. The ponds shall also be designed to handle 1:5 year storm events, with overflow spill capacity for 1:10 year storm events and emergency spillway capacity for 1:100 year storm events. All components require regular maintenance to ensure effectiveness.

Equipment Operations

2.9. Equipment movements and workers' private vehicles shall be restricted to the 'footprint' of the construction area.

2.10. Ensure machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species, noxious weeds and soils from off-site.
2.11. Operate machinery on land above the high water mark, on ice, or in another manner that minimizes disturbance to the banks and bed of any water body.
2.12. Limit machinery crossing (fording) a stream or watercourse to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, construct a temporary crossing structure in compliance with the *Fisheries Act*.
2.13. For fording equipment without a temporary crossing structure, use stream bank and bed protection methods (e.g., swamp mats, pads) if minor rutting is likely to occur during fording.
2.14. Use temporary crossing structures or other practices to cross streams or water bodies with steep and highly erodible (e.g., dominated by organic materials and silts) banks and beds.

Fuel Storage and Refueling/Emergency Plans

2.15. A Spill Response Plan will be prepared and detail the containment and storage, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products in accordance with all applicable federal and provincial legislation. The Plan shall include a list of products and materials to be used or brought to the construction site that are considered or defined as hazardous or toxic to the environment. Such products include, but are not limited to, waterproofing agents, grout, cement, concrete finishing agents, hot poured rubber membrane materials, asphalt cement and sand blasting agents.
2.16. Spill kits shall be provided at re-fuelling, lubrication, and repair locations that are capable of dealing with 110% of the largest potential spill and shall be maintained in good working order. Site staff shall be informed of the location of the spill response kit(s) and be trained in its use.
2.17. If potentially hazardous materials (e.g. cement-based products, sealants or paints) are used on site ensure raw material, mixed compounds and wash water are not released to any watercourse or soils. Measures such as collection/drip trays and berms lined with occlusive material such as plastic and a layer of sand, and double-lined fuel tanks can prevent spills into the environment.
2.18. Hazardous or toxic products shall be stored no closer than 100 metres from streams, wetlands, water bodies or waterways.
2.19. Timely and effective action shall be taken to stop, contain and clean-up all spills as long as the site is safe to enter. The SO shall be notified immediately of any spill. In the event of a major spill, all other work shall be stopped and all personnel devoted to spill containment and clean-up.
2.20. The costs involved in a spill incident (the control, clean up, disposal of contaminants and site remediation to pre-spill conditions), shall be the responsibility of the proponent. The site will be inspected to ensure completion to the expected standard and to the satisfaction of Parks Canada.

Site Clean Up/Waste Disposal

2.21. Clean tools and equipment off-site to prevent the release of wash water that may contain deleterious substances.

2.22. Where possible, sweep up loose material or debris. Any material thought to pose a risk of contamination to soils, surface water or groundwater should be disposed of appropriately off-site.
2.23. Construction, trade, hazardous waste and domestic waste materials shall not be burned, buried or discarded at the construction site or elsewhere in Parks Canada protected heritage places. These wastes shall be contained and removed in a timely and approved manner and disposed at an appropriate waste landfill site located outside the Parks Canada protected heritage place. Construction waste storage containers, shall be emptied when 90% full. Waste containers will have lids, be wildlife proof if there attractants and waste loads shall be covered while being transported.
2.24. Sanitary facilities, such as a portable container toilet, shall be provided and maintained in a clean condition.

3. Asphalt Production and Handling Mitigations Module

Asphalt is a common building material for transportation infrastructure. Its production requires the use of gravel, water, and petroleum products, and associated project activities include transportation, storage and handling of these materials. Installation of asphalt plants is common within the larger parks where gravel extraction is undertaken.

Timing of Works

3.1. Asphalt works are preferably undertaken during periods of dry weather as this allows easier control of contaminated runoff and sediment.
3.2. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters, particularly for surface repair works requiring the application of patching and sealing compounds, tar, asphalt, and chemical surface sealants.

Operation of Asphalt Plants

3.3. Asphalt plant operation must comply with all environmental pollution control regulations, including provincial regulations, and the plant operational plan.
3.4. Spoil piles and stock piles will be at least 30 meters from the edge of any water body.
3.5. There must be enough room between the stockpiles and the asphalt plant for a loader in the event of a spill at the asphalt plant.
3.6. A containment berm with an associated liner made of occlusive material (e.g. plastic of a thickness approved by the SO) and covered with absorbent sand or clay shall be installed under the asphalt storage tank to ensure containment of 110% of the tank's capacity.
3.7. The proponent shall be responsible for the purchase and safe delivery/storage/handling of asphalt cement and emulsions to the asphalt plant site.
3.8. Excess hot mix or reject new asphalt shall be temporarily in stored in the containment area sufficient to prevent runoff of petroleum into soils or surface waters as directed by the SO, and removed from the Parks Canada protected heritage place, prior to project completion.

3.9. Every effort will be made to recycle waste asphalt, either as a base course, or by recycling waste asphalt through the asphalt plant according to engineering specifications.Old cured ground asphalt material shall be removed, recycled, or stored for future recycling at an approved operational gravel pit or asphalt plant site. Stockpiles must be further than 30 metres from any surface waters.
3.10. Remaining stockpiles will be removed or incorporated into reclamation plans for the gravel pits or asphalt plant sites.
3.11. Asphalt to be removed must be sampled and analyzed to determine possible lead contamination. Contaminated asphalt will be transported to an approved waste disposal facility. A receipt of delivery is to be provided to the SO.
3.12. Proponent should protect containment/catchment areas and drip trays at the asphalt plant from rainfall since, if contaminated, all of the collected water will require disposal of at an approved disposal facility at the expense of the Proponent.
3.13. Dyking and ponding will be required to control the rate and quality of runoff from the plant site.
3.14. Ensure that the water in the settling ponds remains clean of petroleum products. Any contaminated water will require disposal at an approved disposal facility at the expense of the Proponent.

Gravel Crushing and Washing

3.15. Where possible within engineering constraints, asphalt materials should be recycled to reduce the need for new gravel.
3.16. Gravel will be obtained from an approved operational borrow pit only. For gravel obtained from a borrow pit within a protected heritage place or borrow pit, gravel extraction within the footprint of the disturbed area of the approved operational borrow pit is permitted.
3.17. Gravel will not be crushed within 30 meters of any water body.
3.18. If water for cleaning is extracted from a watercourse, refer to water withdrawal section of this BMP.
3.19. If gravel requires washing, the water used will not be returned directly to any watercourse.
3.20. Water free from chemical contaminants will be discharged into ground where further erosion and runoff into surface water is prevented. Discharging into well vegetated ground surface, at a rate which prevents erosion can often provide increased absorption and reduction of sediment load.
3.21. Contaminated water must be treated to meet CCME guidelines or transported outside of the Parks Canada protected heritage place for disposal at an approved facility.
3.22. For waste removed from the park a detailed receipt of delivery to an approved facility will be provided to the SO.

Oiling of Truck Boxes

Trucks for hauling asphalt mixture shall have tight, clean, smooth metal beds that have been sprayed with a minimum amount of thin fuel oil to prevent the mixture from adhering and causing waste asphalt.

3.23. Truck boxes may be oiled only when absolutely necessary.

3.24. Oiling will take place in a bermed area, consisting of a plastic underlay with 15 centimetres overlay of clean gravel. Oil contaminated gravel will be hand collected (so as to prevent tearing of the plastic) from the bermed area daily, and put through the asphalt plant.
3.25. Vehicle covers shall be securely fastened.

Air Quality Mitigations

3.26. Asphalt plants should be 500 meters from buildings with human habitation.
3.27. Emissions from the asphalt plant and paving project equipment will comply with End Product Specifications (EPS) emission control standards and other provincial emissions regulations. Stack test results provided to the ESO by the operator or surveillance contractor may be required when the asphalt plant is at full capacity to ensure the plant is operating within the required standards. If the plant is not operating within the appropriate levels, production will cease until the requirements are met.
3.28. Sludge removed from the clarifier that is free of chemical contamination will be contained to prevent fine dust particles from becoming airborne during windy periods.
3.29. Unannounced stack tests will be conducted throughout the project. If the plant does not meet requirements, operation will cease until the requirements can be met.

Disposal and Clean Up of Other Waste Products

3.30. To ensure regular clean-up of waste asphalt and petroleum spills, a defined clean up schedule will be established during the preconstruction meeting.
3.31. Leaks will be collected in drip-trays, the collected material will either be removed from the park, or recycled back through the Asphalt Plant. For any material removed outside the park to an approved facility, a detailed receipt will be provided to the ESO.
3.32. Used oil, filters, grease cartridges, oil cans and other waste products of plant servicing will be collected and disposed of at the nearest industrial waste facility.

4. Concrete Handling Mitigations Module

Concrete is a common construction material used in transportation infrastructure. Its use ensures longevity of the infrastructure and safety for public use. One litre of concrete wash water or leachate in 1000L of water will kill fish. Cement-based products including grouts and concrete are lethal to fish and many other aquatic organisms. Raw product or leachate entering a watercourse will alter water chemistry, making it more basic or alkaline.

Onsite Temporary Concrete Washout Facility

4.1. Temporary concrete washout facilities shall be located a minimum of 30m from storm drain inlets, open drainage facilities, and watercourses.
4.2. Temporary concrete washout facilities shall be temporary pit or bermed areas constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
4.3. Straw bales, wood stakes, and sandbag materials can be used to construct temporary containment walls or “barriers”.

4.4. Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material.
4.5. The soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.
4.6. Perform washout of concrete mixer trucks in designated areas only.
4.7. Wash concrete from mixer truck chutes into approved concrete washout facility or collect in an impermeable bag for disposal.
4.8. Pump excess concrete in concrete pump bin back into concrete mixer truck.
4.9. Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed offsite.
4.10. Once concrete wastes are washed into the designated area and allowed to harden, the concrete shall be broken up, removed, and disposed of per federal and provincial regulations.

Maintenance and Inspection of Temporary Concrete Washout Facilities

4.11. Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100 mm (4 inches) for above grade facilities and 300 mm (12 inches) for below grade facilities.
4.12. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition.
4.13. Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
4.14. Temporary concrete washout facilities shall be inspected for damage (i.e. tears in PVC liner, missing sand bags, etc.).
4.15. Onsite concrete waste storage and disposal procedures should be monitored at least weekly or as directed by the ESO.

Removal of Temporary Concrete Washout Facilities

4.16. Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and restored.

Onsite Concrete Management

4.17. Rolling concrete mixers with surplus concrete in amounts less than one cubic metre of wet concrete may waste this concrete in the grade right-of-way as directed by the Parks Canada Representative in areas that drain well away from watercourses. Surplus amounts in excess of one cubic metre are to be returned to the batching yard.
4.18. Water contaminated in the placing of cement and curing of concrete shall be contained and removed from the site to an approved disposal facility.
4.19. The concrete batching plant must be operated pursuant to applicable dust, air emission, and water quality control regulations.

4.20. Waste, solidified concrete from rolling concrete mixers in amounts less than 1 cubic meter and waste solidified concrete from construction pour shall be buried in the grade within 48 hours of the pour, subject to approval and direction from the Departmental Representative

5. Paving, Resurfacing, Grading Mitigations Module

Highway surface management activities are undertaken to ensure public safety on Parks Canada Agency highways by maintaining clean, level, and unbroken road surface conditions through activities such as pavement cleaning, patching, application of surface treatments, and pavement crack sealing. Grading is used to address drainage issues, vegetation encroachment, potholes and rough surfaces.

Timing of Works

5.1. Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of contaminated runoff and sediment.

5.2. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters, particularly for surface repair works requiring the application of patching and sealing compounds, tar, asphalt, and chemical surface sealants.

Grading

5.3. During grade construction conducted close to any watercourse, water body or wetland ensure materials are not pushed, fall or are eroded into the water or wetlands.

5.4. No grade building shall occur outside of the delineated work area or within 1 metre of the drip line of existing forest. Any material inadvertently falling outside the work limits will be removed promptly in a manner that does not damage trees or vegetation.

5.5. Materials shall be placed at storage sites or on the grade without spillage outside the work limits. Any material inadvertently falling outside the work limits will be removed promptly in a manner that does not damage trees or vegetation.

5.6. Retain a 30 metre vegetated buffer around water bodies or install runoff management structures.

5.7. If possible grade roads early in the spring before vegetation develops seed heads or late in season after vegetation has set seed and is dormant to minimize non-native vegetation propagation.

5.8. Ensure gravel or road bed material is free of weeds and comes from an approved operational gravel source free of other contaminates.

Paving and Resurfacing

5.9. Minimize changes to the surface that could affect infiltration and runoff characteristics and maintain effective surface drainage to limit direct runoff into surface waters.

5.10. Minimize application of seal coats in wet conditions. Attempt to apply only to dry surfaces and not prior to (within 24 hrs.) or during rainfall. If unforeseen rain arrives ensure runoff from recently seal coated surfaces are prevented from entering surface waters.

5.11. For asphalt handling and management see the Asphalt Mitigation Module of the BMP.

Pavement Marking and Barrier and Guardrail Reinstatement

5.12. Minimize changes to the surface that could affect infiltration and runoff characteristics and maintain effective surface drainage to limit direct runoff into surface water Pavement marking shall be undertaken pursuant to standard methods applied in National Parks for control of paint products, both in transport and handling. The Contractor shall present a description of methods to be employed for transporting and controlling paint and hazardous products, application of paint, cleaning of equipment, containment and disposal of waste paint and cleaning products, etc. the satisfaction of the Parks Canada Representative.

5.13. Where concrete barriers or guard rails are temporarily removed, for highway improvements, temporary glow posts shall be installed, at 20.0 m intervals on straight sections and at 10.0 m intervals on curves and shall remain in place until permanent barrier system has been installed.

6. Barriers and Guardrails Mitigations Module

Repair, installation and upgrade of barriers and guardrails involves laydown/staging areas, equipment operations, minor excavation (e.g., for barrier post holes) and use of concrete. Potential adverse effects include destruction of vegetation and erosion and sedimentation.

Timing of Works

6.1. Where excavation is required, schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.

6.2. If the work schedule requires working in the rain, appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

Repairs, Replacement and Upgrades

6.3. An Erosion and Sedimentation Management Plan shall be prepared for the components of the work undertaken within 100m of watercourses, wetlands or riparian environments. If sediment ponds are required, they shall be designed to settle all sediment particles 0.02 mm or larger.

6.4. Where use of concrete is required for guardrail post holes, Concrete Handling Mitigations apply.

6.5. If vegetation removal is required for barrier or guardrail works, Vegetation Removal Mitigations apply.

6.6. Where concrete barriers or guardrails are temporarily removed, temporary glow posts shall be installed, at 20.0 m intervals on straight sections and at 10.0 m intervals on curves and shall remain in place until permanent barrier system has been installed.

7. Vegetation Removal Mitigations Module

Roadside vegetation management activities include mowing, brushing, and landscape maintenance activities undertaken to maintain clear sight lines for highway users, control noxious weeds, facilitate effective drainage, and reduce possible fire hazards. Mature timber

may need to be removed for improving road alignments, improving sight linesor replacing or repairing associated infrastructure. Grubbing (stump and root removal) may be required to prepare the ground surface for other activities.

Timing Windows

7.1. Vegetation clearing can negatively impact nesting birds and/or bats in spring and summer. Avoid all vegetation removal during this time. If vegetation removal is scheduled to occur within these times a qualified professional biologist/ecologist should further clarify the species presence and timing particular to the work site and any occupied bird nests, eggs, or nests of species protected under the Migratory Bird Convention Act (MBCA). See appendix on regulatory guidance for further detail on the MBCA and SARA.

7.2. If a nest is found during the pre-work surveys, the vegetated area will be left intact with a suitable sized buffer of shrubs/trees around it until the young have fledged and left the nest. Size of buffer species dependent, to be determined in consultation with professional biologist or park ecologist.

7.3. Grass mowing and trimming should not occur during peak spring or fall reptile/amphibian migrations and hatching. Consult a local biologist/ecologist for site and species specific timing windows.

Vegetation Removal Mitigations

7.4. Vegetation removal should be limited to the minimum Clear Zone Distance[1] dependent on type and size of road and maximum height needed to meet the road safety objectives.

7.5. Minimize full removal and retain vegetation when possible to reduce erosion.

7.6. Prior to the commencement of any vegetation removal, the worksite must be surveyed for species at risk. If species at risk are found, work must be stopped until site-specific mitigations to address potential adverse effects are developed.

7.7. Survey vegetation for non-native species, clear vegetation areas with non-native vegetation in spring and early summer to avoid further spread and development of the non-native seed bank.

7.8. Clearing activities shall be avoided during nesting seasons for birds, reptiles and amphibian species in the project area.

7.9. If wildlife is observed during work, if possible, give animals the opportunity to escape the work area to the surrounding forest or elsewhere to seek new shelter.

7.10. Avoid ground vegetation removal during dry, windy periods to prevent erosion of topsoil and reduction of air quality with dirt/dust.

7.11. Retain 30 metre vegetated buffer around water bodies, where disturbance is necessary and unavoidable restoration is required.

7.12. Debris will not be deposited in water bodies.

7.13. Ensure tree limbs/stumps are flush cut as close to the ground or stem as possible.

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[1] A clear zone is an unobstructed, traversable roadside area designed to enable a driver to stop safely or regain control of a vehicle that has accidentally left the roadway. The selection and design of appropriate clear zone dimensions is project-specific and should be the responsibility of professionals trained in roadside design.

7.14. Logs and other salvage materials are to be conveyed to and placed at a storage site without spread of debris or damage to other standing trees or landscape resources outside the marked clearing or storage limits. They shall not be skidded through wetlands, waterways or water bodies.
7.15. During the grubbing component, stumps, roots, imbedded logs and other non-soil debris shall be pulled and shaken free of loose soil and rocks before transport to a designated pit.

7.16. Where possible preserve identified wildlife trees by limbing or topping if they are not assessed as hazard trees.

Disposal of Vegetation Debris

7.17. All vegetation debris must be removed as soon as possible from the right-of-way, either by transporting off-site for disposal or piling and burning on-site.
7.18. All vegetation containing non-native species will be piled and burnt or bagged and removed off site to disposal facility.
7.19. Piles will be made where trees are felled, piles will be 1.2-1.8 (4 to 6 feet) in diameter and no more than 1.2 m (4 feet) high (approximately 1 to 3 trees per pile) or as instructed by local fire and vegetation specialists.
7.20. Piles are to be located so that they do not scorch surrounding live trees and measures must be in place to ensure that fires do not spread (i.e., conduct burning on snow or on mineral soil).
7.21. Piles will be left until fall for burning to allow for curing of green fuels.
7.22. Provincial regulations for air quality must be met.
7.23. Where fire fuel loading is not a concern vegetation debris of limited amounts will be dragged in the forest to mimic natural tree fall.
7.24. If removal or burning are not feasible a chipper may be used for less than 50 boles per hectare. Chip depth is to be a maximum of 5 cm (2 inches), spread over area no greater of 5m x 5m per hectare so as to not cover underlying vegetation, prevent new native seedlings from sprouting, and cause soil/seed bank sterilization. Spreading of chips may extend beyond these parameters with permission from Parks Canada.
7.25. To facilitate chipping of woody debris, all trees/shrubs/vines can be left temporarily along the road shoulders and laid facing the same direction.
7.26. In some cases, logs from newly cut trees may be set aside for use elsewhere as directed by local park site managers and the ESO.
7.27. Store removed vegetation on already disturbed areas to minimize disturbance area.
7.28. In appropriate areas re-establish native vegetation where it has been completely removed/damaged.

