Parks Canada Agency

# Bennett Brook Culvert Repairs – Fundy National Park

# Technical Specifications

## ISSUED FOR TENDER

February 2019

Project Number: 1765

WSP Project #: 171-17555-00

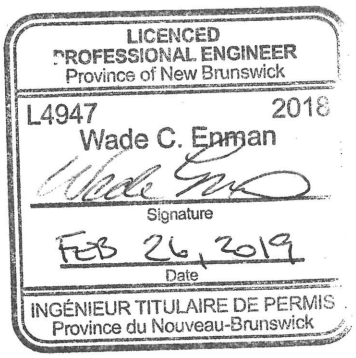
**END OF SECTION**

Specifications
Issued for Tender

Parks Canada Agency

Bennet Brook
Culvert Repairs
Kouchibouguac National Park

Project No. 1765
WSP Canada Inc.

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**END OF SECTION**

## Part 1 General

### 1.1 PROJECT LOCATION

.1 The project is located in Fundy National Park, New Brunswick. The work is located on Route 114 at the crossing of Bennett Brook adjacent to Bennett Lake.

### 1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 Parks Canada is preparing to repair the Bennett Brook culvert at Route 114.

.2 Work includes, but is not limited to, the following repairs of the Bennett Brook Culvert:

- .1 Construction of new wingwalls at all four quadrants of the culvert
- .2 Repair and construction of a new headwall at the inlet to the culvert.
- .3 Construction of a new concrete liner and weirs in the bottom of the existing culvert.
- .4 Repair of the concrete headwall between new and old culvert sections within the culvert.
- .5 Placement of rip-rap at the culvert outlet.
- .6 Reconstruction of rip-rap riffles downstream of the culvert.
- .7 Landscaping of the site as per Departmental Representative's instructions.

.3 Demolition work includes the removal of the existing concrete retaining walls.

- .1 Demolition design shall include all the access, safe removals, and mitigation measures required to complete the work in an environmentally friendly manner.
- .2 All existing retaining wall foundations shall be removed to a minimum depth of 1 meter below finished grade or streambed. All structural elements shall be fully removed that may interfere with the construction of the new retaining walls. All materials shall be removed from site and disposed or recycled in an approved method.

.4 The above listed work is subject to the following constraints during construction:

- .1 All work shall be in accordance with Basic Impact Analysis and accompanying documents completed for this project.
- .2 Construction activities shall not detrimentally impact the surrounding environment or the river waterway and shall respect allowable windows for in-water work.

.5 The Contractor is responsible for the delineation of the construction zones and the existing highway.

.6 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.

.7 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. No claims shall be accepted due to other construction work in the area.

## 1.3 CONTRACT METHOD

.1 Construction work under combined unit price and lump sum items contract.

## 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 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 (New Brunswick).

## 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 culvert and review existing site conditions.

.2 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 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.

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

.6 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.

.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 to ensure that lines and grades of the project can be checked by the Departmental Representative including centreline offset, edge of pave, rounding, etc.

**1.14 EXISTING SERVICES**

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

.2 Existing utility lines may run along the existing embankment, buried along the approaches and ditches. The contractor must coordinate work around the utility with the appropriate utility owner. All finding, re-routing, and damages made to the existing lines are the responsibility of the contractor.

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

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

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

.6 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.

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

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

.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 EXISTING ROADWAY SIGNS**

.1 The Contractor shall note that existing warning, regulatory and information signs exist along the roadway within the project limits.

.2 These signs shall be protected from damage.

.1 If any damage occurs during construction, the Contractor shall bear the expense to immediately replace such damaged signs and/or posts to the satisfaction of the Departmental Representative.

.3 If the Contractor needs to temporarily remove the existing signs in order to complete their work, the removal and reinstatement shall be considered incidental.

**1.16 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.

**1.17 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.

**1.18 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.

**1.19 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.

.2 Longitudinal and transverse measurements for such items as clearing to be made on actual flat or sloped surface.

.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.

**1.20 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.

**1.21 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 New Brunswick Road Builders Association.

**1.22 WORK SEQUENCE**

.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.

**1.23 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 NB 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 with the exception of the dates as stated in Section 01 11 00.

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

.4 No work camps will be located within the boundaries of the Fundy National Park.

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

.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 with the exception of the dates as stated in Section 01 11 00.

### 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 cold milling).

.11 To facilitate dust control, the Contractor shall place RAP as the temporary riding surface in distress and culvert replacement areas (75mm thickness to match adjacent grades).

.12 Guide rail shall be installed at the same locations from which existing guide rail was removed, unless noted otherwise on the Drawings or by the Departmental Representative.

.1 Where existing guide rail is to be removed and new guide rail is to be installed at the same location, the Contractor shall complete the installation within the same working day or provide full physical protection of the region with traffic barrier protection meeting the approval of the Departmental Representative.

.13 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.

**1.6 SMOKING ENVIRONMENT**

.1 Comply with smoking restrictions.

## 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 General Conditions

### 1.2 MEASUREMENT PROCEDURES

.1 See Section 01 29 00 – Payment Procedures

### 1.3 PRIME COST SUM

.1 Include in Contract Price a total Prime Cost Sum of $15,000.

.2 Contract Price, and not Prime Cost Sum, includes Contractor's overhead and profit in connection with such prime cost allowance.

.3 Prime Cost Sum provided for in the unit price table is not a sum due the Contractor; rather, payment will be made against it for miscellaneous work not included in the unit price table ordered under GC 6.1 of the General Conditions.