Integrated Pest Management

7.29. A Field Unit Integrated Pest Management Plan (IPMP) must be completed and approved prior to the use of herbicides to ensure the most effective and least harmful substances are properly used.

8. Excavations, Soil Stripping and Overburden Removal Mitigations Module

Construction projects often involve excavations. To successfully complete reclamation of disturbed areas, and protect areas from erosion proper soil handling and backfilling procedures must be followed. Post excavation and stripping soil and vegetation restoration mitigations should be applied. See section of this BMP for Soil and Vegetation Restoration.

Timing of Works

8.1. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.

8.2. If the work schedule requires working in the rain, appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

Excavation

8.3. Materials shall be placed at storage sites or on the grade without spillage outside the working limits. Any material inadvertently falling outside the work limits is to be removed promptly in a manner that does not damage trees or vegetation.

8.4. All sediment control measures must be in place before starting work in the vicinity of rivers, water bodies, watercourses, and wetlands.

8.5. Special precautions may have to be taken during excavation in the vicinity of intermittent or active drainage channels.

8.6. Excavation plans must be compared to local archaeological resource inventories, if available. If no archaeological information is available for the work area, an Archaeological Overview Assessment (AOA) may be required to determine the archaeological potential of the work area. Based on the results from the AOA, an Archaeological Impact Assessment might be required. It would be time and cost efficient to refer the plan to Parks Canada's Terrestrial Archaeology section before conducting any excavation to determine the appropriate course of action.

8.7. If cultural resources (eg. archaeological resources) are discovered, immediately cease work, and alert SO.

8.8. Minimize changes to the ground surface that affects its infiltration and runoff characteristics and maintain/re-establish effective surface drainage on completion of the project

8.9. Backfill and compact excavations as soon as possible. Optimize degree of compaction to minimize erosion and allow for re-vegetation.

8.10. All trenches or ditches left unattended overnight must be fenced or covered to prevent wildlife entrapment.

Soil Stripping

8.11. Strip topsoil under dry conditions, whenever possible.

8.12. No stripping shall occur outside of the delineated work area or within 1 metre of the drip line of existing forest.

8.13. In the event of a work program shutdown during inclement weather (e.g. winter conditions unfavourable for construction, heavy rain events, construction delays, etc.) erosion control of bared soils or excavated material stockpiles is required.
8.14. Stripping close to any watercourse, water body or wetland shall employ methods to ensure materials are not pushed, do not fall or erode into the water or wetlands.
8.15. Work within a 100 metre buffer from the high water mark of waterways or wetlands will require a site specific sediment and erosion control plan.
8.16. An erosion control plan is also needed to control dust generated from the construction site.

Topsoil Salvage

8.17. Salvage topsoil at all excavation sites for reclamation purposes.
8.18. Usually the upper 15 cm of soil, below the sod layer if present, is considered topsoil, where depths exceed 15cm salvage the entire depth of topsoil.
8.19. Remove stumps and woody debris from topsoil, wherever possible.

Excavated Material Storage

8.20. Allow space for separate storage of topsoil and spoil; where space is available separate stored topsoil from spoil by at least 1 m. Use appropriate material (e.g., geo-textile) to separate soil components where space is limited.
8.21. Topsoil may be stored on hardened surfaces, geo-textile material or directly on undisturbed vegetation. If storage occurs on vegetation, material recovery by hand may be required.
8.22. Cover all stockpiled material with heavy-duty plastic or filter cloth to prevent erosion during precipitation events.
8.23. Topsoil should be stockpiled on the uphill side of the disturbance on sloped terrain.
8.24. Construct barricades to prevent losses on steep terrain (>18°, 3:1) and within 100m of watercourses.

Excess Materials and Waste (Overburden Removal)

8.25. Remove excess excavated material from site where it cannot be used for the final grading of the area. Site specific arrangements must be made for disposal locations and procedures of overburden.
8.26. Surplus excavated material may be used to fill depressions around the project site providing topsoil is stripped before filling, with approval from SO.

9. Slope Stabilization, Drilling and Blasting Mitigations Module

Where standard excavation is not sufficient, scaling, hydraulic hammers, drilling units or trim blasting are used to break up rock or soil for removal. Accumulations of debris in ditches reduce their effectiveness at trapping rock fall and reduce public safety. Ditches will be cleaned using a loader and back hoe. Guardrails and rock fences may be temporarily removed to permit this activity.

Timing of Works

9.1. Time any vegetation removal work should adhere to the Migratory Bird windows for the area.
9.2. Time work to reduce impact to mammals, amphibians and reptiles using rock faces during sensitive life stages such as birthing and rearing of young. This often occurs during the spring. Confirm timing windows with local wildlife ecologists.
9.3. Avoid ditch clearing during wet periods and wait until ditches are dry to reduce impacts to amphibians and reptiles and limit sedimentation.

Slope Stabilization-Scaling, Hydraulic Hammers

The use of hydraulic hammers attached to excavators is considered the ideal solution for rock disintegration. It avoids rock blasting where the parent rock is no longer rippable by the excavator's bucket but still has enough planes of weakness for economical operation and effective use of the hydraulic hammer. Scaling is the manual removal of loose material on rock slopes using pry bars, hydraulic press, brooms, shovels and power equipment operated by personnel using roped access to a rock face.

9.4. For vegetation clearing refer to the vegetation removal mitigation module of this BMP.
9.5. For slope-stabilization in soils, please refer to the Excavation section.
9.6. Survey the work site for cultural resources such as rock art (ex. pictographs, petroglyphs, etc. prior to the work commencing, establish site specific mitigations for their protection.
9.7. Measures shall be taken to control dust as much as possible during the removal and falling of rock materials down slope.
9.8. Placement of rip rap and backfill on shorelines shall be undertaken without contacting the watercourse, wetted margins and must not be below the High Water Mark.
9.9. If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, then ensure that appropriately- sized, clean rock is used, and rock is installed at a similar slope to maintain a uniform bank.
9.10. Direct concentrated surface water (runoff) away from cut and fill slopes.
9.11. Immediately stabilize banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through vegetation restoration with native species suitable for the site-refer to soil and vegetation restoration section of BMP.

Drilling and Blasting for Slope Stabilization and Geotechnical Investigations

Trim blasting is used for controlled blasts in which explosive charges are placed in predetermined pattern of holes drilled into the rock face and then detonated. Potentially unstable masses of rock can sometimes be stabilized using rock bolts and long steel rods drilled into the rock to bind it together. Drilling is a common method of investigation to obtain geotechnical reports required for engineering design.

Drilling

9.12. Debris from drilling will be contained (screened or settle out) so it will not cover the surrounding area or enter any water course. All debris will be removed, see section on overburden removal for further mitigations.

9.13. The cuttings from all drilling will be contained so they can be removed entirely from the site. If contaminated, the cuttings are to be disposed at an approved waste disposal facility.

9.14. Control of spoil and sediment loaded water is required on the drill site. Dyking will be required to retain the deposit on non-vegetated surfaces. If contaminated, the spoil pile must be disposed at an approved waste disposal facility.

9.15. During aquifer tests, the water must be piped so it does not erode any soil or any part of the ground. If the water from the tests is piped to a creek, stream, or river, the pipe is to be situated so that there is no erosion of the stream bank or bed. If any sand or similar material is discharged during the aquifer test, care must be taken that the sand does not cover any vegetation.

9.16. All test wells will be filled in after the testing is completed. The proponent will be responsible for rectifying any future problems associated with any of the wells or test wells.

Blasting

9.17. The Parks Canada Representative will identify a magazine location for explosives should a factory site or "ready-to-use" explosives storage site be required

9.18. The blasting supervisor will ensure no damage to infrastructure, people, surrounding vegetation or wildlife by mitigating risk of fly rock.

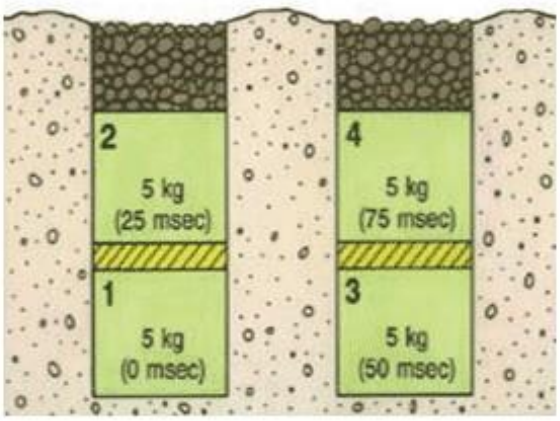
9.19. Avoid using explosives in or near water. Use of explosives in or near water produces shock waves that can damage a fish swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.

9.20. If explosives are required as part of a project (e.g., removal of structures such as piers, pilings, footings; removal of obstructions such as beaver dams; or preparation of a river or lake bottom for installation of a structure such as a bridge or culvert), the potential for impacts to fish and fish habitat will be minimized by implementing the following measures:

- Time in water work requiring the use of explosives to prevent disruption of vulnerable fish life stages, including eggs and larvae, by adhering to appropriate fisheries **timing windows**.
- Isolate the work site to exclude fish from within the blast area by using bubble/air curtains (i.e., a column of bubbled water extending from the substrate to the water surface as generated by forcing large volumes of air through a perforated pipe/hose), cofferdams or aquadams.
- Remove any fish trapped within the isolated area and release unharmed beyond the blast area prior to initiating blasting.
- Minimize blast charge weights used and subdivide each charge into a series of smaller charges in blast holes (i.e. Decking) with a minimum 25 millisecond (1/1000 seconds) delay between charge detonations (see Figure 1).

- Back-fill blast holes (stemmed) with sand or gravel to grade or to streambed/water interface to confine the blast.
- Place blasting mats over top of holes to minimize scattering of blast debris around the area.
- Do not use ammonium nitrate based explosives in or near water due to the production of toxic by-products. Remove all blasting debris and other associated equipment/products from the blast area.

Figure 1: Sample Blasting Arrangement



Per Fig. 1: 20 kg total weight of charge; 25 msecs delay between charges and blast holes and decking of charges within holes. (Fisheries and Oceans Canada, 2015)

10. Soil and Vegetation Restoration Mitigations Module

Almost all projects activities included in this BMP will require some ecological restoration- *the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed*. The restoration plan can be a simple application of the following mitigations and can be at the site or both at the site and in concert with another site designated to offset the permanent impact of a project. For disturbance areas greater than a hectare a restoration plan is required. The restoration works can be often be considered projects in and of themselves. Soil and vegetation restoration must apply the principles of effective, efficient and engaging solutions.

Timing Windows

10.1. Develop restoration plan as part of the project scoping and specifications prior to project approvals.

10.2. Vegetation restoration is most effective if seeded in the fall, this allows for full scarification of the seed over the winter and adequate moisture available. Spring and early summer will also work, consider using seed that requires shorter scarification times for these applications. Transplants will do best in the spring and summer and will require adequate watering.

Topsoil Replacement

10.3. Implement restoration plan for the disturbed area immediately following completion of construction.
10.4. Replace topsoil to all areas immediately following fine grading.
10.5. Do not compact topsoil.
10.6. Where insufficient topsoil is available imported soil may be used as a last resort. Imported topsoil must be certified completely free of non-native seeds and compost developed from sewage treatment plants. Methods of improving vegetation succession using locally sourced, weed and contaminant free materials are preferred.
10.7. Slopes to be seeded should be no steeper than 2 horizontal to 1 vertical (2:1) and covered with a minimum of 5 cm (2 inch) of topsoil. Finish grading should always follow top soil placement.
10.8. Where remaining soils are unstable due to steepness or soil characteristics, immediate installation of sod or erosion control blanket is required.
10.9. Methods of bioengineering such as terracing, willow staking, live pole drain systems should be assessed as solutions where soils are steeper or remain unstable.

Soil Amendments

Fertilizer Application

10.10. Avoid use of fertilizer to limit non-native vegetation growth and allow for local species to use available nutrients.
10.11. If needed use locally sourced mycorrhizae compost teas to improve vegetative success.

Topsoil substitute

10.12. Apply an organic cellulose only amendment as a soil substitute if reclamation standards are not being met within the defined time frame.
10.13. Determine the type of organic amendment based on the site-specific requirements (e.g., peat moss, compost).

Seedbed Preparation

10.14. The seedbed will be scarified by hand or, with the approval of the SO, by machine on large areas (i.e., roadbeds) where it is accessible and appropriate.
10.15. The seedbed will be scarified if seeding takes place more than 7 days after final grading or if there has been a rainfall between final grading and the seeding date.

10.16. The cleats of a tracked vehicle or a harrow device will be used, where possible, to prepare an adequate seedbed with seedling safe-sites (microsites) substantially free of soil crusts.

10.17. Align cleat marks at right angles on slopes to trap seed and sediment and reduce erosion.

Species Selection

10.18. When selecting species and varieties:

- Use species of local native plant communities.
- Species viability in proposed environment and climatic conditions.
- Capability to effectively control erosion, where required.
- Adaptation to the variable site conditions of undulating topography.
- Consider palatability of some species to herbivores and avoid growing attractants in areas of increased risk to wildlife and visitors.
- Variable life expectancy to produce variable, delayed die-out of seeded species and replacement with indigenous native plants.

Seed Lot Selection

10.19. Select seed lots based on indigenous species variety and quality (guaranteed weed seed free content and highest purity and germination), consult with vegetation restoration specialist or fire/vegetation ecologist.

10.20. Reject any seed lots containing any seed of undesirable crop or weed species.

Seed Mixture Composition

10.21. The proportion of each species should be calculated to provide an adequate quantity of pure live seed (PLS) per unit area of each key component.

10.22. Aim for density of about 140 seedlings/m^2 at the end of the first growing season to provide adequate ground cover and allow native species to re-colonize the site over time.

10.23. Consider that parameters such as seed lot purity, seed germination, seedling establishment, seed size and seeding method affect the final stand composition.

Seeding

10.24. Use approved native seed mixes developed for site-specific conditions for various elevations.

10.25. Seed and stabilize (e.g. mulch/tackifier) bare areas as soon as possible after disturbance, preferably as soon as a significant area is graded and finished and before the next rain event. If there is a risk of seedling mortality as a result of fall frost stabilize until appropriate growing conditions exist.

10.26. Use sod in high traffic areas or places that need extra erosion control. Source sod grown from native species (often called fescue sod) and ensure adequate anchoring and watering is in place.

10.27. Use temporary seeding when outside the seeding dates for permanent vegetation

10.28. Apply a seed mixture which is appropriate for the climate, soil, and drainage conditions of the site.

10.29. Apply seed at a rate appropriate to the seed mixture, seeding method and existing vegetation conditions.

10.30. Conduct broadcast seeding under calm wind conditions. Hydro-seeding is acceptable where access is available.
10.31. Do not exceed 30 kg/ha for the broadcast method, ensure seed is integrated with the soil by light rake or harrow. Broadcast method seeding rate is 25 kg/ha (2.5g/m^2) (e.g., 1x25 kg bag will cover 10,000m^2 or 1 hectare).
10.32. For hydro-seeding do not exceed 75 kg/ha with light mulch rates (500 kg/ha- of mulch with hydro-seeding) and 150 kg/ha with heavy mulch rates (1500 kg/ha of mulch with hydro-seeding).
10.33. Do not increase the seeding rate to compensate for poor seedbed conditions.
10.34. Monitor temporary erosion control measures to prevent seed loss.
10.35. Some seeding procedures may have to be completed or repeated in subsequent years.

Alternatives to Seeding

10.36. Use topsoil seed bank in small areas when there is no risk of erosion or competition from invasive species (i.e., natural regeneration).
10.37. Use native transplants in areas where conventional seeding applications are not applicable or where slope stability is an issue.
10.38. Use conventional forestry planting methods for container grown transplants, see website for guidance.

Reclamation Standards

10.39. Minimum standard for plant density is 25 plants/m^2, with 90% frequency.
10.40. Minimum standard for plant cover is 80% ground cover, with 90% frequency.
10.41. Minimum standard for plant community composition standard is 50% cover and 90% frequency of native species.
10.42. Exclude species designated as weeds in the work sites from the plant density standard consult local vegetation ecologist for current site specific non-native vegetation management program.
10.43. Rock, plant litter and non-vascular species are included in the cover standard.
10.44. Remaining plant cover of seeded native species is acceptable.

Reclamation Plot Evaluation

10.45. Select any site within reclamation area measuring 10 x 10 m, providing 100 plots of 1 square meter.
10.46. Measure the plant density, cover and composition in each of the 100 square meter plots.
10.47. The reclamation standard will have been met if 90 of the 100 plots match or exceed the criteria.
10.48. No fertilizer will be applied one year before the reclamation standard is evaluated.

Time Limits

10.49. Inspect site annually during the growing season.
10.50. Minimum reclamation standard, as above, to be met within one season post planting.
10.51. Apply amendments annually, depending on reclamation progress.

10.52. Re-seed site if the plant density standard is not expected to be achievable within 5 years.

- A new restoration plan will be prepared and implemented when reclamation standards have not been met after 5 years.

11. Drainage Structures Mitigations Module

Drainage structures on roadway, highway and parkways are structures such as culverts, ditches and drains. Drainage structure management activities are undertaken to ensure that surfaces are safe and efficiently drained, water is efficiently channeled to ditches and watercourses, and erosion of highways and adjacent properties is prevented. These mitigations include the cleaning and maintenance of drainage structures and related hardware, as well as the repair or replacement of existing and installation of new drainage structures.

Timing of Works

11.1. Time work in water to respect **timing windows** to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. Contact your local aquatics specialists and DFO offices for further information on **timing windows** in your region.

11.2. Conduct in-stream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.

11.3. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.

11.4. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

Drainage Structures

11.5. Isolate your work area from any flowing water that may be present. Ensure any flows are temporarily diverted around the portion of the ditch or watercourse where you are working.

11.6. Select appropriate equipment and work access routes to reduce damage to riparian vegetation and watercourse banks when using earth-moving equipment.

11.7. For smaller scale debris and sediment removal activities, remove materials by hand.

11.8. To assist with bank stability and invasive plant prevention, leave topsoil and root systems intact on channel banks surrounding your work area.

11.9. Ensure any works to repair damaged structures retain the pre-repair channel conditions (e.g., streambed profile, substrate, channel cross section) and do not constrict the stream width.

11.10. Maintain effective sediment and erosion control measures until complete re-vegetation of disturbed areas is achieved.

Culverts

If a proposed culvert crosses a stream where fish are present, the crossing should be designed or upgraded to provide fish passage and avoid interference with fish habitat. To mitigate the

impact of culverts on fish movement technical assessment of the water flows and fish species is required to establish a culvert design that will allow for passage of fish. Often there are regional or provincial best practices available online and qualified professionals can assist with designs. Some best management practices for installation or replacement of culverts follows.

Culvert Design and Alternatives

Utilize alternative crossing structures (e.g. clear span bridges, lock blocks and concrete decks) as a replacement for culverts, where possible.

11.11. Ideally, crossings should have natural streambed material through them to allow continuous substrate that matches the streambed below and above the crossing. Open bottom crossings are ideal for maintaining natural substrate.

11.12. Utilize a single large culvert design over a multiple culverts design (i.e. several smaller culverts) to reduce debris blockage and increased fish and wildlife passage, where hydrologically feasible

11.13. Design culvert bottoms to be placed at least 30cm below the stream bed elevation to ensure culverts remain passable by fish and wildlife by preventing culverts from becoming perched.

11.14. A minimum water depth of 200 mm should be provided throughout the culvert length. To maintain this water depth at low flow periods an entrance/downstream pool can be constructed. In some cases, an upstream pool may also be necessary.

11.15. The culvert slope should follow the existing streambed slope where possible.

11.16. The culvert, inlet(s) and outlet(s) should be adequately protected with rip-rap to prevent erosion and scour around the culvert during high runoff events. The following measures should be incorporated when using replacement rock to stabilize the culvert:

- Place appropriately-sized, clean rocks into the eroding bank area by hand or machinery operating outside the water course.
- Do not obtain rocks from below the ordinary high water mark of any water body.
- Where possible, install rock at a slope similar to the stream bank to maintain a uniform stream profile and natural stream alignment. Otherwise, install the rock at the closest slope required to ensure it is stable.
- Ensure rock does not interfere with fish passage or constrict the channel width.

11.17. Trash racks should not be used near the culvert inlet. Accumulated debris may lead to severely restricted fish passage and potential injuries to fish. Where trash racks cannot be avoided in culvert installations, they must only be installed above the water surface indicated by bank full flow. A minimum of 9 inches clear spacing should be provided between trash rack vertical members. If trash racks are used, a long term maintenance plan must be provided along with the design, to allow for timely clearing of debris.

11.18. Natural or artificial supplemental lighting should be considered in new or replacement culverts that are over 150 feet in length.

11.19. Ensure designs locate culvert structures in areas that minimize impacts to riparian vegetation and associated wildlife.

Culvert Installation

11.20. It may be necessary to exclude fish from the immediate construction site while a culvert is being installed. If this practice is necessary, fish shall be salvaged by a qualified aquatics professional from within the exclusion area.

11.21. If dewatering is required refer to the dewatering mitigation module of this BMP for appropriate mitigations.

11.22. Maintain effective sediment and erosion control measures until complete re-vegetation of disturbed areas is achieved.

11.23. Remove any old structures to a suitable upland disposal facility away from the riparian area and floodplain to avoid waste material from re-entering the watercourse

Wildlife Considerations for Culverts

At times, culverts are placed along portions of highways that bisect wetlands or specific habitats that support an abundance of wildlife. Consider building natural rock ledges through culverts to allow for small and medium-sized animals to walk on during periods of high flow.

12. Bridge Maintenance Mitigations Module

Bridge structure management activities include the cleaning and painting of bridge structures as well as the repair, rehabilitation, and replacement of bridge elements including decks, railings, abutments, and bearings. Works may include asphalt, concrete works, chipping, painting, grouting, timber truss, abutment and piling maintenance. These activities help ensure bridge structures remain structurally sound and safe for public use.

Timing of Works

12.1. Time work in water to respect **timing windows** to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. Contact your local aquatics ecologists, provincial jurisdictions and DFO offices for further information on **timing windows** in your region.

12.2. Conduct in-stream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.

12.3. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.

12.4. Cover or otherwise contain stockpiled materials during heavy rain events or extended absences.

12.5. If the work schedule requires working in the rain, the area of work must be isolated with appropriate sediment controls installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

Bridge Cleaning

12.6. Schedule bridge-cleaning activities to coincide with the watercourse's spring freshet when possible. At freshet or during periods of high flow a large watercourse will often have its highest background levels of sediment. At this time, the introduction of a small amount of sediment to a watercourse (from bridge cleaning) will have a lower risk of potential impact when considered against those high natural background levels.

12.7. If works are planned outside the freshet or if your region does not experience a freshet, discuss the protocol and timing of these works with your local aquatics ecologist and/or DFO Officer.

12.8. Dry sweep and collect loose material off bridge surfaces before washing the bridge. Adequately seal drains and any open joints on the bridge deck before sweeping or washing to prevent material or sediment-laden wash water from entering any watercourse

12.9. If dry sweeping and preventing direct runoff to waterway is not a feasible way to clean the surface, discussion and planning with local aquatic ecologists will be required.

12.10. Use water alone. If your cleaning activities require degreasers or any other chemical, approval for use must be obtained from local aquatics specialists and/or DFO.

12.11. Contain any wash water or runoff to the bridge deck. Direct wash water towards the bridge approaches and away from the watercourse, then to a vegetated area or contained settling area (e.g., dry ditch channel unconnected to a watercourse) where it can infiltrate.

12.12. If superstructure cleaning is undertaken above or on the bridge deck level, prevent potentially harmful materials from entering into road drains. Block deck drains with suitable barriers (e.g., polyethylene or drain blocks) to prevent direct discharge to a watercourse, or re-route runoff through temporary piping onto adjacent settling pond or structure, using a hydro vacuum would be another option.

12.13. If water for cleaning is extracted from a watercourse, refer to water withdrawal section of this BMP.

Repairs Using Treated Wood Products

12.14. Untreated wood products are recommended, if treated wood is to be used, ensure it has been treated with a wood preservative appropriate for the project. Refer to the *Parks Canada Guide for the Use, Handling and Disposal of Pressure Treated Wood 2009* and any further updates from Parks Canada Real Property – Environmental Management.

12.15. If treated timber must be cut to size, ensure cutting takes place away from the bridge and watercourse. Sawdust from treated wood is harmful to aquatic organisms and must be prevented from entering any watercourse.

12.16. Wood preservatives should be applied in a contained area and not be applied over or within 200m of water.

Bridge and Structure Painting

12.17. Ensure paint flakes, abrasive grits and abrasive/paint flake mixtures do not enter the watercourse as they may leach toxic heavy metals into receiving waters and/or be ingested by fish.

12.18. Install ground covers and/or vertical drapes such as sheets of plastic or air-permeable cloth (e.g., burlap or canvas) prior to removal activities to capture falling debris. Floating barges may be deployed in watercourses to capture falling debris, such as paint flakes and dust.

12.19. Waste materials collected during removal and application of protective coating operations (e.g., blasting abrasives, paint particles, rust and grease) should be

collected and retained for disposal at appropriate locations. Waste materials must not be deposited into watercourses or riparian areas.

12.20. Use hydro blasting or manual techniques, where possible, when removing road dirt, soluble salts and loose paint to minimize impacts to the watercourse.

12.21. Use water without cleaning agent additives if grease film removal is necessary.

12.22. Avoid use of toxic liquid paints, primers, solvents, degreasers and rust inhibitors.

12.23. Minimize spill potential by storing, mixing and transferring paints and solvents on land.

13. Water Withdrawal and Dewatering Mitigations Module

Construction often requires the use of water, many common methods of excavation and site isolation require dewatering. Temporary, short term water withdrawal provides an efficient uncontaminated water source for local project sites. Dewatering can allow sites to be effectively dry during construction, reducing the impact of sediment laden water entering fish bearing waters.

Timing Windows

13.1. As a general guide to prevent taking more water than aquatic system can support, limit total take of water to less than 5 successive days and less than 10 days in any period of 30 days.

13.2. Avoid water withdrawal during breeding seasons of amphibians and reptiles to avoid destruction of egg masses, consult local aquatics ecologist for site specific guidance.

Water Withdrawal

13.3. Water should not be withdrawn from a wetland or stream less than 5 metres wide at the surface or a lake less than one hectare in area.

13.4. Water withdrawal should follow the 10/90 rule which allows for up to 10% of the stream flow to be withdrawn, as long as the stream flow does not fall below the 90% exceedence flow (eg.1 in 10 chance in a given year).

13.5. No permanent or semi-permanent works for water withdrawal should be placed in the stream channel.

13.6. Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish, amphibians and/or reptiles. Entrainment occurs when a fish or amphibian is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish, reptile or amphibian is held in contact with the intake screen and is unable to free itself.

Pump Screens

13.7. In freshwater, fish-bearing waters design and installation of intake end-of-pipe fish screens:

- Locate screen in areas and depths of water with low concentrations of fish throughout the year away from natural or artificial structures that may attract fish that are migrating, spawning, or in rearing habitat.
- Orient the screen face in the same direction as the flow of water.
- Ensure openings in the guides and seals are less than the opening criteria to make “fish tight”.

- Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse to prevent entrainment of sediment and aquatic organisms associated with the bottom area.
- Provide structural support to the screen panels to prevent sagging and collapse of the screen. Large cylindrical and box type screens should have a manifold installed to ensure even water velocity distribution across the screen surface. The end of the structure should be made of solid materials and the end of the manifold capped.
- Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where debris loading (woody material, leaves, algae mats, etc.) is a concern. A 150 mm (6 in.) spacing between bars is typical.
- Provision should be made for the removal, inspection, and cleaning of screens.
- Ensure regular maintenance and repair of cleaning apparatus, seals, and screens to prevent debris fouling and impingement of fish.
- Pumps must be shut down when fish screens are removed for inspection and cleaning.

Dewatering

13.8. A site specific dewatering plan is required be provided before commencing a pump-out sump to dewater excavation sites with specific details on how and where the water will be discharge.

13.9. Site specific mitigations may be required depending on the conditions of the discharge area, freezing conditions operation, overflow avoidance, decanting and settlement pond reclamation.

13.10. Water containing suspended materials shall not be pumped into watercourses, drainage systems or on to land, except with the permission of the SO.

13.11. Soil and vegetation erosion protection is required for water pumped on to land.

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Appendix 1 Regulatory Guidance

Jurisdictions

While all projects on lands managed by Parks Canada must adhere to Federal law and regulation, it is considered best practice to refer to local community, regional, provincial regulation and best practices where federal guidance is silent and/or attempt to meet those targets if it can reduce the overall impact of the project.

Some of the project activities reviewed have potential environmental impacts that are addressed by various provincial, federal and territorial acts and regulations. All activities must meet current environmental law and regulations in their design and construction. The following is a brief description of some of the key federal acts and regulations. Further review, understanding and application of other federal, provincial and territorial environmental laws are part of a rigorous approach to project planning and execution.

Canada National Parks Act and Regulations-Parks Canada

All work inside National Parks and Protected Areas must be performed in accordance with the laws and regulations set out in the *Canada National Parks Act* and Regulations. This includes the requirement for most activities described to only be done under a permit such as: business licence for contractor, disturbance of natural objects, travel in restricted areas, special events or use of disposal sites.

Fisheries Act - Fisheries and Oceans Canada

If a project is to be conducted near water, it is the proponent's responsibility to ensure they avoid causing serious harm to fish in compliance with the *Fisheries Act*. The advice in on the Fisheries and Oceans website will help a proponent avoid causing harm and comply with the Act.

If the water body in the project area has fish or is connected to waters at any time that have fish the project must meet the self assessment criteria on the Fisheries and Oceans website, if not a project review can be made by Fisheries and Oceans Canada to assess whether the project requires authorization or authorization can be requested directly. Given the level of detail required for a review and/or authorization request the EIA officer may need to consider a more involved EIA pathway in those circumstances.

Migratory Bird Convention Act – Environment Canada

The purpose of this Act is to implement the Convention by protecting and conserving migratory birds - as populations and individual birds - and their nests. Section 6 - prohibits the disturbance, destruction, or taking of a nest, egg, or nest shelter of a migratory bird.

In Canada, the general nesting period may start as early as mid-March and may extend until end of August. This is a general nesting period that covers most federally protected migratory bird species. This period varies regionally across Canada mainly due to differences in species assemblages, climate, elevation and habitat type. Generally, the nesting period is delayed in more northerly latitudes, corresponding to vegetation development and food availability. (Environment Canada, 2014). To help with determining regionally relevant periods where

nesting is likely to occur, Environment Canada is publishing estimated regional nesting periods within large geographical areas across Canada referred as "nesting zones". These periods are estimated for each zone and consider the time of first egg-laying until the young have naturally left the vicinity of the nest. Field Units may wish to refine this section and add their known local nesting periods.

Species at Risk Act

If a species listed under the *Species at Risk Act* (SARA) is found within the project area, any potential adverse effects from the proposed project to the individuals of the species, their residences and/or their critical habitat must be understood. Species at risk considerations require specific expertise, due to additional legal requirements under the SARA and CEAA 2012. If the projects or activities to be addressed by the BMP could affect a listed species or its critical habitat, the EIA officer may need to consider a more involved EIA pathway in those circumstances.

APPENDIX B

Borehole Logs

151-06993

January 15, 2015

Steve Babstock, P.Eng.
Parks Canada
Cape Breton Highlands National Park
Ingonish Beach, NS
B0C 1L0

Re: Geotechnical Investigation – Factual Report
South Mountain Asphalt Rehabilitation, Cape Breton Highlands National Park, Nova Scotia

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1.0 Introduction

WSP Canada Inc. (WSP) has investigated subsurface conditions for pavement rehabilitation along the South Mountain section, of the Cape Breton Highlands National Park. The area of pavement was identified as a key area in need of repair.

The South Mountain section is located between km 51.0 and km 63.7, excluding km 55.3 to km 59.5 for a total distance of 8.5 km along the Cabot Trail between Effie's Brook Bridge and Neil's Harbour. This roadway was reconstructed in 1982 and paved in 1984. Severe centerline cracking has been experienced, attributed to paving the asphalt pavement in a single layer with a longitudinal cold joint along the centerline. Water entered the pavement structure through the centerline joint and caused pavement distress and unacceptable distortions, especially during spring frost conditions. Since that time, various repairs have been carried out to different sections of the roadway.

2.0 Methodology

Fieldwork for the subsurface investigation was carried out between July 23 and July 25, 2015 and consisted of drilling 53 boreholes (BH-21 to BH-37-1 and BH-S21 to BH-S36-1, including roadway and shoulder) at the approximate locations shown on the WSP RS4 Site Plan dated December 2015. The borehole investigation was carried out using a truck-mounted drill rig supplied by Logan Drilling. The boreholes were drilled in the asphalt roadway and gravel shoulder along the Cabot Trail, at locations shown in Appendix A. Boreholes in the asphalt roadway were re-instated with asphalt at the borehole surface, following completion of drilling.

The geotechnical field investigation was completed under the supervision of qualified WSP personnel. The boreholes were terminated at depths generally ranging from 1.5 to 3.0 metres below the asphalt surface. Soil samples were taken at select boreholes at 600 mm increments using a 50 mm outside diameter split-spoon sampler, driven in accordance with standard penetration resistance procedures (ASTM D1586 procedure). Grab samples were also taken off the augers. The N value, described as the number of blows required to drive the sampler 305 mm (1 ft) into the soil, was recorded at each sample location and are plotted on the borehole logs.

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Asphalt cores were also taken using a gas powered drill at select locations along the South Mountain.

Qualified engineering field personnel logged the subsurface conditions in the field. Borehole and asphalt coring locations were located in the field by handheld GPS and are shown on the WSP RS4 Site Plan dated December 2015. An explanation of the symbols and terms used in this report are enclosed in Appendix A. Borehole logs detailing the subsurface conditions are enclosed in Appendix B. A summary of asphalt core locations and conditions are provided in Appendix C.

3.0 Subsurface Conditions

In summary, asphalt pavement overlying base gravels, subbase gravels and subgrade fill deposits were encountered. At select boreholes, bedrock was encountered below the subgrade fill deposits. The fill materials generally consisted of a sand and gravel, with trace to some silt. The material was in a dry to moist condition and compact in relative density. The subgrade fill material was proven to a total depth of 3.0 metres at select boreholes.

3.1 Asphalt Pavement

The roadway surface consisted of asphalt pavement, ranging from 125 to 200-mm in thickness. A second layer of asphalt concrete was encountered below the base gravels in two boreholes (BH-21-1 and BH-29-1).

In addition to the boreholes, nine (9) core samples were taken of the asphalt to determine pavement condition and structure. Five (5) (Core C2, C4, C7, C8, C9) of the core samples were taken at locations where moderate to severe cracking was observed. A summary of asphalt core locations and conditions are provided in Appendix C attached.

3.2 Base Gravel s

Base gravels beneath the asphalt pavement ranged from 100 to 500-mm in thickness. The base gravels generally consisted sand and gravel, trace silt, was compact to dense in relative density, dry to moist and brown in colour

3.3 Subbase Gravels

Subbase gravels beneath the asphalt pavement ranged from 160 to 615-mm in thickness. The subbase gravels generally consisted sand and gravel, trace silt, was compact to dense in relative density, dry to moist and brown in colour.

3.4 Subgrade

The subgrade fill materials were proven to total depths ranging from 0.8 to 3.0 metres below the asphalt surface. The subgrade fill materials generally consisted of gravel and sand, trace to some silt, was compact to dense in relative density, moist to wet and brown in colour. Standard Penetration N-Values ranged from 4 to 84 blows per 305mm, indicating loose to very dense relative density (note: higher N-Values may be the result of cobble sized particles.) Detailed conditions are enclosed in the borehole logs in Appendix B.

4.0 Conclusion

This report has been prepared for the sole benefit of Parks Canada and is not intended for use by others. This report may not be reproduced without the prior written permission of WSP and Parks Canada. Contractors undertaking the work must draw their own interpretations of the factual investigation results provided in this report as it affects the construction costs, procedures and scheduling.

As boreholes are a localized representation of the total study area, subsurface conditions may vary between and beyond the borehole locations. If significant differences are encountered than reported, we should be notified immediately so that our interpretation and recommendations can be reviewed and revised if necessary.

We trust this report meets your present requirements. If you have any questions with the information in the report, please do not hesitate to contact us at your convenience.

Yours truly,

WSP Canada Inc.

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Encl

Appendix A

BOREHOLE LOG EXPLANATION FORM

BOREHOLE LOG EXPLANATION FORM

This explanatory section provides the background to assist in the use of the borehole logs. Each of the headings used on the borehole log, is briefly explained.

DEPTH

This column gives the depth of interpreted geologic contacts in metres below ground surface.

STRATIGRAPHIC DESCRIPTION

This column gives a description of the soil based on a tactile examination of the samples and/or laboratory test results. Each stratum is described according to the following classification and terminology.

Soil Classification*		Terminology	Proportion
Clay	<0.002 mm		
Silt	0.002 to 0.06 mm	"trace" (e.g. trace sand)	<10%
Sand	0.06 to 2 mm	"some" (e.g. some sand)	10% - 20%
Gravel	2 to 60 mm	adjective (e.g. sandy)	20% - 35%
Cobbles	60 to 200 mm	"and" (e.g. and sand)	35% - 50%
Boulders	>200 mm	noun (e.g. sand)	>50%

* Extension of MIT Classification system unless otherwise noted.

The use of the geologic term "till" implies that both disseminated coarser grained (sand, gravel, cobbles or boulders) particles and finer grained (silt and clay) particles may occur within the described matrix.

The compactness of cohesionless soils and the consistency of cohesive soils are defined by the following:

COHESIONLESS SOIL		COHESIVE SOIL	
Compactness	Standard Penetration Resistance "N", Blows / 0.3 m	Consistency	Standard Penetration Resistance "N", Blows / 0.3 m
Very Loose	0 to 4	Very Soft	0 to 2
Loose	4 to 10	Soft	2 to 4
Compact	10 to 30	Firm	4 to 8
Dense	30 to 50	Stiff	8 to 15
Very Dense	Over 50	Very Stiff	15 to 30
		Hard	Over 30

The moisture conditions of cohesionless and cohesive soils are defined as follows.