.4 Such work may include, but not be limited to:

.1 Fish rescue completed prior to dewatering, and during construction.

.2 Placement of topsoil, hydroseeding and replanting of native species at the Bennett Brook project site. Work is to be completed in coordination with the Departmental Representative and Parks Canada field staff.

.5 Once a Prime Cost Sum has been agreed upon with Parks Canada, it shall be included as an item on the Project Schedule. This shall occur on the next update of the Project Schedule.

## 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 Should the Contractor need to remove any existing regulatory/warning/information signs or posts in order to complete their Work, the removal and reinstatement of the signs and posts shall be considered incidental.

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

### 1.2 MEASUREMENT AND PAYMENT

.1 Mobilization / Demobilization

.1 Unit of Measurement is Lump Sum

.2 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.

.2 Environmental Procedures

.1 Unit of Measurement is Lump Sum

.2 This item includes all environmental protection, sedimentation and erosion control measures required to complete the project, such as (but not limited to) diversion ditching, silt fences, temporary ground covers and rock flow checks in accordance with Parks Canada National Best Management Practices – Roadway, Highway, Parkway and Related Infrastructure. Also included is the periodic and general maintenance of all erosion control measures or as directed by the Departmental Representative.

.3 Construction Facilities

.1 Unit of Measurement is Lump Sum

.2 This item includes the provision of construction facilities required to complete the project. This item includes:
- Provide and maintain adequate access to project site.
- Build and maintain temporary roads during period of Work.
- Upon completion of work, rehabilitate any temporary roads to the satisfaction of the Departmental Representative.
- Clean roads and parking areas where used by the Contractor or employees.
- Provide, erect and maintain project identification site signs, safety and instruction signs and notices.
- Provide sanitary facilities.
- Construction site trailer(s).
- Removal of temporary facilities from site as directed by the Departmental Representative.

.4 Structure Demolition

.1 Unit of Measurement is Lump Sum

.2 This item includes demolition of the existing concrete retaining walls. This item also includes all permits required for demolition and disposal of material.

.5 Temporary Structures

.1 Unit of Measurement is Lump Sum

.2 This item includes all materials, labor, and equipment required to facilitate the design, supply, installation, removal, and disposal of any temporary structure and/or shoring to complete the work as described by the contract documents. This item also includes additional excavation of any material of whatever nature encountered, beyond the defined excavation limits, to ensure adequate and proper anchorage. This item also includes all permits required for disposal of material.

.3 50% of Lump Sum Contract Price for Temporary Structures to be paid when installation is complete. The remainder of the Lump Sum Price for Temporary Shoring to be paid when any and all temporary structures and shoring structures are removed and all materials and equipment have been removed from site to the satisfaction of the Departmental Representative and all other Agencies having jurisdiction.

.6 Electrofishing

.1 Unit of Measurement is Lump Sum.

.2 This item includes all materials, labor, and equipment required to complete a fish rescue as outlined in the Environmental Procedures specification.

.3 This item will be paid as a Prime Cost Sum item as outlined in Specification 01 21 00 – Allowances.

.7 Landscaping

.1 Unit of Measurement is Prime Cost Sum.

.2 This item includes all material, labor, and equipment required to complete final landscaping at the project site and access road. Landscaping may include, but is not limited to the following:

.1 Salvaging of existing native species as identified by the Departmental Representative and Parks Canada field staff.

.2 Placement of topsoil, hydroseeding and dry mulch at the project site and access road.

.3 Replanting of salvaged or new plants, shrubs and trees as requested by the Departmental Representative and Parks Canada field staff.

.3 This item will be paid as a Prime Cost Sum item as outlined in Specification 01 21 00 – Allowances.

.8 Other Items Not Included in the Unit Price Table

.1 Unit of Measurement is Lump Sum

.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, Traffic Control, Permits and Water Control.

## 1.3 ITEMS – UNIT PRICE TABLE

.1 Cast-in-Place Reinforced Concrete

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

.2 This item includes supply, formwork, reinforcing, placing, compacting and finishing of all concrete for the concrete headwall at the structure inlet and the concrete liner. Measurement shall be based on Contract Drawings with no deduction for displacement by reinforcement. Concrete joint sealant will not be measured separately and will be considered incidental to this pay item.

.2 Concrete Patch Repair

.1 Unit of Measurement is Metres Squared ($m^2$)

.2 This item includes repairs to all concrete on the culvert outlet.

Measurement for partial depth repair shall be as determined by Departmental Representative on site. There shall be no adjustment of the repair area based on the depth to sound concrete. No repair will be paid for more than once. Measurement shall include furnishing of all materials, aggregates, cement, supplementary cementing materials, reinforcing steel, tools, equipment falsework, forms, bracing, labour, curing, surface finishing, deck sealing, evaporation retardant, anchors, embedded items, and all other items required to complete the work, as specified. All demolition and removal work to complete partial depth repairs along with cleaning and surface preparation shall be considered incidental to this unit of measure. Installation of new reinforcing steel for sub- structure repairs shall be considered incidental to this unit of measure. Epoxy-crack injection, as noted on the drawings, shall also be considered incidental to this unit of measure. This item does not include re-facing work at the inlet.

.3 Segmental Concrete Retaining Wall

.1 Unit of Measurement is Metre Squared ($m^2$)

This item includes supply and installation of the segmental concrete block retaining walls at the culvert inlet and outlet. It shall also include any clearing and grubbing required to complete the work, supply and installation of mud slab as described by drawings, and any geotextile required under the retaining wall backfill. Measurement shall be based on Contract Drawings.

.4 Unclassified Excavation Roadway and Drainage

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

.2 This item includes excavation of unclassified material after removal of grubbing and topsoil and for placement and compacting of approved fill (common and rock) to lines and elevations indicated. This item shall also include excavation for the removal of the existing wingwalls and reconstruction of the new segmental block retaining walls. This item shall also include the removal and off-site disposal of all stumps, roots, visible rock fragments greater than 0.25 $m^3$, downed timber, embedded logs, humus, root mat and topsoil from areas identified. This item shall also include any cutting and disposal of all trees, brush, and vegetative growth from areas identified.

.5 Borrow Common

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

.2 This item includes all labor, material, and equipment necessary to salvage and reuse the previously excavated native materials to blend into existing site conditions. This item shall also include provisions, transportation requirements, and storage requirements, to stock pile the excavated material at a location approved by the Departmental Representative. Additionally, transportation and disposal off site of all excess materials shall be considered incidental to this item.

.6 Class A Gravel

.1 Unit of Measurement is Tonne (t)

.2 This item includes supply, haulage, placement and compaction of Class A gravel material to the limits and at the locations indicated on the drawings. There will be no payment for extra thickness of base material 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.

.7 Rock fill – R50 Rip-Rap

.1 Unit of Measurement is Cubic Metre (t)

.2 This item includes supply and placement where indicated. This item also includes the supply and installation of geotextile material beneath the R50 rip-rap as required. Measurement shall be based on contract drawings.

**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 New Brunswick 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 03 30 00 - Cast-in-Place Concrete

.2 Section 31 23 10 - Excavating, Trenching and Backfilling

.3 Section 31 37 00 - Rip Rap

### 1.2 REFERENCES

.1 New Brunswick Department of Transportation and Infrastructure (NBDTI):

.1 New Brunswick Work Area 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 NBDTI Work Area 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 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 or portable variable message signs 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 NBDTI Work Area Traffic Control Manual.

.3 Place signs, delineators, barricades and miscellaneous warning devices in locations recommended in NBDTI Work Area 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 NBDTI Work Area 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 CONTROL OF PUBLIC TRAFFIC

.1 Provide competent flag personnel who have a valid provincial license, trained in accordance with, and properly equipped to NBDTI Work Area 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.

## 1.6 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 60 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 NBDTI Work Area Traffic Control Manual.

.2 The maximum cumulative traffic delay associated with work carried out under this Contract shall not exceed 10 minutes (between 0900hrs and 1600hrs) through the Contract limits during peak season (1 July to 30 August). Outside the peak season a 20 minute maximum cumulative delay within the Contract limits will be permitted.

.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 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, unless approved otherwise by Departmental Representative.

.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 The Contractor shall provide for services 24 hrs per day, 7 days per week.

.6 Major responsibilities of the traffic accommodation person:

.1 Maintain traffic control devices and signs during regular shutdown on weekends and at night throughout the week.

.2 Clean signs, flares, barricades, etc. used to control and accommodate traffic.

.7 Contact proper authorities in the event of an emergency, i.e., Contractor's Supervisor, Park Warden, and Departmental Representative.

**1.7 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 New Brunswick:

.1 Occupational Health and Safety Act, - Updated 2017.

### 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 New Brunswick 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 with the exception of dates listed in Section 01 11 00.

.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.

.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 during all times except during full road closure periods as specified in Section 01 11 00.

.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 sub-contractors 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, Parks Canada Act, and the New Brunswick Clean Water 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 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.

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

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

.7 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 New Brunswick Transportation of Dangerous Goods Act 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 100 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 fuel, lubricant, and any other chemical product.

.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 fish (some fish may not be observed until techniques are employed to remove the fish, eg., electrofishing) must be removed from the work area prior to dewatering operations. This may include the installation and maintenance of barrier nets to isolate the work while the construction is ongoing.

## 1.18 FISH RESCUE

.1 To avoid the serious harm to fish and their habitat, the following mitigation measures shall be included into the proponents plans.

.1 A fish rescue must be conducted prior to commencement of construction activities to minimize harmful effects to fish during the proposed culvert rehabilitation project. The fish rescue shall be completed by qualified crew. Fish barrier fences shall be installed by the fish rescue crew to isolate the work area from other sections of the waterway. If any section of the site is flooded during the work, or if there is a break in the barrier fence, another fish rescue shall be conducted. Rescued fish shall be kept in holding buckets and released back into the watercourse approximately 20 metres above or below the barrier fences in suitable fish habitat. The crew shall record and report to the Departmental Representative the number of sweeps necessary to remove fish and the total number of fish captured/species/sweep.

## 1.19 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.

## 1.20 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.

**1.21 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.

**1.22 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 (Type W1) 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 (Type N1).

.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 SEDIMENT CONTROL

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative.

.2 The Contractor shall install additional sediment control fence as directed by the Contractor's on-site environmental representative, as well as per applicable permits and regulations.

.3 The sediment control fence shall be installed as indicated on the Contract Documents and prefabricated sediment control fence shall be installed 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 in effective runoff control.

.4 The Contractor shall maintain the sediment control fence in a functional condition continuously from the time of installation until the completion of the Contract or removal.