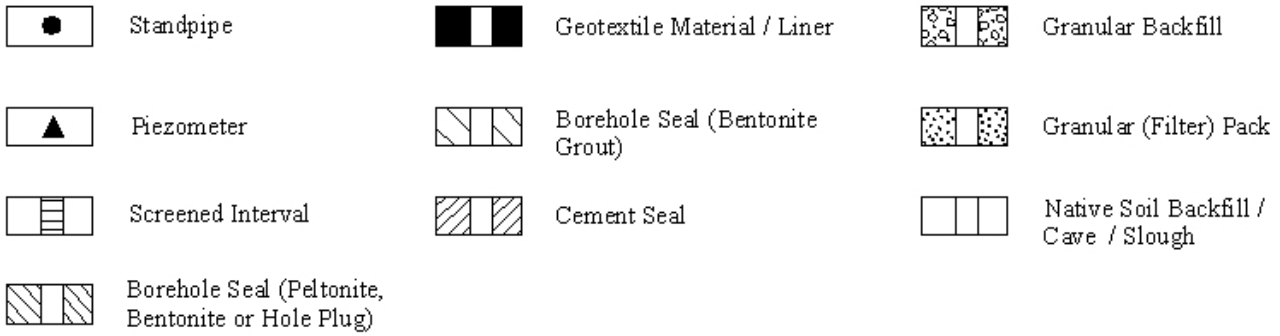
COHESIONLESS SOILS	COHESIVE SOILS		
Dry	DTPL	-	Drier Than Plastic Limit
Moist	APL	-	About Plastic Limit
Wet	WTPL	-	Wetter Than Plastic Limit
Saturated	MWTPL	-	Much Wetter Than Plastic Limit

STRATIGRAPHY

Symbols may be used to pictorially identify the interpreted stratigraphy of the soil and rock strata.

MONITOR DETAILS

This column shows the position and designation of standpipe and/or piezometer ground water monitors installed in the borehole. Also the water level may be shown for the date indicated.



Where monitors are placed in separate boreholes, these are shown individually in the "Monitor Details" column. Otherwise, monitors are in the same borehole. For further data regarding seals, screens, etc., the reader is referred to the summary of monitor details table.

SAMPLE

These columns describe the sample type and number, the "N" value, the water content, the percentage recovery, and Rock Quality Designation (RQD), of each sample obtained from the borehole where applicable. The information is recorded at the approximate depth at which the sample was obtained. The legend for sample type is explained below.

SS	=	Split Spoon	GS	=	Grab Sample
ST	=	Thin Walled Shelby Tube	CS	=	Channel Sample
AS	=	Auger Flight Sample	WS	=	Wash Sample
CC	=	Continuous Core	RC	=	Rock Core

$$\% \text{ Recovery} = \frac{\text{Length of Core Recovered Per Run}}{\text{Total Length of Run}} \times 100$$

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundness of the rock mass. It is obtained from the rock cores by summing the length of core recovered, counting only those pieces of sound core that are 100 mm or more in length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD Classification	RQD (%)
Very poor quality	< 25
Poor quality	25 - 50
Fair quality	50 - 75
Good quality	75 - 90
Excellent quality	90 - 100

TEST DATA

The central section of the log provides graphs which are used to plot selected field and laboratory test results at the depth at which they were carried out. The plotting scales are shown at the head of the column.

Dynamic Penetration Resistance - The number of blows required to advance a 51 mm diameter, 60º steel cone fitted to the end of 45 mm OD drill rods, 0.3 m into the subsoil. The cone is driven with a 63.5 kg hammer over a fall of 750 mm.

Standard Penetration Resistance - Standard Penetration Test (SPT) "N" Value - The number of blows required to advance a 51 mm diameter standard split-spoon sampler 300 mm into the subsoil, driven by means of a 63.5 kg hammer falling freely a distance of 750 mm. In cases where the split spoon does not penetrate 300 mm, the number of blows over the distance of actual penetration in millimetres is shown as $\frac{xBlows}{mm}$

Water Content - The ratio of the mass of water to the mass of oven-dry solids in the soil expressed as a percentage.

W_P - Plastic Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

W_L - Liquid Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

REMARKS

The last column describes pertinent drilling details, field observations and/or provides an indication of other field or laboratory tests that were performed.

Appendix B

SUMMARY TABLE AND BOREHOLE LOGS

151-06993 - Cabot Trail - Cape Breton - Pavement Rehabilitation

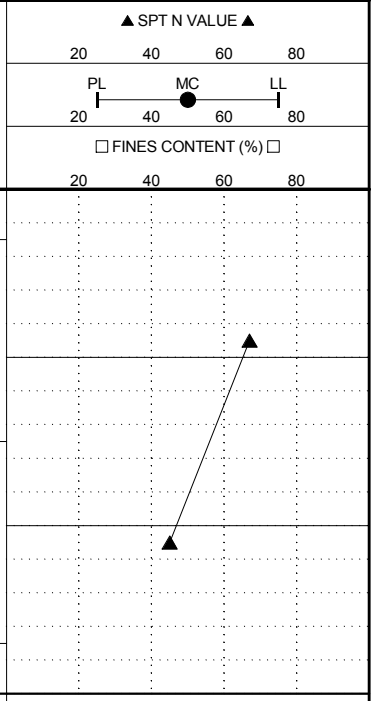
Borehole Drilling Summary - South Mountain

Borehole ID	Section	Station	Lane	Offset	Total Depth (m)	Depth to Groundwater (m)	Asphalt Thickness (mm)	Base Thickness (mm)	Sub Base Thickness (mm)	Comments
21	South - 1	51+036	WBL	1.95 m Left	1.5	-	150	200	200	
S21	South - 1	51+040	EBLS	5.10 m Right	1.5	-		100	300	
21-1	South - 1	51+340	WBL	2.00 m Left	3	-	150*	150	375	*2nd layer of Asphalt
21-2	South - 1	51+040	WBRTL	8.65 m Left	3	-	125	150	300	
21-3	South - 1	50+970	This borehole was not inside the project limits.							
22	South - 1	51+429	EBL	2.10 m Right	1.5	-	175	200	400	
S22	South - 1	51+429	EBLS	4.80 m Right	1.5	-		250	450	
23	South - 1	51+932	WBL	2.15 m Left	1.5	-	175	150	300	
S23	South - 1	51+933	WBL	2.35 m Left	1.5	-		250	350	
23-1	South - 1	52+187	EBL	2.10 m Right	3	-	150	150	350	
S23-1	South - 1	52+186	EBLS	4.80 m Right	1.5	-		300	300	
24	South - 1	52+418	EBL	2.3 m Right	1.5	-	150	150	300	
25	South - 1	52+912	WBL	1.90 m Left	0.825	-	125	150	300	Split Spoon Refusal
26	South - 1	53+412	EBL	2.30 m Right	1.5	-	150	150	300	
27	South - 1	53+916	WBL	2.50 m Left	1.5	-	175	150	300	
28	South - 1	54+408	EBL	2.15 m Right	1.5	-	160	165	275	
S28	South - 1	54+408	EBLS	5.35 m Right	1.5	-		250	350	
28-1	South - 1	54+473	WBL	2.10 m Left	3	-	190	150	160	
S28-1	South - 1	54+472	WBLS	5.00 m Left	1.5	-		200	400	
28-2	South - 1	54+582	WBL	2.20 m Left	3	-	190	150	250	
28-3	South - 1	54+264	EBL	1.75 m Right	3	-	175	150	275	
28-4	South - 1	54+267	EBL	2.90 m Right	3	-	150	150	300	
S28-4	South - 1	54+265	EBLS	5.80 m Right	1.5	-		200	300	
28-5	South - 1	53+883	WBL	2.05 m Left	3	0.2	150	150	300	
S28-5	South - 1	53+882	WBLS	4.20 m Left	1.5	-		250	350	
28-6	South - 1	53+883	EBL	2.20 m Right	3	-	150	150	250	
S28-6	South - 1	53+883	EBLS	4.80 m Right	1.5	-		200	400	
28-7	South - 1	53+863	WBL	1.70 m Left	1.05	-	175	150	300	Split Spoon Refusal
29	South - 1	54+902	WBL	2.00 m Left	1.5	-	200	175	300	
29-1	South - 1	55+178	WBL	1.85 m Left	3	-	160*	150	200	*2nd layer of Asphalt
29-2	South - 2	55+000	EBL	2.35 m Right	3	-	160	140	400	
S29-2	South - 2	54+999	EBLS	5.95 m Right	1.5	-		250	300	
29-3	South - 2	54+789	WBL	2.10 Left	3	-	125	150	300	
S29-3	South - 2	54+790	WBLS	4.90 m Left	1.5	-		300	300	
30	South - 2	59+513	EBL	1.95 m Right	1.5	-	160	160	300	
31	South - 2	60+049	WBL	2.20 m Left	1.5	-	160	140	300	
31-1	South - 2	60+110	EBL	1.60 m Right	3	-	135	150	615	
31-2	South - 2	59+776	EBL	2.50 m Right	3	-	150	225	300	
S31-2	South - 2	59+775	EBLS	5.15 m Right	1.5	-		300	450	
32	South - 2	60+491	EBL	2.00 m Right	1.5	-	150	175	575	
32-1	South - 2	60+766	WBL	2.05 m Left	3	-	150	150	200	
32-2	South - 2	60+623	EBL	1.95 m Right	3	0.3	115	135	250	
S32-2	South - 2	60+624	EBLS	4.95 m Right	1.5	0.6		500	250	
32-3	South - 2	60+453	WBL	1.90 m Left	3	-	150	150	375	
S32-3	South - 2	60+452	WBL	4.70 m Left	1.5	-		375	250	
33	South - 2	60+994	WBL	1.75 m Left	1.5	-	125	250	300	
33-1	South - 2	61+168	WBL	2.50 m Left	3	-	100	150	300	
34	South - 2	61+493	EBL	1.90 m Right	1.5	-	175	200	375	
S34	South - 2	61+491	EBL	4.80 m Right	1.5	-		300	250	
35	South - 2	61+971	WBL	2.55 m Left	1.5	-	200	250	450	
36	South - 2	62+491	EBL	1.70 m Right	1.5	-	150	200	250	
36-1	South - 2	62+417	EBL	2.50 m Right	3	-	125	250	375	
S36-1	South - 2	62+415	EBLS	4.50 m Right	1.5	-		200	300	
37	South - 2	63+000	This borehole was not inside the project limits.							
37-1	South - 2	62+947	WBL	2.35 m Left	3	-	175	250	200	
38	South - 2	63+500	This borehole was not inside the project limits.							

BORING NUMBER BH 21

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 4.85 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 51+036
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		4.85	Aspahlt (150 mm in thickness)				
		4.7	Type 1 (Base): Gravelly Sand, some silt, trace clay, Very Dense, moist, brown (approximately 200 mm in thickness)				
0.5		4.5	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, Very Dense, moist, brown and pink (approximately 200 mm in thickness)		SS 1	22-30-37-31 (67)	92
1.0		4.1	Fill (Subgrade): Gravelly Sand, some silt, trace clay, Compact to Dense, moist, brown and pink		SS 2	45-30-15-20 (45)	100
1.5		3.35	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				
2.0							
2.5							
3.0							
3.5							
4.0							



GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 21-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 18.54 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 51+340
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		18.54	Asphalt (150 mm in thickness)					
		18.39	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 25 mm in thickness)					
		18.365			AU 1			
		18.315	Asphalt (50 mm in thickness)					
		18.165	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)					
0.5			Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 375 mm in thickness)		AU 2			
		17.79	Fill (Subgrade): Sand, some gravel, some silt, trace clay, moist to wet, brown					
1.0					AU 3			
1.5								
2.0								
2.5								
		15.84	Refusal at 2.7 meters below ground surface.					
3.0			Groundwater was not observed at time of investigation.					
			*Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 21-2

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 4.44 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 51+040
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		4.44	Asphalt (125 mm in thickness)					
		4.315	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)		AU 1			
0.5		4.165	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)		AU 2			
1.0		3.865	Fill (Subgrade): Gravelly Sand, some silt, trace clay, trace mica, moist, brown		AU 3			
1.5		2.94	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 22

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 20.72 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 51+429
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
		20.72	Asphalt (175 mm in thickness)					
		20.545	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 200 mm in thickness)		AU 1			
0.5		20.37	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 400 mm in thickness)		AU 2			
1.0		19.97	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown					
1.5		19.22	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 23

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 43.22 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 51+932
AFTER DRILLING ---

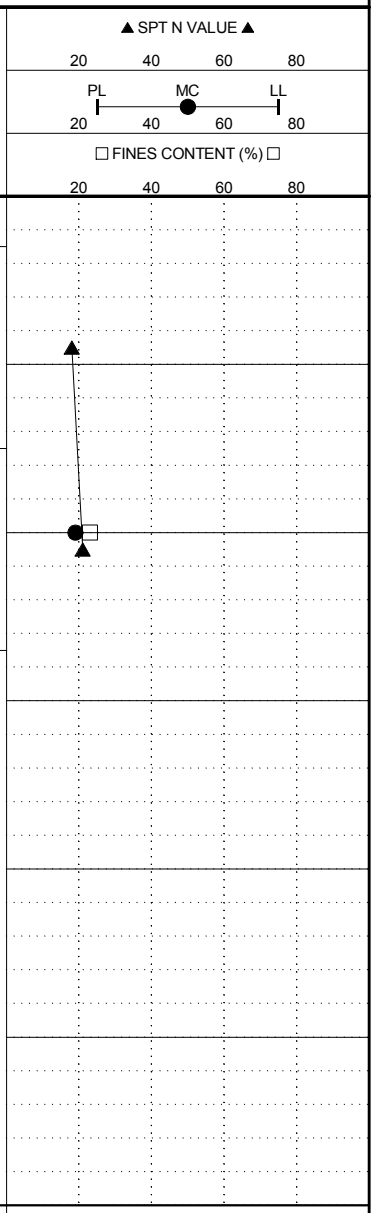
DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		43.22	Asphalt (175 mm in thickness)					
		43.045	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)		AU 1			
0.5		42.895	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)		AU 2			
1.0		42.595	Fill (Subgrade): Sand, some gravel, trace silt, trace clay, moist to wet, brown		AU 3			
1.5		41.72	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 23-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 60.25 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 52+187
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		60.25	Asphalt (150 mm in thickness)				
		60.1	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)				
0.5		59.95	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 350 mm in thickness)		SS 1	7-8-10-10 (18)	67
1.0		59.6	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist to wet, brown		SS 2	13-11-10-9 (21)	75
1.5							
2.0							
2.5							
3.0		57.25	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				
3.5							
4.0							



GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 24

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 74.96 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 52+418
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
		74.96	Asphalt (150 mm in thickness)					
		74.81	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)		AU 1			
0.5		74.66	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)		AU 2			
1.0		74.36	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown		AU 3			
1.5		73.46	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 25

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 117.84 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 52+912
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		117.84	Asphalt (125 mm in thickness)					
		117.715	Type 1 (Base): Gravelly Sand, some silt, trace clay, brown (approximately 150 mm in thickness)					
		117.565	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)		SS 1	12-11-13-8 (24)	67	
0.5		117.265	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown		SS 2	6-50/-0.05	100	>>
		117.015	Split spoon refusal at 0.825 meters below ground surface - Possible Bedrock or Boulder					
1.0			Groundwater was not observed at time of investigation.					
			*Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
1.5								
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 26

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 119.13 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 53+412
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		119.13	Asphalt (150 mm in thickness)					
		118.98	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)		AU 1			
0.5		118.83	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)		AU 2			
1.0		118.53	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown		AU 3			
1.5		117.63	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 27

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 141.73 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 53+916
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
		141.73	Asphalt (175 mm in thickness)					
		141.555	Type 1 (Base): Gravelly Sand, some silt, trace clay, Compact to Dense, moist, brown (approximately 150 mm in thickness)		AU 1			
0.5		141.405	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, Dense, moist, pink (approximately 300 mm in thickness)		AU 2			
1.0		141.105	Fill (Subgrade): Gravelly Sand, some silt, trace clay, Compact, moist, brown		AU 3			
1.5		140.23	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 28

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 177.26 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+408
AFTER DRILLING ---

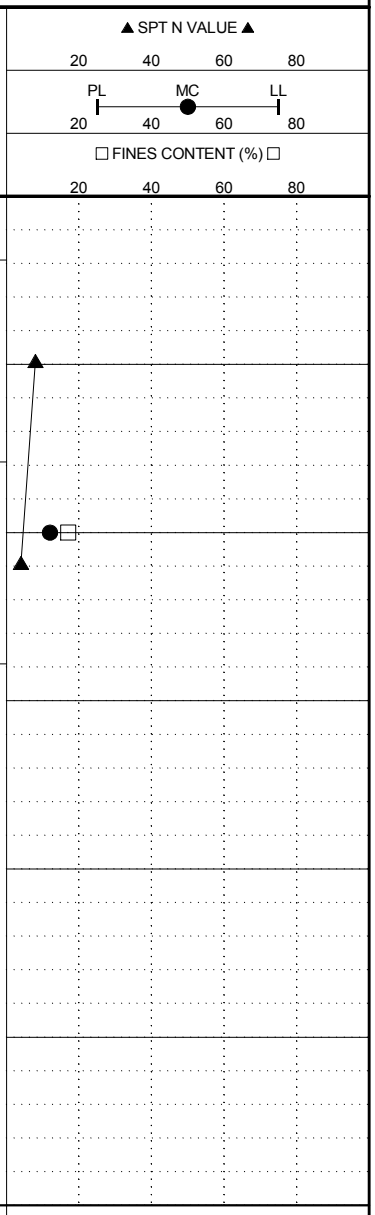
DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		177.26	Asphalt (160 mm in thickness)					
		177.1	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 165 mm in thickness)		AU 1			
0.5		176.935	Type 2 (Sub base): Sand, some gravel, some silt, trace clay, moist, brown (approximately 275 mm in thickness)		AU 2			
1.0		176.66	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown		AU 3			
1.5		175.76	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 28-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 181.57 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+473
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		181.57	Asphalt (190 mm in thickness)				
		181.38	Type 1 (Base): Gravelly Sand, some silt, trace clay, Compact, moist, brown (approximately 150 mm in thickness)				
		181.23	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, Loose, moist, brown (approximately 160 mm in thickness)				
0.5		181.07	Fill (Subgrade): Sand, some silt, trace gravel and clay, Very Loose, moist to wet, brown		SS 1	7-4-4-3 (8)	50
1.0					SS 2	1-1-3-3 (4)	50
1.5							
2.0							
2.5							
3.0		178.57	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				
3.5							
4.0							



GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 28-2

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 185.77 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+582
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		185.77	Asphalt (190 mm in thickness)					
		185.57	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)		AU 1			
0.5		185.42	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown and grey (approximately 250 mm in thickness)		AU 2			
1.0		185.17	Fill (Subgrade): Gravelly Sand, some silt, trace clay, wet, brown		AU 3			
1.5								
2.0								
2.5								
3.0		182.77	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 28-3

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 160.91 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+264
AFTER DRILLING ---