.5 The Contractor shall inspect all sediment control fences after each rainfall and at least daily during periods of prolonged rainfall.

.6 The Contractor shall immediately repair any damage to sediment control fences or parts thereof.

.7 The Contractor shall remove retained sediment prior to it having accumulated to a level approximately but not exceeding one-half the height of the fence, and this sediment shall be disposed of at a location at least 30m from any watercourse, and in such manner that the sediment will not be returned to the Work Area or the watercourse; or

.1 Subject to the approval of the Departmental Representative, the Contractor may install a second, back-up sediment control fence, at his/her expense.

.8 The Contractor shall remove all sediment control fence and the time of such removal shall be subject to the Departmental Representative approval but in all cases shall occur prior to the completion of the Contract.

.1 Sediment control fence removed shall become property of the Contractor and shall be disposed of outside of the Work Site.

.2 If the Departmental Representative notified the Contractor in writing, prior to the completion of the Contract, that all or any part of the sediment control fence is to remain in place, the Contractor shall be deemed to have completed her/his obligations for that portion of the sediment control fence under his Item and the sediment control fence shall become the property of the Owner.

.9 At the time of removal, the Contractor shall excavate any remaining sediment and dispose of it at a location at least 30m from any watercourse, and in such manner that the sediment will not be returned to the Work Area or the watercourse and shall dress and seed the area of the removed fence and sedimentation, to the satisfaction of the Departmental Representative.

## 3.2 EROSION CONTROL

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative.

.2 The Contractor shall install additional erosion control structures as directed by the Contractor's on-site environmental representative, as well as per applicable permits and regulations.

.3 Erosion control structures shall be constructed as indicated on Contract Documents.

.4 Erosion control structures may be installed in natural swales prior to ditch construction, in temporary or partially constructed ditches, and/or in completed ditches.

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

.5 The Contractor shall carry out the Work in accordance with Contract Documents.

.6 The application, construction details and clean-out requirements for different types of erosion control structures shall be carried out as indicated in Table 1.4.1 and Clause 1.4.7.

**Table 1.4.1**

**Erosion Control Structures**

| Type | Application | Clean-Out Requirements |
|---|---|---|
| "A" | Type A structures shall be installed as spillways of dykes that are built to pond runoff from ditches or from grubbed areas, or at the end of a cut where runoff leaves the ditch to flow down a natural slope. | The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point within 300mm of the crest of the spillway. |
| "B" | Type B structures are typically installed in rock ditches where stakes required for Type C and D structures cannot be driven. | The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point within 100mm of the crest of the notch. |
| "C" | Type C structures are typically installed in earth ditches or swales. | The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point of 100mm of the crest of the notch. |
| "D" | Type D structures are typically installed in earth ditches or swales. | The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point of 100mm of the crest of the notch. |

.7 Clean-out consists of removal of sediment deposits retained by the structure and disposal of the removed materials in accordance with Clause 1.4.11.

.1 Sediment removal shall be performed so as to cause minimal disturbance to the ground or any part of the erosion control structure, and in the case of Type A structures, to the sediment pond dyke.

.8 The Contractor shall maintain erosion control structure(s) in a functional condition from the time of installation until their removal.

.1 All erosion control structures shall be kept in place until the grass on hydroseeded slopes and ditches is stabilized as an effective erosion deterrent, or as directed by the departmental representative.

.1 In Work Areas that are hydroseeded up to but no later than September 15th, erosion control structures Types B, C, and D shall be kept in place until the day on which the ground is prepared for hydroseeding, as approved by the Departmental Representative.

.2 All erosion control structure(s) shall be removed as follow:

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative.

.2 Scheduling of the removal of the erosion control structures shall be subject to the approval of the Departmental Representative.

.1 Erosion control structures removed shall become property of the Contractor and shall be disposed of outside of the Work Site.

.2 If the Departmental Representative notified the Contractor in writing, prior to the completion of the Contract, that all or any of the erosion control structure(s) are to remain in place, the Contractor shall be deemed to have completed his/her obligations for the portion of the Work under this Item and the erosion control structure(s) indicated shall become the property of the Owner.

.3 At the time of the removal the Contractor shall excavate any remaining sediment and dispose of it at a location at least 30m from any watercourse, and in such manner that the sediment will not be returned to the Work Area or the watercourse.

.4 The Contractor is the ensure that all possible care is taken to ensure that ground disturbance is maintained at a minimum during the erosion control structure removal operation and that all necessary precaution is taken to ensure that no sediment release occurs as a result of this removal activity.

.5 The Contractor shall be responsible to match the affected ditches and Slopes with the Slopes and ditch grades of the adjacent Work Area(s).

.6 The Contractor shall restore the area of the removed erosion control structure, deposited sedimentation and other disturbed ground within the Work Area, to the satisfaction of the Departmental Representative within 48 hours following the removal of the erosion control structure.

.9 The Contractor shall inspect all erosion control structure(s) after each rainfall and at least daily during periods of prolonged rainfall.

.10 The Contractor shall immediately repair any damage to erosion control structure(s) or parts thereof.

.11 The Contractor shall dispose of the excavated sediment at a location, at least 30m away from any watercourse, and in such manner that the sediment will not be returned to the Work Area or watercourse.

.12 The Contractor shall not remove any erosion control structure without the authorization of the Departmental Representative.

**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 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 03 30 00 | - | Cast-in-Place Concrete |
| .2 | Section 03 30 07 | - | Concrete Repairs |
| .3 | Section 05 50 00 | - | Metal Fabrications |
| .4 | Section 31 23 10 | - | Excavating, Trenching and Backfilling |
| .5 | Section 31 37 00 | - | Rip Rap |
| .6 | Section 32 32 34 | - | Segmental Concrete Retaining Wall |

### 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 DEPARTMENTAL REPRESENTATIVE'S SITE OFFICE

.1 Contractor to provide Departmental Representative's office trailer/space. Minimum office trailer/space size is 3.0 m x 12.5 m.

.2 Insulate building and provide heating system to maintain 22 degrees C inside temperature at -20 degrees C outside temperature.

.3 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colors. Finish floor with 19 mm thick plywood.

.4 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10% upward light component.

.5 Contractor to arrange and pay for telephone, internet connection and photocopier in Departmental Representative's office for its exclusive use. Capacity of internet to be suitable for business applications.

.6 Contractor to equip office with two 1 m x 2 m tables, one 1 m x 2 m drafting table, 4 chairs, 6 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.

.7 Upon completion of the Contract; all equipment and furniture provided by the Contractor shall be returned to it.

.8 Supply of the Departmental Representative's office, supplies and services will be incidental to the work.

.9 Contractor to provide laboratory space for the Departmental Representative at the aggregate crushing operation, laboratory to include the following.

.1 Ability to secure laboratory.

.2 Minimum laboratory trailer/space size is 3.0 m x 7.5 m.

.3 Contractor to supply continual access to clean water.

.4 One work desk and one chair.

.5 Contractor to supply continual access to electricity and lighting. Sufficient electricity and outlets to power two 120v/240v warming ovens, one 120v hot plate, one electronic scale, one 120v sieve shaker and three table fans simultaneously.

.6 Sink for washing samples.

.7 Secure storage for a nuclear density gauge.

.8 Minimum 1.0 m x 3.0 m work bench.

.10 Contractor to provide laboratory space for the Departmental Representative at the Asphalt Plant, laboratory to include the following.

.1 Ability to secure laboratory.

.2 Minimum laboratory trailer/space size is 3.0 m x 10.0 m.

.3 Contractor to supply continual access to clean water.

.4 One work desk and one chair.

.5 Contractor to supply continual access to electricity and lighting. Sufficient electricity and outlets to power one NCAT 240v ignition oven, two 120v/240v warming ovens, one 120v hot plate, one electronic scale, one 120v sieve shaker, one 120v vacuum pump and three table fans simultaneously.

.6 Sink for washing samples.

.7 Secure storage for a nuclear density gauge.

.8 Minimum 1.0 m x 5.0 m work bench.

## 1.7 CONTRACTOR'S CAMP

.1 The Contractor will not be permitted to set up a camp within Fundy National Park.

## 1.8 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.

**1.9 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.

**1.10 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.

**1.11 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.

**1.12 PROTECTION AND MAINTENANCE OF TRAFFIC**

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

**1.13 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.

**1.14 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 Government of Canada Weights and Measures Act 1985.

.2 Government of Canada Weights and Measures Regulations 1990.

### 1.2 CERTIFICATION

.1 Prior to use, Contractor shall have weigh scales certified as meeting requirements of Statutes of Canada, Weights and Measures Act. Display certificate in a visible location.

### 1.3 OPERATION

.1 Contractor shall provide a weigher at scale location to issue tickets and prepare a daily summary sheet to submit to Departmental Representative. Tickets shall include information to identify the truck and registered weight along with tare, gross and net weights.

.1 Tickets shall not be issued to vehicles which exceed the vehicle's registered weight.

## Part 2 Products

### 2.1 EQUIPMENT

.1 Weigh scales: of sufficient capacity to weigh loaded vehicles in a single operation. The weigh scale shall be calibrated in SI units.

.2 Scale house:

.1 To enclose mass indicator and where weigher can perform work and maintain records.

.2 Waterproof, one sliding window facing scale platform, one other window for cross ventilation, entrance door not to fact on to scale platform.

.3 Approved weigh tickets, in triplicate, with consecutive serial numbers shall be provided by Contractor.

## Part 3 Execution

### 3.1 INSTALLATION

.1 Provide, install and maintain scales and scale house at location approved by Departmental Representative.

.2 Remove scales and scale house when no longer required and as directed by Departmental Representative. Level approach ramps.

.3 The work shall include installation of the anchorage assemblies.

**3.2 MAINTENANCE**

.1 Maintain scale platform and scale mechanism clean and free from gravel, asphalt, snow, ice and debris.

.2 Maintain approach ramps in good condition free from sags and ruts.

.3 Have scales re-tested and re-certified if requested by Departmental Representative.

**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.

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

.5 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 New Brunswick, 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 The Contractor shall be satisfied, before commencing any Work, as to the meaning, intent and accuracy of any control points, control lines and benchmarks established by the Departmental Representative.

.1 Records of control point check surveys will contain all electronic survey files, reports and other relevant survey data showing closures.

.3 Should the Contractor discover or suspect any errors in any control points, control lines, benchmarks, and data provided by the Departmental Representative, the Contractor shall at once discontinue the affected work until such errors are investigated by the Departmental Representative and, if necessary, rectified.

.4 No separate payment will be made for layout work and the cost thereof will be considered incidental to the various items of work to be performed in the Contract.