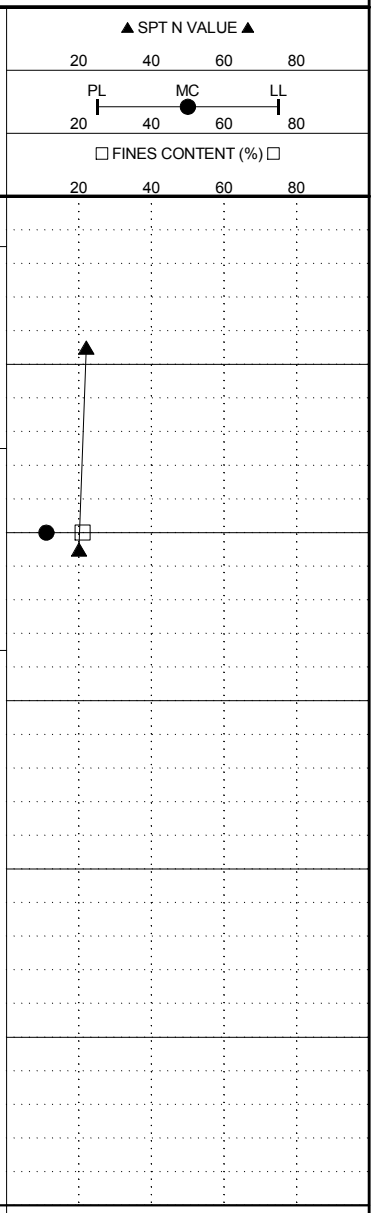
DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		160.91	Asphalt (175 mm in thickness)					
		160.735	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)		AU 1			
0.5		160.585	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 275 mm in thickness)		AU 2			
1.0		160.31	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown					
1.5								
2.0								
2.5								
3.0		157.91	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 28-4

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 160.87 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+267
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		160.87	Asphalt (150 mm in thickness)				
		160.72	Type 1 (Base): Gravelly Sand, some silt, trace clay, Compact, moist, brown (approximately 150 mm in thickness)				
		160.57	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, Compact, moist, brown (approximately 300 mm in thickness)		SS 1	9-11-11-8 (22)	92
0.5		160.27	Fill (Subgrade): Sand, some gravel, some silt, trace clay, Loose to Dense, moist, brown				
1.0					SS 2	5-5-15-29 (20)	50
1.5							
2.0							
2.5							
3.0		157.87	End of borehole at 3.0 meters below ground surface.				
3.5			Groundwater was not observed at time of investigation.				
4.0			*Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				



GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 28-5

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 141.29 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING 0.20 m / Elev 141.09 m
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 53+883
AFTER DRILLING ---

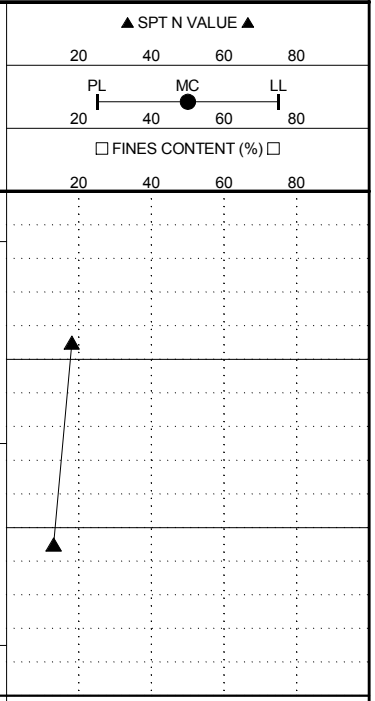
DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
		141.29	Asphalt (150 mm in thickness)					
		141.14	Type 1 (Base): Gravelly Sand, some silt, trace clay, saturated, brown (approximately 150 mm in thickness)	▽				
0.5		140.99	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, saturated, brown (approximately 300 mm in thickness)					
1.0		140.69	Fill (Subgrade): Gravelly Sand, some silt, trace clay, saturated, brown					
1.5		139.79	Refusal at 1.5 meters below ground surface. Groundwater was observed at 0.2 meters below ground surface at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 28-6

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 139.46 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 53+883
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		139.46	Asphalt (150 mm in thickness)				
		139.31	Type 1 (Base): Gravelly Sand, some silt, trace clay, Compact, moist, brown (approximately 150 mm in thickness)				
		139.16	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, Compact, moist, brown (approximately 250 mm in thickness)		SS 1	11-8-10-10 (18)	67
0.5		138.91	Fill (Subgrade): Gravelly Sand, some silt, trace clay, Loose to Compact, moist to wet, brown				
1.0					SS 2	5-5-8-12 (13)	33
1.5		137.96	Refusal at 1.5 meters below ground surface Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				
2.0							
2.5							
3.0							
3.5							
4.0							



GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 28-7

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 138.8 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 53+863
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		138.8	Asphalt (175 mm in thickness)					
		138.625	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)					
0.5		138.475	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)					
1.0		138.175	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown					
1.5		137.75	Split spoon refusal at 1.05 meters below ground surface - Possible Bedrock or Boulder Groundwater not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 29

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 199.23 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+902
AFTER DRILLING ---

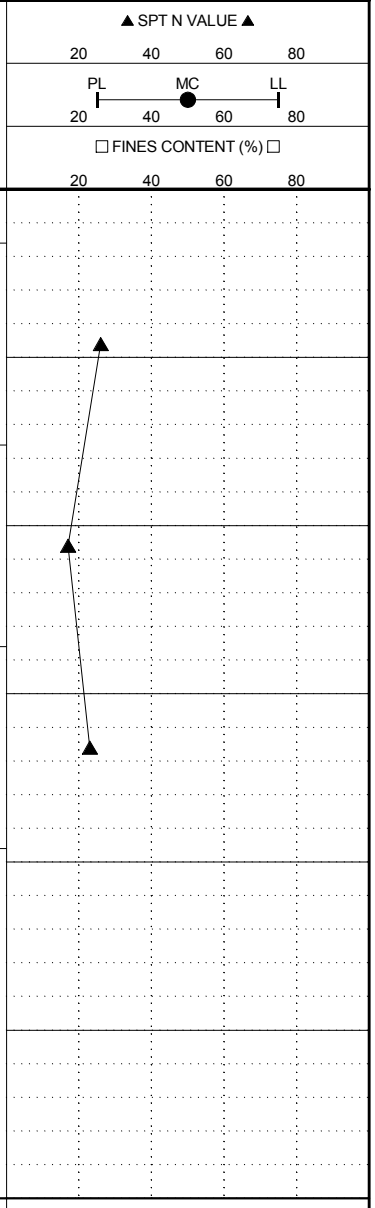
DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
		199.23	Asphalt (200 mm in thickness)					
		199.03	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 175 mm in thickness)		AU 1			
0.5		198.855	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)		AU 2			
1.0		198.555	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown		AU 3			
1.5		197.73	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 29-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 214.34 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 55+178
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		214.34	Asphalt (160 mm in thickness)				
		214.18	Type 1 (Base): Gravelly Sand, some silt, trace clay, Compact, moist (approximately 150 mm in thickness)				
		214.03	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, Compact, moist, pink (approximately 115 mm in thickness)				
0.5		213.915	Asphalt (50 mm in thickness)		SS 1	9-13-13-14 (26)	92
		213.84	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, Compact, moist, pink (approximately 200 mm in thickness)				
		213.64	Fill (Subgrade): Gravelly Sand, some silt, trace clay, Compact, moist, brown				
1.0					SS 2	11-7-10-10 (17)	50
1.5					SS 3	8-10-13-9 (23)	100
2.0							
2.5							
3.0		211.34	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				
3.5							
4.0							

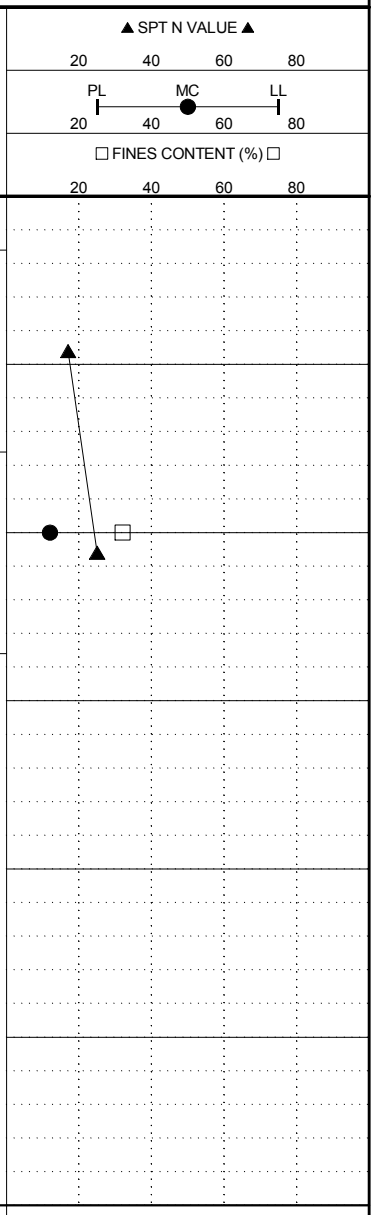


GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 29-2

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 205.78 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 55+000
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		205.78	Asphalt (160 mm in thickness)				
		205.62	Type 1 (Base): Gravelly Sand, some silt, trace clay, Compact, moist, brown (approximately 140 mm in thickness)				
0.5		205.48	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, Compact, moist, brown (approximately 400 mm in thickness)		SS 1	7-11-6-4 (17)	67
1.0		205.08	Fill (Subgrade): Silty Sand, some gravel, trace clay, moist, brown		SS 2	7-11-14-8 (25)	58
1.5							
2.0							
2.5							
3.0		202.78	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				
3.5							
4.0							



GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 29-3

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 195.44 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+789
AFTER DRILLING ---

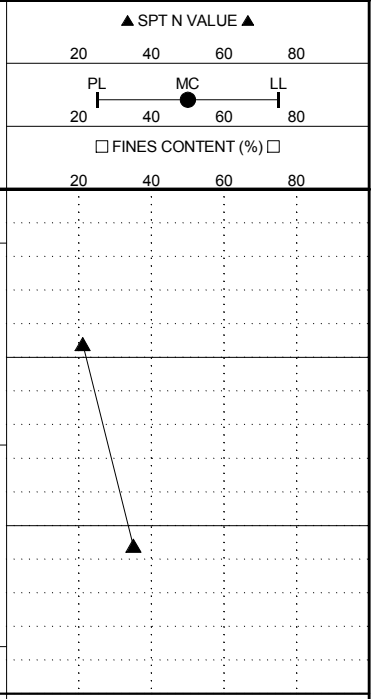
DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		195.44	Asphalt (125 mm in thickness)					
		195.315	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)		AU 1			
0.5		195.165	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)					
1.0		194.865	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown		AU 2			
1.5								
2.0								
2.5								
3.0		192.44	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 30

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 110.72 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 59+513
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		110.72	Asphalt (160 mm in thickness)				
		110.58	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 160 mm in thickness)				
0.5		110.42	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)		SS 1	10-11-10-10 (21)	83
1.0		110.12	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown		SS 2	12-14-21-30 (35)	92
1.5		109.22	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				
2.0							
2.5							
3.0							
3.5							
4.0							



GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 31

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 90.08 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 60+049
AFTER DRILLING ---

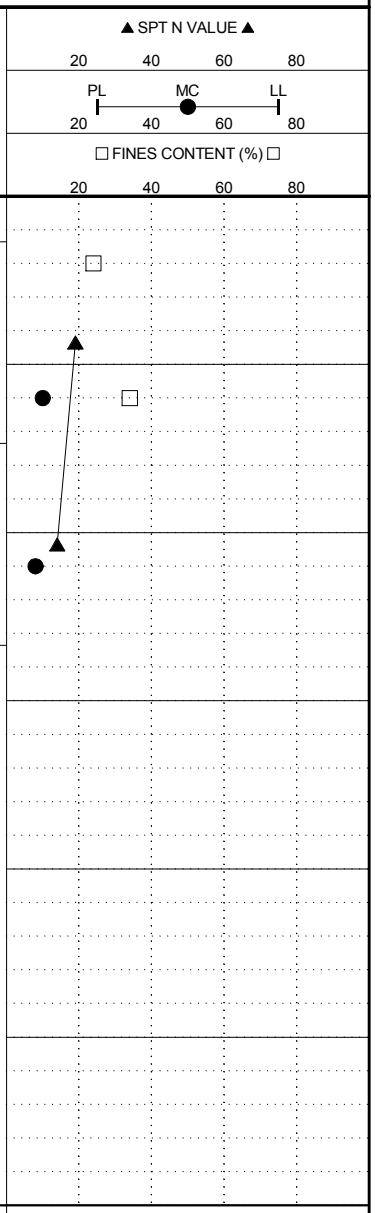
DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
		90.08	Asphalt (160 mm in thickness)					
		89.92	Type 1 (Base): Gravelly Sand, some silt, trace clay, light brown to orange (approximately 140 mm in thickness)		AU 1			
0.5		89.78	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, dark brown (approximately 300 mm in thickness)		AU 2			
1.0		89.48	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, light brown to orange		AU 3			
1.5		88.58	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 31-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 88.8 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 60+110
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		88.8	Asphalt (135 mm in thickness)				
		88.665	Type 1 (Base): Sand, some gravel, some silt, trace clay, Compact, moist, brown (approximately 150 mm in thickness)				
0.5		88.515	Type 2 (Sub base): Silty Sand, trace gravel, trace clay, Compact, moist, pink (approximately 615 mm in thickness)		SS 1	6-9-10-7 (19)	50
1.0		87.9	Fill (Subgrade): Gravelly Sand, some silt, trace clay, Compact, moist to wet, brown		2	7-5-9-9 (14)	92
1.5							
2.0							
2.5							
3.0		85.8	End of borehole at 3.0 meters below ground surface.				
3.5			Groundwater was not observed at time of investigation.				
4.0			*Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				



GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 31-2

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 104.22 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 59+776
AFTER DRILLING ---

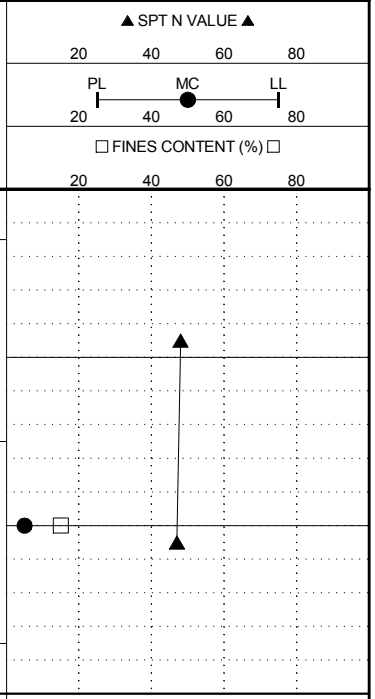
DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		104.22	Asphalt (150 mm in thickness)					
		104.07	Type 1 (Base): Gravelly Sand, some silt, trace clay, brown (approximately 225 mm in thickness)					
0.5		103.845	Type 2 (Sub base): Sand, some silt, some gravel, trace clay, brown (approximately 300 mm in thickness)					
1.0		103.545	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown		AU 1			
1.5								
2.0								
2.5								
3.0		101.22	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 32

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 67.32 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 60+491
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		67.32	Asphalt (150 mm in thickness)				
		67.17	Type 1 (Base): Gravelly Sand, some silt, trace clay, Dense, moist, brown (approximately 175 mm in thickness)				
0.5		66.995	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, Dense, moist, pink (approximately 575 mm in thickness)		SS 1	18-22-26-20 (48)	83
1.0		66.42	Fill (Subgrade): Gravelly Sand, some silt, trace clay, Dense, moist, brown		2	13-25-22-16 (47)	100
1.5		65.82	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				
2.0							
2.5							
3.0							
3.5							
4.0							



GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 32-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION 61.49 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 60+766
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		61.49	Asphalt (150 mm in thickness)					
		61.34	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)		AU 1			
0.5		61.19	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 200 mm in thickness)		AU 2			
		60.99	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown					
1.0								
1.5								
2.0								
2.5								
3.0								
		58.49	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 32-2

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 58.92 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING 0.30 m / Elev 58.62 m
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 60+623
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		58.92	Asphalt (115 mm in thickness)					
		58.805	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 135 mm in thickness)		AU 1			
0.5		58.67	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, wet to saturated, brown (approximately 250 mm in thickness)	▽	AU 2			
1.0		58.42	Fill (Subgrade): Silty Sand, some gravel, trace clay, saturated, brown		AU 3			
1.5								
2.0								
2.5								
3.0		55.92	End of borehole at 3.0 meters below ground surface. Groundwater was observed at 0.3 metres below ground surface at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 32-3

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION 70 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 60+453
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		70	Asphalt (150 mm in thickness)					
		69.875	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 150 mm in thickness)					
0.5		69.625	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 375 mm in thickness)					
1.0		69.25	Fill (Subgrade): Silty Sand, trace gravel, trace clay, moist to wet, brown		AU 1			
1.5								
2.0								
2.5								
3.0		67	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 33

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION 57.96 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 60+994
AFTER DRILLING ---

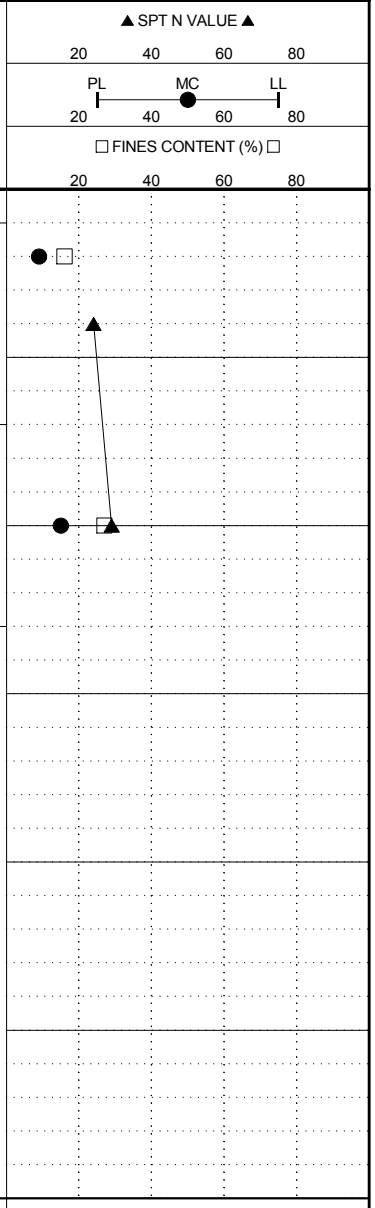
DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
		57.96	Asphalt (125 mm in thickness)					
		57.835	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 250 mm in thickness)		AU 1			
0.5		57.585	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)		AU 2			
1.0		57.285	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown		AU 3			
1.5		56.46	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 33-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION 52.84 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 61+168
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		52.84	Asphalt (100 mm in thickness)				
		52.74	Type 1 (Base): Gravelly Sand, some silt, trace clay, Compact, moist, brown (approximately 150 mm in thickness)				
		52.59	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, Compact, moist, brown (approximately 300 mm in thickness)		SS 1	14-12-12-9 (24)	50
0.5		52.39	Fill (Subgrade): Silty Sand, trace gravel, trace clay, Compact to Dense, moist to wet, brown				
1.0					SS 2	9-12-17-20 (29)	17
1.5							
2.0							
2.5							
3.0		49.84	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				
3.5							
4.0							



GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 34

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION 37.38 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 61+493
AFTER DRILLING ---

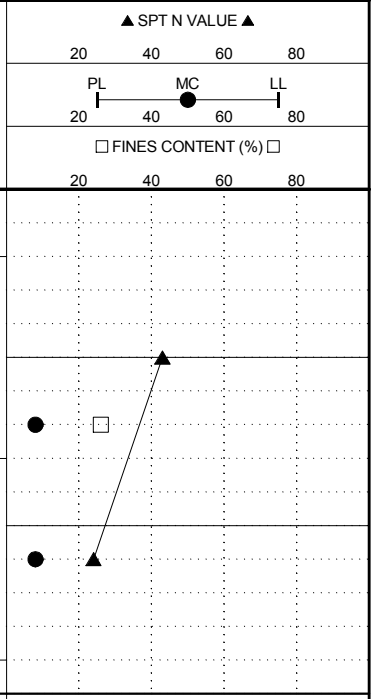
DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		37.38	Asphalt (175 mm in thickness)					
		37.205	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 200 mm in thickness)					
0.5		37.005	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 375 mm in thickness)					
1.0		36.63	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown					
1.5		35.88	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 35

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION 17.03 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 61+971
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		17.03	Asphalt (200 mm in thickness)				
		16.83	Type 1 (Base): Gravelly Sand, some silt, trace clay, some asphalt millings, Very Dense, moist, black (approximately 250 mm in thickness)				
0.5		16.58	Type 2 (Sub base): Silty Sand, trace gravel, trace clay, Dense, moist, brown (approximately 450 mm in thickness)		SS 1	60-23-20-18 (43)	100
1.0		16.13	Fill (Subgrade): Gravelly Sand, some silt, trace clay, Compact, moist, brown		SS 2	19-11-13-12 (24)	67
1.5		15.53	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				
2.0							
2.5							
3.0							
3.5							
4.0							

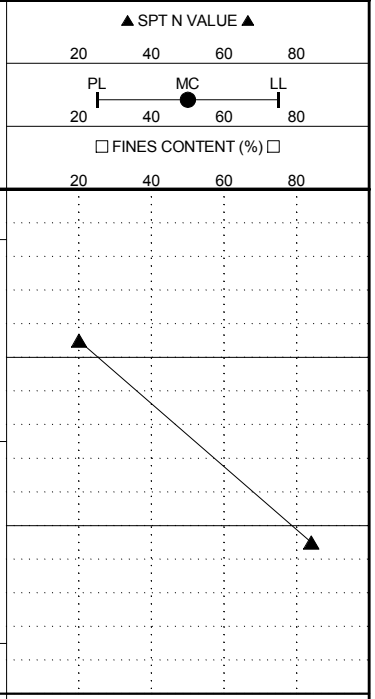


GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 36

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION 8.56 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 62+491
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
		8.56	Asphalt (150 mm in thickness)				
		8.41	Type 1 (Base): Gravelly Sand, some silt, trace clay, Compact, moist, brown (approximately 200 mm in thickness)				
0.5		8.21	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, Compact, moist, brown and pink (approximately 250 mm in thickness)		SS 1	8-10-10-15 (20)	63
		7.96	Fill (Subgrade): Gravelly Sand, some silt, trace clay, Compact to Very Dense, moist, brown				
1.0					2	10-70-14-10 (84)	83
1.5		7.06	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).				
2.0							
2.5							
3.0							
3.5							
4.0							



GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 36-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION 10.46 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 62+417
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		10.46	Asphalt (125 mm in thickness)					
		10.335	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, light brown (approximately 250 mm in thickness)		AU 1			
0.5		10.085	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, light brown to dark brown (approximately 375 mm in thickness)		AU 2			
1.0		9.71	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist to wet, dark brown		AU 3			
1.5								
2.0								
2.5		8.06	Refusal at 2.4 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH 37-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION -11.06 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 62+947
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		-11.06	Asphalt (175 mm in thickness)					
		-11.235	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, light brown (approximately 250 mm in thickness)		AU 1			
0.5		-11.485	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, light brown to dark brown (approximately 200 mm in thickness)		AU 2			
		-11.685	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown to grey		AU 3			
1.0								
1.5								
2.0								
2.5								
3.0		-14.06	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S21

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 2.88 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 51+040
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		2.88	Type 1 (Base): Gravelly Sand, some silt, trace clay, trace asphalt millings, moist, dark brown and black (approximately 100 mm in thickness)		AU 1			
		2.78	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, trace millings, moist to wet, dark brown and black (approximately 300 mm in thickness)		AU 2			
0.5		2.48	Fill (Subgrade): Gravelly Sand, some silt, trace clay, wet, dark brown		AU 3			
1.0								
1.5		1.38	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S22

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 20.64 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 51+429
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		20.64	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 250 mm in thickness)					
		20.39	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 450 mm in thickness)					
0.5								
		19.94	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown					
1.0								
1.5		19.14	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S23

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 45.59 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 51+933
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		45.59	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 250 mm in thickness)		AU 1			
0.5		45.34	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 350 mm in thickness)					
1.0		44.99	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist to wet, brown					
1.5		44.09	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S23-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 59.05 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 52+186
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
		59.05	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)		AU 1			
0.5		58.75	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)		AU 2			
1.0		58.45	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown					
1.5		57.55	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S28

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 176.86 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+408
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		176.86	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 250 mm in thickness)					
		176.61	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 350 mm in thickness)					
0.5								
		176.26	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown					
1.0								
1.5		175.36	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S28-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 180.38 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+472
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		180.38	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 200 mm in thickness)					
		180.18	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 400 mm in thickness)					
0.5								
		179.78	Fill (Subgrade): Gravelly Sand, some silt, trace clay					
1.0								
1.5		178.88	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S28-4

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 162.38 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+265
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		162.38	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 200 mm in thickness)					
		162.18	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)					
0.5		161.88	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist to wet, brown					
1.0								
1.5		160.88	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S28-5

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 139.94 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 53+882
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		139.94	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 250 mm in thickness)					
		139.69	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown and pink (approximately 350 mm in thickness)					
0.5								
		139.34	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown and pink					
1.0								
1.5		138.44	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S28-6

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/25/15 **COMPLETED** 7/25/15
GROUND ELEVATION 139.01 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 53+883
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		139.01	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, pink (approximately 200 mm in thickness)					
		138.81	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, pink (approximately 400 mm in thickness)					
0.5								
		138.41	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, pink					
1.0								
1.5		137.51	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S29-2

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 205.58 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+999
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		205.58	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 250 mm in thickness)					
		205.33	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)					
0.5								
		205.03	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown					
1.0								
1.5								
		204.08	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S29-3

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 194.85 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 1 STA. 54+790
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		194.85	Type 1 (Base): Gravelly Sand, some silt, trace clay, brown (approximately 300 mm in thickness)					
0.5		194.55	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, brown (approximately 300 mm in thickness)					
1.0		194.25	Fill (Subgrade): Gravelly Sand, some silt, trace clay, brown					
1.5								
2.0		193.35	End of borehole at 3.0 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S31-2

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 102.54 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 59+775
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		102.54	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)		AU 1			
0.5		102.24	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 450 mm in thickness)		AU 2			
1.0		101.79	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown					
1.5		101.04	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S32-2

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/24/15 **COMPLETED** 7/24/15
GROUND ELEVATION 61.27 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING 0.60 m / Elev 60.67 m
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 60+624
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
		61.27	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 500 mm in thickness)					
0.5		60.77	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist to saturated, brown (approximately 250 mm in thickness)	▽				
		60.52	Fill (Subgrade): Gravelly Sand, some silt, trace clay, saturated, brown					
1.0								
1.5		59.77	End of borehole at 1.5 meters below ground surface. Groundwater was observed at 0.6 meters below ground surface at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S32-3

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION 69.32 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 60+452
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		69.32	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 375 mm in thickness)		AU 1			
0.5		68.945	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist to wet, brown (approximately 250 mm in thickness)		AU 2			
1.0		68.695	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist to wet, brown		AU 3			
1.5		67.82	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S34

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION 36.74 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 61+491
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
		36.74	Type 1 (Base): Gravelly Sand, some silt, trace clay, some asphalt millings, moist, brown and black (approximately 300 mm in thickness)		AU 1			
0.5		36.44	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, some asphalt millings, moist, brown and black (approximately 250 mm in thickness)		AU 2			
1.0		36.19	Fill (Subgrade): Gravelly Sand, some silt, trace clay, some millings, moist, brown and black		AU 3			●
1.5		35.24	End of borehole at 1.5 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

BORING NUMBER BH S36-1

CLIENT Parks Canada
PROJECT NAME Cabot Trail - North and South Mountain
PROJECT NUMBER 151-06993
PROJECT LOCATION Cape Breton, Nova Scotia
DATE STARTED 7/23/15 **COMPLETED** 7/23/15
GROUND ELEVATION 12.7 m * **HOLE SIZE** 100 mm Diameter
DRILLING CONTRACTOR Logan Drilling
GROUND WATER LEVELS:
DRILLING METHOD Truck Mounted Drill Rig
AT TIME OF DRILLING ---
LOGGED BY L. Mattson **CHECKED BY** C. Rogers
AT END OF DRILLING ---
NOTES South Mountain - Section 2 STA. 62+415
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEVATION (m)	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
		12.7	Type 1 (Base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 200 mm in thickness)					
		12.5	Type 2 (Sub base): Gravelly Sand, some silt, trace clay, moist, brown (approximately 300 mm in thickness)					
0.5		12.2	Fill (Subgrade): Gravelly Sand, some silt, trace clay, moist, brown					
1.0								
		11.5	Refusal at 1.2 meters below ground surface. Groundwater was not observed at time of investigation. *Approximate ground surface elevations and station values are referenced to WSP Plan and Profile (Issued for RS2 review, September 2015).					
1.5								
2.0								
2.5								
3.0								
3.5								
4.0								

GEOTECH BH COLUMNS PARKS CANADA - BOREHOLES FOR CABOT TRAIL.GPJ GINT STD CANADA.GDT 9/29/15

Appendix C

ASPHALT CORES PHOTO LOG

Cabot Trail – Core C2

- Region: South Mountain – Section 2
- Station: 62+290
- Offset: 2.7m Right C/L (EBL)
- Total Thickness: 140mm
- Observation: Two (2) pieces, vertical crack (30mm depth) top lift.

Cabot Trail – Core C3

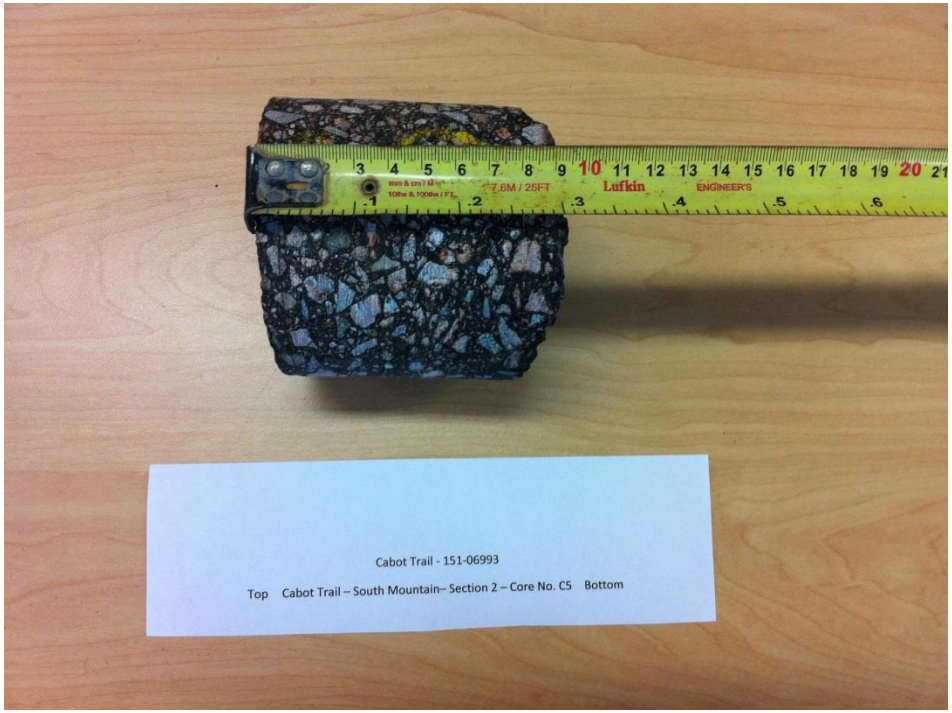
- Region: South Mountain – Section 2
- Station: 62+200
- Offset: 4.3m Left C/L (WBL)
- Total Thickness: 200mm
- Observation: No cracks.

Cabot Trail – Core C4

- Region: South Mountain – Section 2
- Station: 60+090
- Offset: 2.2m Right C/L (EBL)
- Total Thickness: 150mm
- Observation: Two (2) pieces, vertical crack (80mm depth) top lift.

Cabot Trail – Core C5

- Region: South Mountain – Section 2
- Station: 60+110
- Offset: 6.0m Left C/L (WB Side)
- Total Thickness: 90mm
- Observation: No cracks.



Cabot Trail – Core C6

- Region: South Mountain – Section 1
- Station: 55+290
- Offset: 2.2m Left C/L (WBL)
- Total Thickness: 150mm
- Observation: No cracks.

Cabot Trail – Core C7

- Region: South Mountain – Section 1
- Station: 54+913
- Offset: 3.8m Left C/L (WB Side)
- Total Thickness: 125mm
- Observation: Two (2) pieces, inverse V-crack full depth.

Cabot Trail – Core C8

- Region: South Mountain – Section 1
- Station: 54+700
- Offset: 2.4m Left C/L (WBL)
- Total Thickness: 200mm
- Observation: Two (2) pieces, inverse V-crack (60mm depth) top lift.

Cabot Trail – Core C7-1

- Region: South Mountain – Section 1
- Station: 53+500
- Offset: 2.4m Left C/L (WBL)
- Total Thickness: 75mm
- Observation: No cracks

Cabot Trail – Core C9

- Region: South Mountain – Section 1
- Station: 52+800
- Offset: 2.1m Right C/L (EBL)
- Total Thickness: 175mm
- Observation: Two (2) pieces, vertical crack (80mm) depth top lift.

APPENDIX C

Material Disposal Site Release

RELEASE

IN CONSIDERATION of the delivery and unloading of fill material, **THE UNDERSIGNED** hereby for themselves, their administrators, successors and assigns release and forever discharge **Parks Canada Agency** from any and all action, causes of action, claims and demands for upon or by reason of any damage to property which heretofore has been or hereafter may be sustained in consequences of the material delivered in the County of _____, Nova Scotia on or about the _____ day of _____ 20 _____.

THE UNDERSIGNED hereby affirm the disposal site is not a wetland. Further, **THE UNDERSIGNED** hereby agrees the surplus excavated material shall not be placed in a wetland unless specifically permitted by the Nova Scotia Department of Environment and Labour. The **Contractor and/or recipient** of the surplus excavated material will be held responsible for all environmental permitting and liability.

AND FOR THE SAID CONSIDERATION, the undersigned agree not to make claim or take proceedings against any other person or corporation who might claim contribution or indemnity under the provisions of any statute or otherwise.

WITNESS this _____ day of _____, 20 _____.

X_____ **X** _____
Witness *(please print)* **Signature of Witness**

IN THE PRESENCE OF:

X_____ **X** _____
Resident *(please print)* **Contractor** *(please print)*

X_____ **X**_____
Signature of Resident **Signature of Contractor**

Address of Resident:

_____
Civic number, Road name, City/town/village, Postal Code

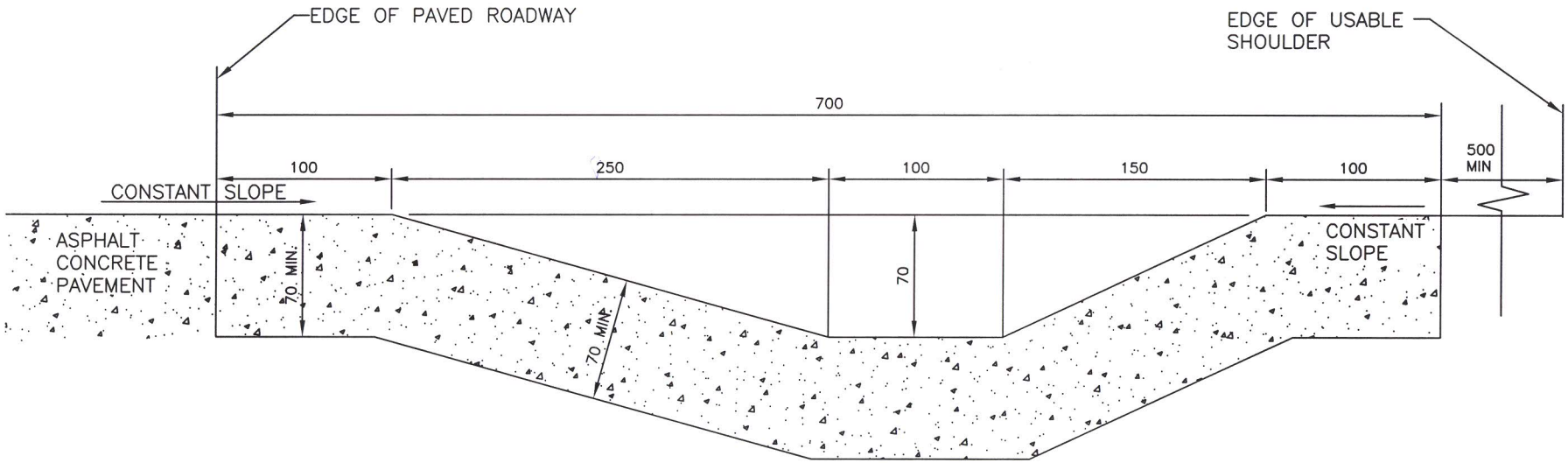
Location of Material Disposal: *(if different from resident's address)*

_____
Civic number, Road name, City/town/village, Postal Code

APPENDIX D

NSTIR Detail Drawings

The contract drawings reference the following detail drawings from the Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance (2014). The details are provided for reference only and do not necessarily constitute a complete compilation of applicable standards.