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

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

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

### 1.4 SURVEY REQUIREMENTS

.1 The Contractor shall be responsible for establishing all secondary control points and/or lines, all slope stakes, the establishment of line and grades for subgrade and the various granular aggregate layers, layout by line and grade of all structures, culverts, and underground utilities, and shall perform all other layout and measurement necessary for the proper execution of the Contract.

.2 Secondary control point accuracy shall be:

.1 Minimum horizontal requirement is 3.0 cm ± 1:20,000 at a 95% confidence level.

.2 Minimum vertical requirement for a closed level loop is 0.008 times the square root of the distance leveled in kilometres.

.3 The staking of all works shall be of a sufficient accuracy and frequency for the Departmental Representative to carry out its quantity measurements and quality assurance program.

.4 On request of the Departmental Representative, the Contractor shall submit documentation to verify the accuracy of the layout work.

.5 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.

.6 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 RELATED REQUIREMENTS

.1 Section 01 35 43 – Environmental Procedures

.2 Section 02 41 13 – Selective Site Demolition

.3 Section 03 30 00 – Cast-in-Place Concrete

### 1.2 WASTE MANAGEMENT PLAN

.1 Prior to commencement of work, prepare Waste Management Work Plan.

.2 Work Plan to include:

- .1 Waste audit;
- .2 Waste reduction practices;
- .3 Material source separation process;
- .4 Procedures for sending recyclables to recycling facilities;
- .5 Procedures for sending non-salvageable items and waste to approved waste processing facility or landfill site;
- .6 Training and supervising workforce on waste management at site;
- .7 Contaminated soil removal and disposal.

.3 Work Plan to incorporate waste management requirements specified herein and in other sections of the specifications.

.4 Develop Work Plan in collaboration with all sub-contractors to ensure all waste management issues and opportunities are addressed.

.5 Submit copy of Work Plan to Departmental Representative for review and approval.

- .1 Make revisions to Plan as directed by Departmental Representative.

.6 Implement and manage all aspects of Waste Management Work Plan for duration of work.

.7 Revise Plan as work progresses addressing new opportunities for diversion of waste from landfill.

### 1.3 WASTE AUDIT

.1 At project start-up, conduct waste audit of:

- .1 Site conditions identifying salvageable and non-salvageable items and waste resulting from demolition and removal work.
- .2 Projected waste resulting from product packaging and from material left over after installation work.

### 1.4 WASTE REDUCTION

.1 Based on waste audit, develop waste reduction program.

.2 Structure program to prioritize actions, with waste reduction as first priority, followed by salvage and recycling effort, then disposal as solid waste.

.3 Identify materials and equipment to be:

.1 Protected and turned over to Departmental Representative when indicated;

.2 Salvaged for resale for Contractor;

.3 Sent to recycling facility;

.4 Sent to waste processing/landfill site for their recycling effort;

.5 Disposal of an approved landfill site.

.4 Reduce construction waste during installation work. Undertake practices which will minimize waste and optimize full use of new materials on site, such as:

.1 Use of a central cutting area to allow for easy access to off-cuts;

.2 Use of off-cuts for blocking and bridging elsewhere;

.3 Use of effective and strategically placed facilities on each site for storage and staging of leftover or potentially cut materials (such as gypsum board, plywood, ceiling tiles, insulation, etc.) to allow for easy incorporation into work whenever possible, avoiding unnecessary waste.

## 1.5 MATERIAL SOURCE SEPARATION PROCESS

.1 Develop and implement material source separation process at commencement of work as part of mobilization and waste management at each site.

.2 Provide on-site facilities to collect, handle and store anticipated quantities of reusable, salvageable and recyclable materials.

.1 Use suitable containers for individual collection of items based on intended purpose;

.2 Locate to facilitate deposit, but without hindering traffic or other site operations;

.3 Clearly mark containers and stockpiles as to purpose and use.

.3 Perform demolition and removal of existing structure components and equipment following a systematic deconstruction process.

.1 Separate materials and equipment at source, carefully dismantling, labelling and stockpiling alike items for the following purposes:

.1 Reinstallation into the work where indicated;

.2 Salvaging reusable items not needed in project which Contractor may sell to other parties. Sale of such items not permitted on site;

.3 Sending as many items as possible to locally available recycling facility;

.4 Segregating remaining waste and debris into various individual waste categories for disposal in a “non-mixed state” as recommended by waste processing/landfill sites.

.4 Isolate product packaging and delivery containers from general waste stream. Send to recycling facility or return to supplier/manufacturer.

.5 Send leftover material resulting from installation work for recycling whenever possible.

.6 Establish methods whereby hazardous and toxic waste materials, and their containers, encountered or used in the course work are properly isolated, stored on site and disposed in accordance with applicable laws and regulations from authorities having jurisdiction.

.7 Isolate and store existing materials and equipment identified for re-incorporation into the work. Protect against damage.

## 1.6 WORKER TRAINING AND SUPERVISION

.1 Provide adequate training to workforce, through meetings and demonstrations, to emphasize purpose and worker responsibilities in carrying out the Waste Management Plan.

.2 Waste Management Coordinator: designate full-time person on site, experienced in waste management and having knowledge of the purpose and content of Waste Management Plan to:

.1 Oversee and supervise waste management during work;

.2 Provide instructions and directions to all workers and sub-contractors on waste reduction, source separation and disposal practices.

.3 Post a copy of the Plan in a prominent location on each site for review by workers.

## 1.7 CERTIFICATE OF MATERIAL DIVERSION

.1 Submit to Departmental Representative, copies of certified weigh bills from authorized waste processing sites and sale receipts from recycling/reuse facilities confirming receipt of construction materials and quantity of waste diverted from landfill.

.2 Submit data at pre-determined project milestones as determined by Departmental Representative.

.3 Compare actual quantities diverted from landfill with projections made during waste audit.

## 1.8 DISPOSAL REQUIREMENTS

.1 Burying or burning of rubbish and waste materials is prohibited.

.2 Disposal of waste, volatile materials, mineral spirits, oil, paint, paint thinner or unused preservative material into waterways, storm, or sanitary sewers is prohibited.

.3 Do not dispose of preservative treated wood through incineration.

.4 Do not dispose of preservative treated wood with other materials destined for recycling or reuse.

.5 Dispose of treated wood, end pieces, wood scraps and sawdust at a sanitary landfill.

.6 Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.

.7 Contact the authority having jurisdiction prior to commencement of work, to determine what, if any, demolition and construction waste materials have been banned from disposal in landfills and at transfer stations. Take appropriate action to isolate such

banned materials at site of work and dispose in strict accordance with Provincial and Municipal regulations.

.8 Transport waste intended for landfill in separated condition, following rules and recommendations of landfill operator in support of their effort to divert, recycle and reduce amount of solid waste placed in landfill.

.9 Collect, bundle and transport salvaged materials to be recycled in separated categories and condition as directed by recycling facility. Ship materials only to approved recycling facilities.

.10 Sale of salvaged items by Contractor to other parties not permitted on site.

## 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 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 10 - 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.

.2 Prior to beginning of Work on site, submit detailed Waste Reduction Workplan in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Submit 2 copies of certified receipts from authorized disposal sites and reuse and recycling facilities for material removed from site upon request of Departmental Representative.

.1 Written authorization from Departmental Representative is required to deviate from haulers and receiving organizations listed in Waste Reduction Workplan.

.4 Where required by authorities having jurisdiction, submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.

.5 An engineered demolition plan is required. The demolition plan shall be designed by an engineer licensed to practice in the Province of New Brunswick, Canada. Submit drawings stamped and signed by qualified professional engineer registered in or licensed in the Province of New Brunswick, Canada. Environmental controls shall be shown on the plan which will be subject to review and approval by DFO. The demolition plan shall be submitted to the Departmental Representative four (4) weeks prior to initiating removal of the existing structure.

## 1.5 QUALITY ASSURANCE

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

.2 Regulatory Requirements: Ensure Work is performed in compliance with CEPA, CEAA, TDGA, applicable Provincial/Territorial and Municipal 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 10 - 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 PROTECTION**

.1 Prevent movement, settlement or damage of adjacent structures.

.1 Provide bracing, shoring and underpinning as required.\

.2 Repair damage caused by demolition as directed by Departmental Representative.

.2 Support affected structures and, if safety of structure being demolished or adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.

.3 Prevent debris from blocking surface draining system.

**3.2 PREPARATION**

.1 Do work in accordance with Section 01 35 29.06 – Health and Safety.

.2 Contact Utilities prior to commencing work. Coordinate removals and relocations with respective Utilities.

.3 Disconnect any Utility affected by the required work.

.1 Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of demolition.

.4 Disconnect and cap any Utility to remain.

.5 Do not disrupt active or energized Utilities designated to remain undisturbed.

.6 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.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.

.7 Protection of in-place conditions:

.1 Work in accordance with Section 01 35 43 – Environmental Procedures.

.2 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades, properties.

**3.3 DEMOLITION**

.1 Demolish structure as indicated on drawings.

.2 Demolition of the existing structure includes the entire superstructure (deck, curbs, railings, asphalt, and girders) and the demolition of the existing foundations to 1 meter below the finished grade lines.

.3 At end of each day's work, leave work in safe and stable condition.

.4 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.

.5 Remove structural components and asphaltic material.

.6 Only dispose of material specified by selected alternative disposal option as directed by Departmental Representative.

.7 Dispose of materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.8 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.

**3.4 SAFETY CODE**

.1 Blasting operations not permitting during demolition.

**3.5 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.

**3.6 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 10 - Excavating, Trenching and Backfilling.

**3.7 REMOVAL OF GUIDERAIL**

.1 Guiderail, 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 guiderail, hardware and delineators shall become the 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 reinstatement of any length of guiderail section is completed in the same day.

**3.8 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 aggregate base material (crushed rock 0-31.5mm), 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 before nightfall.

.2 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.

**3.9 REMOVAL OF SIGN POSTS / POLES**

.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 outide the work site, unless indicated otherwise on the Contract Drawings.

.3 The Contractor shall be responsible to completely backfill the hole resulting from the sign post/pole removal with compacted aggregate base material (crushed rock 0-31.5mm), 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/pole removal before nightfall.

.2 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.

**3.10 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.

**3.11 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.

**3.12 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.

**3.13 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.

**3.14 PROTECTION**

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

**END OF SECTION**

## Part 1 General

### 1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 74 21 – Construction/Demolition Management and Disposal

.3 Section 03 20 00 – Concrete Reinforcing

.4 Section 03 30 00 – Cast-in-Place Concrete

### 1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 The measurement and payment procedure for this section shall meet the requirements in Section 01 29 00 - Payment Procedures.