NOTES:
1. OFFTAKE GUTTERS ARE TO BE CONSTRUCTED AT LOCATIONS SPECIFIED BY THE ENGINEER AND ARE TO EXTEND TO THE EDGE OF SHOULDER AND DOWN THE SLOPE 1m MINIMUM.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

Manager Highway Planning and Design

Director, Highway Engineering Services

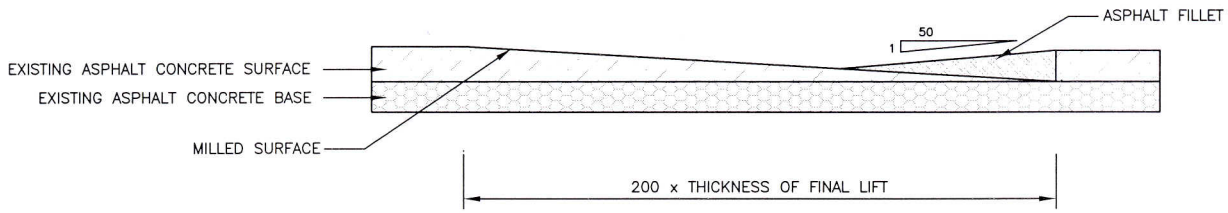
Executive Director Highway Engineering and Construction

NOVA SCOTIA
Transportation and Infrastructure Renewal

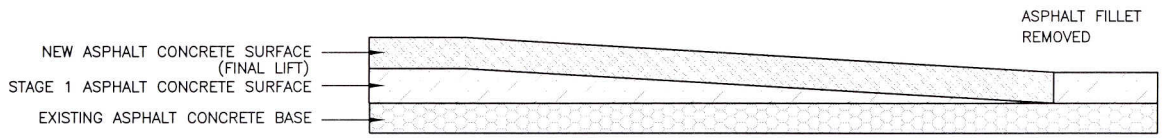
No.	REVISION
1	HS # ADDED TO TITLE

Scale :	N.T.S.
Drawn by :	M.LABRECHE
Checked by :	K.BODDY
Date of Plan :	AUG2009
File No. :	S-2009-023

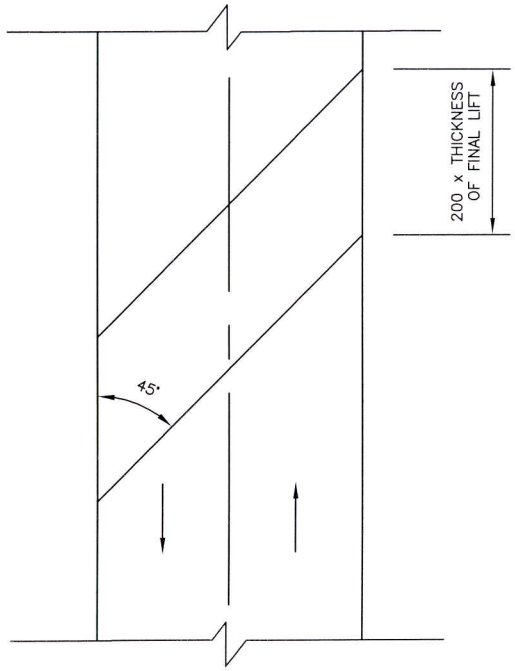
ASPHALT CONCRETE GUTTER HS-403



STAGE 1



STAGE 2



PLAN VIEW

NOTES:

Manager Highway Planning and Design

Director Highway Engineering Services

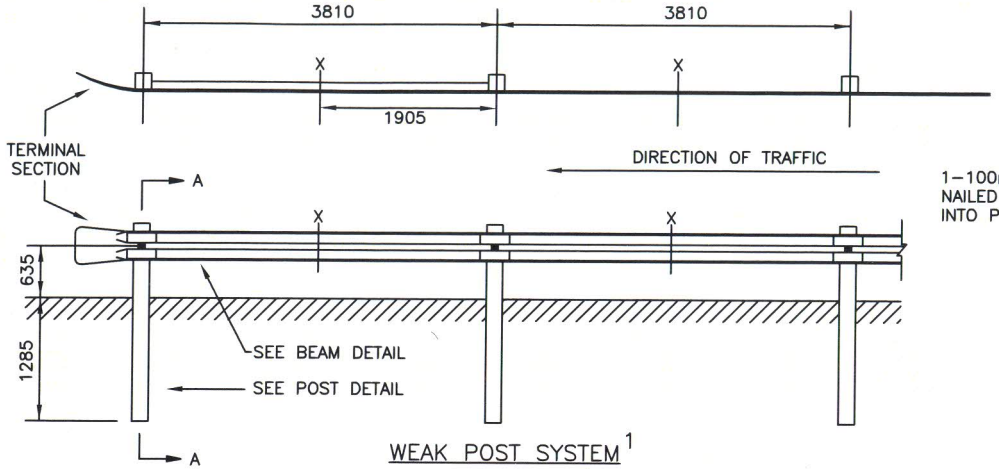
Executive Director Highway Engineering and Construction

NOVA SCOTIA
Transportation and Infrastructure Renewal

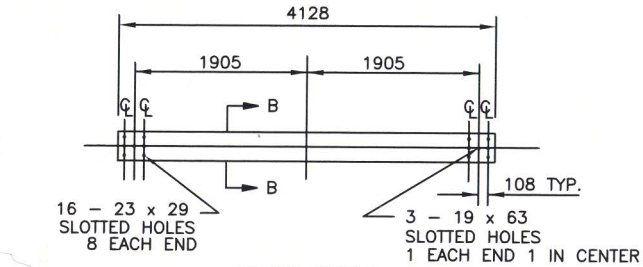
No.	REVISION

Scale : N.T.S.
Drawn by : M.LABRECHE
Checked by : K.BODDY
Date of Plan : AUG2009
File No. : S-2009-013

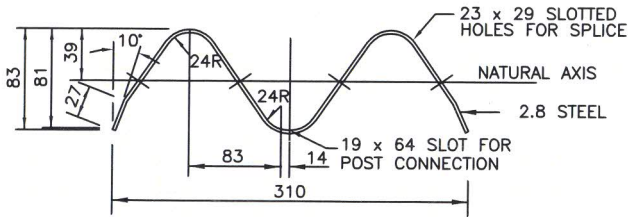
TRANSVERSE ASPHALT CONCRETE KEY JOINT HS404



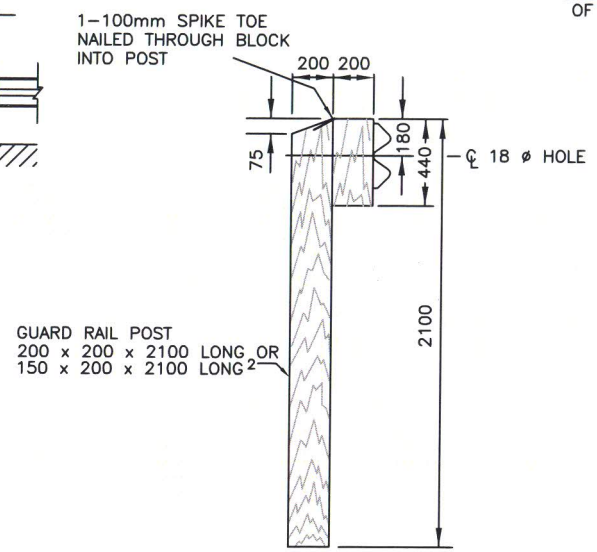
WEAK POST SYSTEM [1]



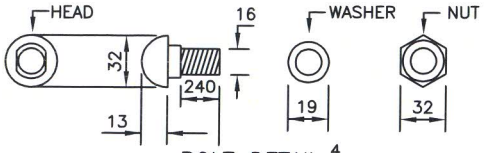
BEAM DETAIL



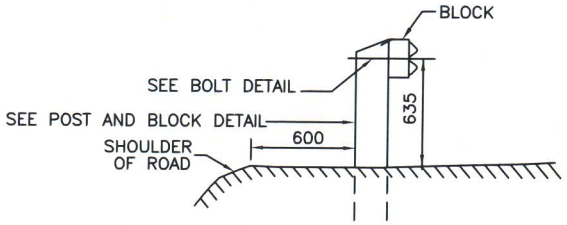
SECTION B–B



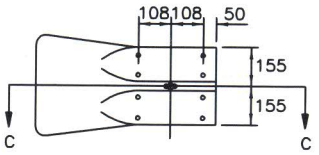
POST AND BLOCK DETAIL



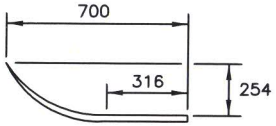
BOLT DETAIL [4]



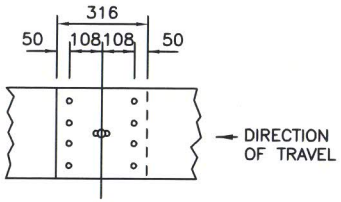
SECTION A–A



BEAM TERMINAL DETAIL [3]



SECTION C–C



BEAM SPLICE DETAIL

NOTES:
1. FOR STRONG POST SYSTEM, ADD POST AT POINT X.
2. IF 150 x 200 x 2100 LONG POSTS ARE USED, THE MATERIAL IS TO BE HARDWOOD.
3. TERMINAL SECTION ONLY APPROPRIATE FOR 4–LANE DIVIDED HIGHWAYS.
4. ALL BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED BY THE HOT DIP PROCESS. BOLTS SHALL BE CAPABLE OF WITHSTANDING 106 kN IN SINGLE SHEAR. 16mm SQUARENUT AND 19mm ROUND WASHERS ARE TO BE USED. ONE WASHER FOR EACH 240mm x 16mm BOLT. BOLTS ARE TO HAVE 75mm THREADS. FOR STRONG POST SYSTEM BOLT LENGTH SHALL BE 440mm.
5. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

Manager Highway Planning and Design

Director Highway Engineering Services

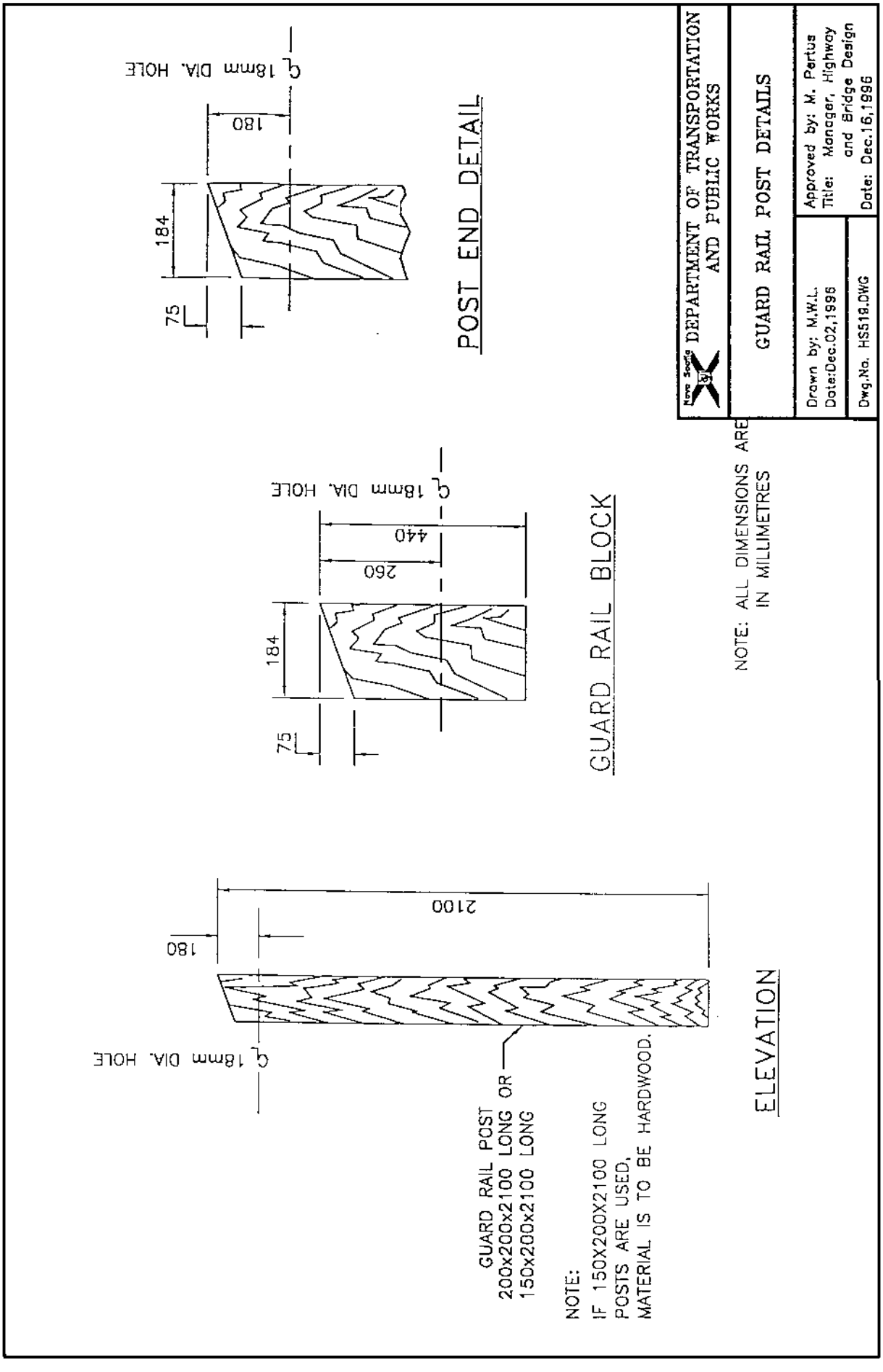
Executive Director Highway Engineering and Construction

NOVA SCOTIA
Transportation and Infrastructure Renewal

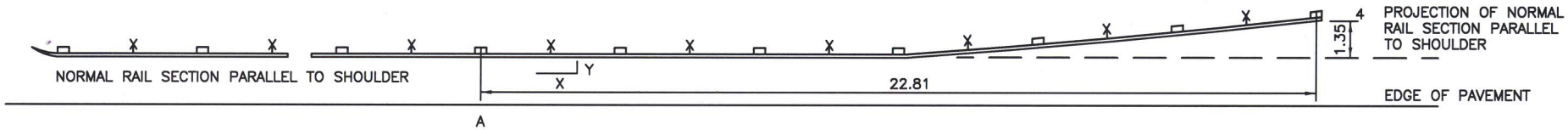
No.	REVISION
3	UPDATED TO AAHSTO STANDARD. JAN15
2	BEAM SPLICE DETAIL MODIFIED /SEP10
1	DETAILS, NOTES, TITLES /FEB 10

Scale :	N.T.S.
Drawn by :	M.LABRECHE
Checked by :	J.RAE
Date of Plan :	AUG2009
File No. :	S–2009–071

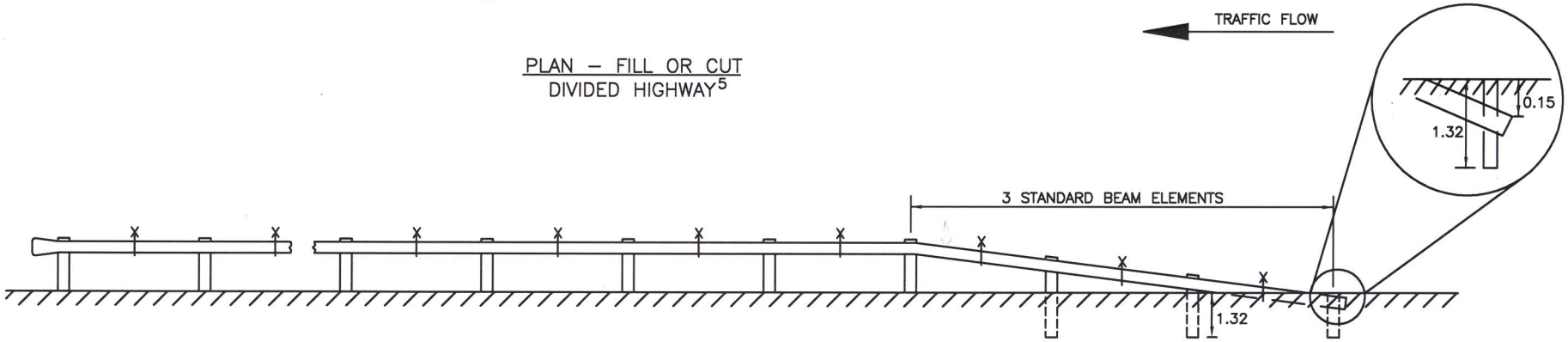
GUARD RAIL AND POST DETAILS
HS518


℄ 18mm DIA. HOLE
180
184
75
POST END DETAIL
℄ 18mm DIA. HOLE
440
260
184
75
GUARD RAIL BLOCK
NOTE: ALL DIMENSIONS ARE IN MILLIMETRES
Nova Scotia
DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS
GUARD RAIL POST DETAILS
Drawn by: M.W.L.
Date:Dec.02,1996
Approved by: M. Pertus
Title: Manager, Highway and Bridge Design
Date: Dec.16,1996
Dwg.No. HS518.DWG
2100
180
℄ 18mm DIA. HOLE
GUARD RAIL POST
200x200x2100 LONG OR
150x200x2100 LONG
NOTE:
IF 150X200X2100 LONG
POSTS ARE USED,
MATERIAL IS TO BE HARDWOOD.
ELEVATION

POST OFFSET TABLE	
FILL OR CUT	
X	Y[3]
3.81	0.04
7.62	0.15
11.42	0.34
15.22	0.60
19.02	0.94
22.81	1.35



PLAN – FILL OR CUT
DIVIDED HIGHWAY[5]



ELEVATION
DIVIDED HIGHWAY[5]

1. FOR STRONG POST SYSTEM, ADD POST AT POINT "X"
2. THIS STANDARD DRAWING IS NOT APPLICABLE TO NEW 100 SERIES HIGHWAY CONSTRUCTION WHERE ENERGY ABSORBING GUARD RAIL TERMINALS (EAGRT) SYSTEMS ARE SPECIFIED.
3. MEASURED FROM FACE OF RAIL BASED ON NORMAL RAIL SECTION PARALLEL TO SHOULDER AT A.
4. GUARD RAIL MAY BE PLACED AS PRACTICABLE FROM EDGE OF SHOULDER. IN NO CASE MAY GUARD RAIL BE PLACED DOWN THE SLOPE.
5. FOR 2–LANE/ 2–WAY ROADWAYS, BURY BOTH ENDS OF GUARD RAIL.
6. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

NOVA SCOTIA
Transportation and Infrastructure Renewal

No.	REVISION
4	Addition of EAGRT note – Feb 12
3	Addition of post bury depth – FEB 11
2	Addition of "X" for strong post system
1	Notes, Titles – Feb 10

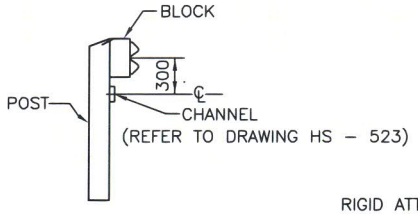
Scale :	N.T.S.
Drawn by :	M.LABRECHE
Checked by :	J.RAE
Date of Plan :	AUG2009
File No. :	S–2009–072

Manager Highway Planning and Design

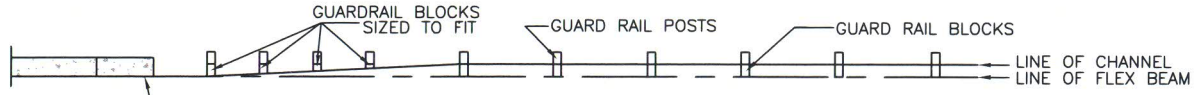
Director Highway Engineering Services

Executive Director Highway Engineering and Construction

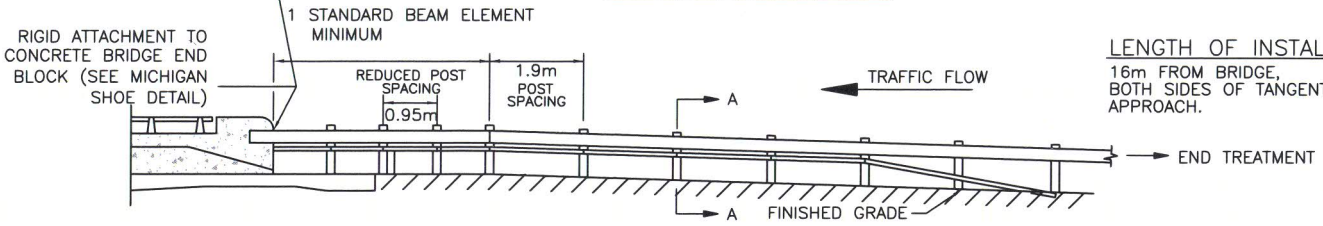
STEEL BEAM GUARD RAIL
END TREATMENT HS520



SECTION A–A



PLAN BRIDGE APPROACH

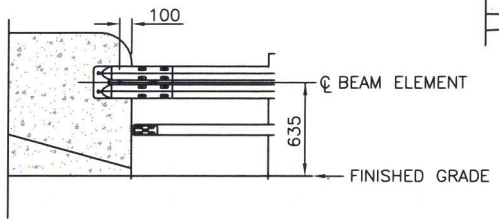


LENGTH OF INSTALLATION

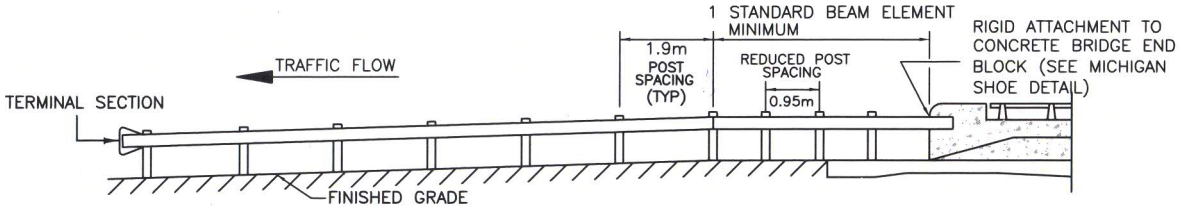
16m FROM BRIDGE, BOTH SIDES OF TANGENT APPROACH.

ELEVATION – ROADSIDE BARRIER AT CONCRETE BRIDGE

- TWO WAY TRAFFIC AT ALL FOUR CORNERS OF BRIDGE
- DIVIDED HIGHWAY AT APPROACH TO BRIDGE ONLY

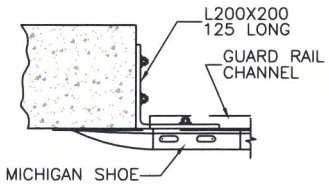


ELEVATION END BLOCK CONNECTION



ELEVATION – ROADSIDE BARRIER AT CONCRETE BRIDGE (NO CHANNEL)

- DIVIDED HIGHWAY AT DEPARTURE OF BRIDGE ONLY



PLAN END BLOCK CONNECTION

NOTES:
1. SEE BEAM DETAIL, BEAM TERMINAL DETAIL, BEAM SPLICE DETAIL, POST AND BLOCK DETAIL, BOLT DETAIL, NOTE 2, NOTE 3, NOTE4 ON STANDARD DRAWING S–2009–071.
2. SEE STANDARD DRAWING S–2009–072 FOR END TREATMENT.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

NOVA SCOTIA
Transportation and Infrastructure Renewal

No.	REVISION
5	GUARDRAIL RAISED 35mm ON BLOCK DETAIL–FEB 2015
4	Moved note 4 and 5 under headings – Jan 12
3	Length of installation note – Aug 11
2	Addition of Note 4 and 5 – Feb 11
1	SEC A–A, Notes – Feb 10

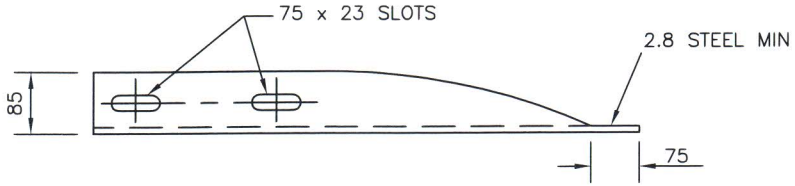
Scale :	N.T.S.
Drawn by :	M.LABRECHE
Checked by :	J.RAE
Date of Plan :	AUG2009
File No. :	S–2009–073

Manager Highway Planning and Design

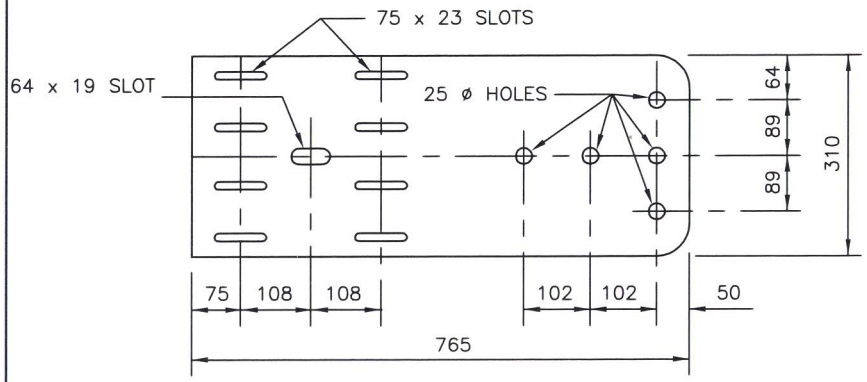
Director Highway Engineering Services

Executive Director Highway Engineering and Construction

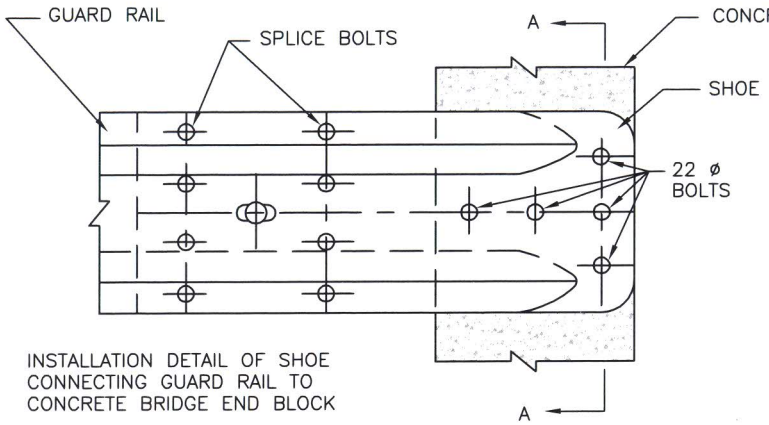
ROADSIDE BARRIER AT CONCRETE BRIDGE APPROACH HS521



PLAN DETAIL OF SHOE

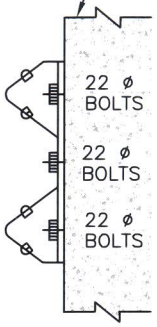


ELEVATION DETAIL OF SHOE



INSTALLATION DETAIL OF SHOE CONNECTING GUARD RAIL TO CONCRETE BRIDGE END BLOCK

ELEVATION DETAIL OF INSTALLED SHOE



SECTION A–A

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

Manager Highway Planning and Design

Director Highway Engineering Services

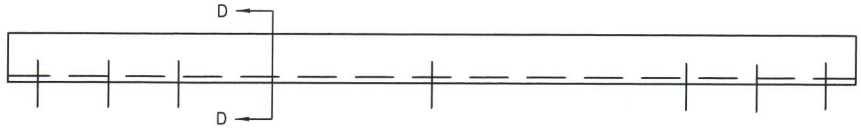
Executive Director Highway Engineering and Construction

NOVA SCOTIA
Transportation and Infrastructure Renewal

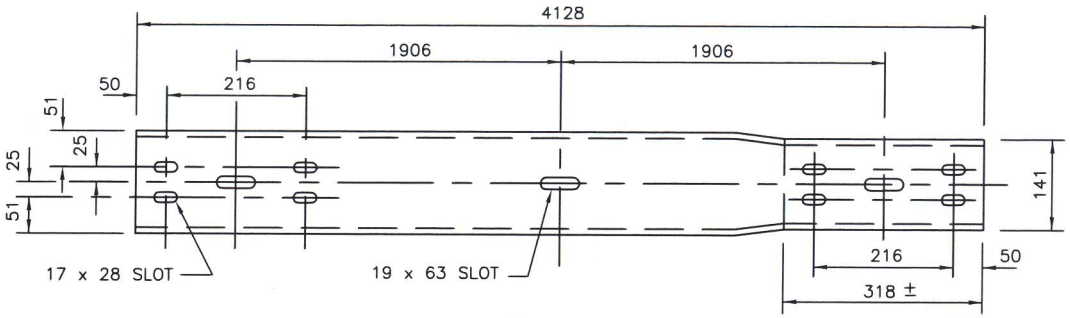
No.	REVISION
2	ADDITIONAL 25ø HOLE
1	"HS" # ADDED TO TITLE

Scale :	N.T.S.
Drawn by :	M.LABRECHE
Checked by :	J.RAE
Date of Plan :	NOV2015
File No. :	S–2009–074

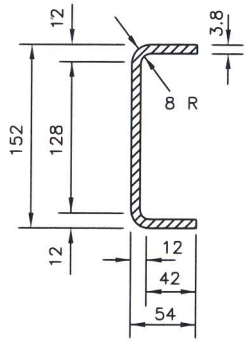
MICHIGAN SHOE DETAIL
HS522



PLAN

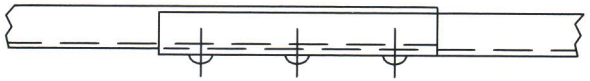


ELEVATION

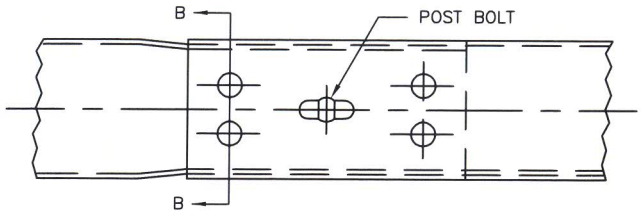


SECTION D–D

COLD ROLLED CHANNEL DETAIL

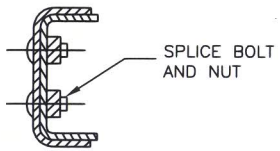


PLAN



ELEVATION

SWAGGED SPLICE



SECTION B–B

SWAGGED SPLICE DETAIL

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

Manager Highway Planning and Design

Director Highway Engineering Services

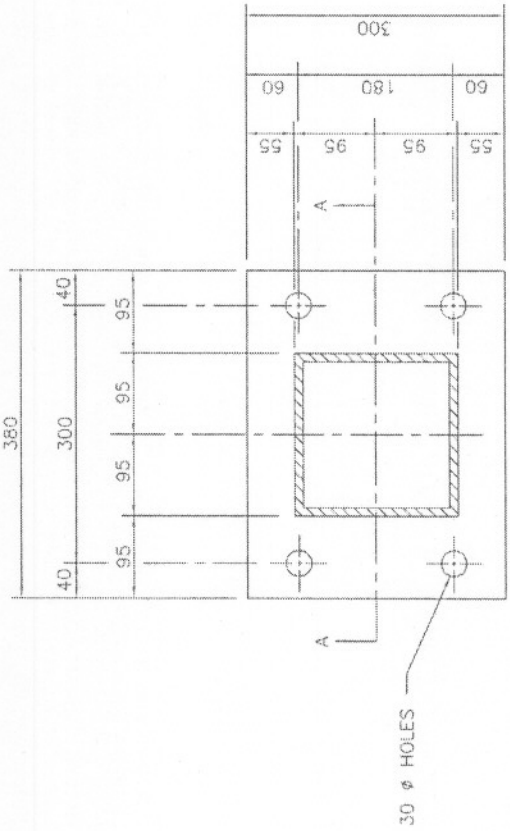
Executive Director Highway Engineering and Construction

NOVA SCOTIA
Transportation and Infrastructure Renewal

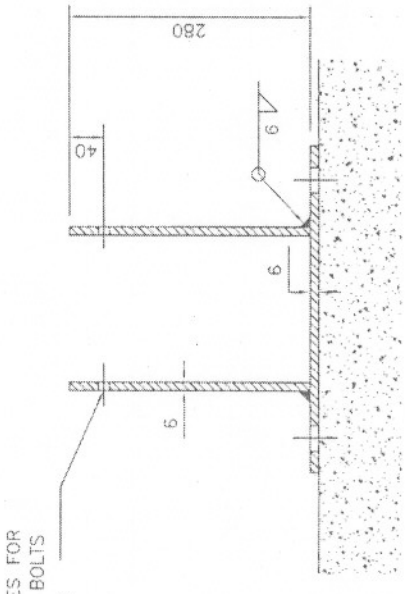
No.	REVISION
1	HS # ADDED TO TITLE

Scale :	N.T.S.
Drawn by :	M.LABRECHE
Checked by :	J.RAE
Date of Plan :	AUG2009
File No. :	S–2009–075

GUARDRAIL CHANNEL DETAIL
HS523



PLAN



SECTION A–A

NOTES:
1. BASE PLATE IS HELD IN PLACE BY WEDGE ANCHORS (RED HEAD PHILLIPS ANCHORS WS-7860 OR EQUIVALENT) INSTALLED TO MANUFACTURER'S SPECIFICATIONS.
2. ANCHORS ARE 22mmø x 150mm LONG WITH 100mm EMBEDMENT.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

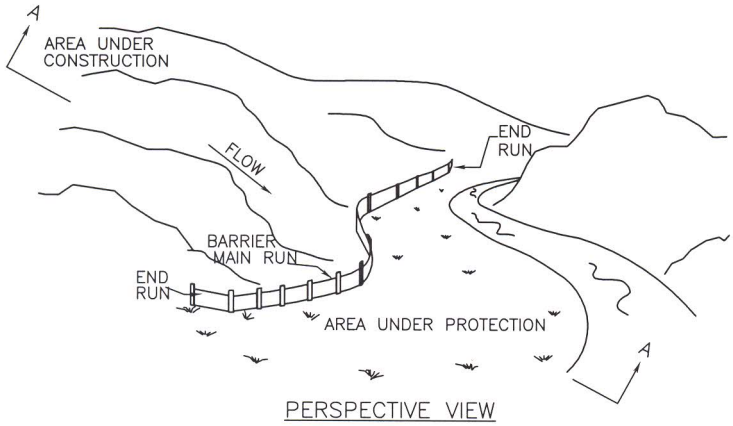
NOVA SCOTIA
Transportation and Infrastructure Renewal

No.	REVISION
1	HS # ADDED TO TITLE

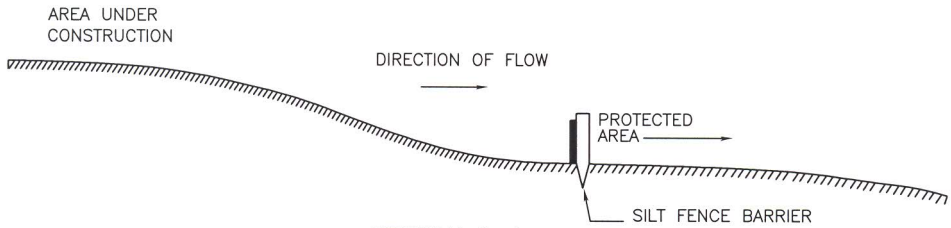
Scale : N.T.S.
Drawn by : M.LABRECHE
Checked by : J.RAE
Date of Plan : AUG2009
File No. : S-2009-078

Manager Highway Planning and Design
Director Highway Engineering Services
Executive Director Highway Engineering and Construction

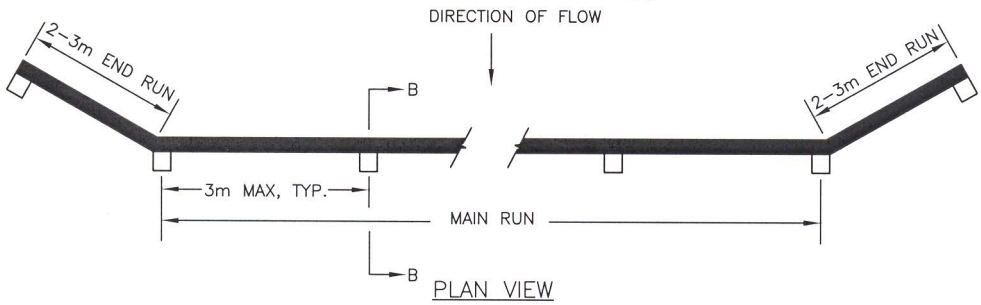
GUARDRAIL ANCHOR BASE ON CONCRETE HS-525



PERSPECTIVE VIEW

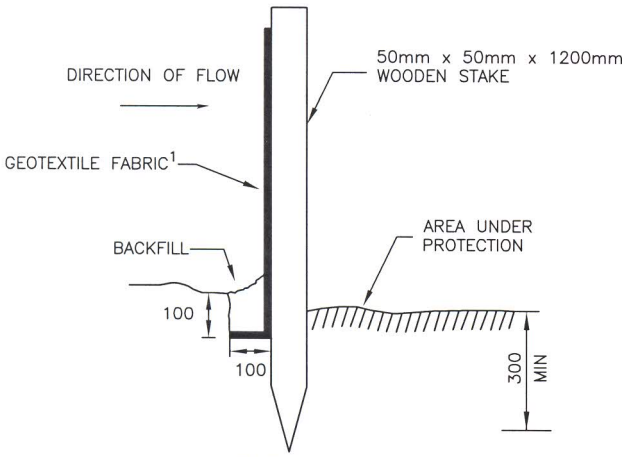


SECTION A–A



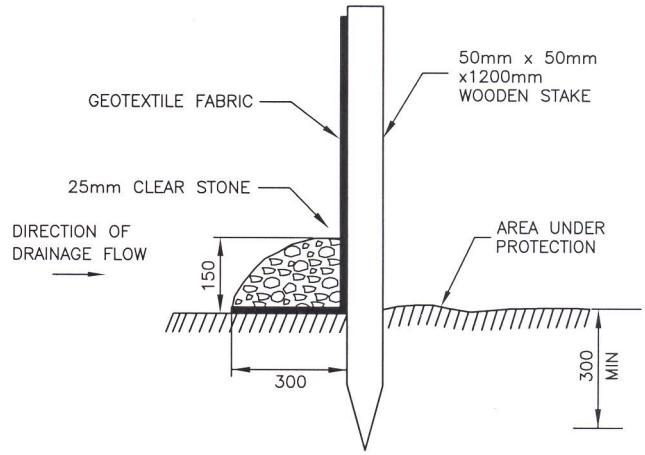
PLAN VIEW

OPTION #1



SECTION B–B

OPTION #2[3]



SECTION B–B

NOTES:
1. OVERALL HEIGHT OF FABRIC IS 0.9m WITH 20cm BURIED LEAVING 0.7m ABOVE GROUND LEVEL.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
3. OPTION 2 PERMITTED IN AREAS WHERE CONSTRUCTION OF TRENCH IS DIFFICULT TO EXCAVATE.

Scale :	N.T.S.
Drawn by :	M.BARTEAUX
Checked by :	B.PETT
Date of Plan :	AUG2009
File No. :	S–2009–132

Manager Environmental Services

Director Highway Engineering Services

Executive Director Highway Engineering and Construction

NOVA SCOTIA
Transportation and Infrastructure Renewal

No.	REVISION
1	Added Option 2 and Notes –APR 2011

SEDIMENT CONTROL FENCE FOR SHEET FLOW HS702