### 1.3 REFERENCES

.1 Canadian Standards Association (CSA):

.1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-O86-14, Engineering Design in Wood.

.3 CSA O121-08(R2013), Douglas Fir Plywood.

.4 CSA O151-09(R2014), Canadian Softwood Plywood.

.5 CSA O153-13, Poplar Plywood.

.6 CAN/CSA-O325-07(R2012), Construction Sheathing.

.7 CSA O437 Series-93(R2011), Standards for OSB and Waferboard.

.8 CAN/CSA-S269.1-1975 (R2003), Falsework for Construction Purposes.

.9 CAN/CSA-S269.3-M92(R2013), Concrete Form- work, National Standard of Canada.

### 1.4 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit shop drawings for formwork and falsework.

.1 Submit drawings and calculations stamped and signed by a Professional Engineer registered or licensed in the Province of New Brunswick, at least four (4) weeks before construction. The submission is intended for information purposes only and shall in no way relieve the Contractor of full responsibility to carry out work related in accordance with CSA S269.3 for Concrete Formwork and CSA S269.1 for Falsework.

.2 In addition to the design of the formwork, the formwork designer shall also provide calculations that consider the local load transfer of formwork loads to the girder section such that the local load effects do not locally overstress the girder flanges or webs and that the loads can be safely transferred into the girder section / global system.

.3 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.

.4 Indicate formwork design data: permissible rate of concrete placement and temperature of concrete in forms.

.5 Indicate sequence of erection and removal of formwork/falsework as directed by formwork Engineer.

## 1.5 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with jurisdictional requirements.

.2 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.

.3 Ensure that formwork surfaces which will be in contact with concrete are not contaminated by foreign material. Handle and erect the fabricated formwork so as to prevent damage.

.4 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/ Demolition, Waste Management and Disposal.

.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 volatile organic compounds (VOC's).

# Part 2 Products

## 2.1 MATERIALS

.1 Formwork Materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA O121, CAN/CSA-O86.

.2 For concrete with special architectural features, such as the end crash block pedestals and exposed sides of bridge deck and curbs, use formwork materials to CSA A23.1/A23.2.

.3 Rigid insulation board between approach slab and wingwalls.

.4 Formwork shall be constructed from lumber devoid of warped defects in order to achieve a face alignment free of distortion. This shall apply to all panel forms including prefabricated boards, plywood and steel panels.

.5 Formwork on exposed concrete surfaces shall be new or like new to achieve a quality aesthetically pleasing finish.

.2 Form Ties:

.1 For concrete not designated "Architectural", use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25mm diameter in concrete surface.

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs (applied before concrete sealers and costings are applied). The exposed surfaces of the concrete on the deck, curbs, abutments, and wingwalls are to be considered "Architectural Concrete" for this project.

.3 Form Release Agent: 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. Form release agents must be compatible with waterproofing systems where applicable.

.4 Falsework Materials: to CSA S269.1.

.5 Sealant: to Section 07 92 00 – Concrete Joint Sealant.

## Part 3 Execution

### 3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centers before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Fabricate and erect falsework in accordance with CSA S269.1.

.3 Do not place shores and mud sills on frozen ground.

.4 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.5 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.

.6 Align form joints and make watertight.

.1 Keep form joints to minimum.

.7 Use 25 mm chamfer strips on external corners and/or 25mm fillets at interior corners, joints, unless specified otherwise.

.8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.9 Construct forms for architectural concrete as indicated.

.1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.10 Built in anchors, sleeves, and other inserts required to accommodate work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.2 Anchors and inserts cast into the concrete shall either be isolated from dissimilar metals by either a 30mm cleaer spacing or denso tape barrier on the formwork anchors/inserts.

.11 Clean formwork in accordance with CSA A23.1/A23.2 before placing concrete.

### 3.2 REMOVAL AND RESHORING

.1 Notify Departmental Representative prior to form removal.

.2 Form removal times are dependent on proper curing in accordance with CAN/CSA A23.1 and CAN/CSA S269.3. Provide written evidence of concrete strength to the Departmental Representative 24 hours prior to form removal to show the suitable strength has been achieved. Contractor shall pay for the concrete cylinder strength tests to demonstrate concrete strength prior to form removal.

.3 Leave formwork in place for the following minimum periods of time after placing concrete:

.1 Two (2) days for walls.

.2 Four (4) days for beam soffits, slabs, decks and other structural members, or two (2) days when replaced immediately with adequate shoring to standard specified for falsework.

.3 Two (2) days for footings and abutments.

.4 Remove formwork when concrete has reached 70% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring. No vehicle loading or backfilling of abutments shall take place until concrete reaches design strength, unless otherwise approved in writing by Departmental Representative.

.5 If formwork is used to aid curing, it shall not be removed until seven (7) days after the concrete placement.

.6 Reuse formwork and falsework subject to requirements of CSA A23.1/A23.2.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 45 00 – Quality Control

.3 Section 03 10 00 – Concrete Forming and Accessories

.4 Section 03 30 00 – Cast-in-Place Concrete

### 1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Payment for this item shall be included in the contract unit price, per cubic meter, for Cast-in-Place Concrete.

### 1.3 REFERENCES

.1 American Concrete Institute (ACI)

.1 SP-66-04, ACI Detailing Manual 2004.

.1 ACI 315-99, Details and Detailing of Concrete Reinforcement.

.2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.

.2 American Society for Testing and Materials International (ASTM).

.1 ASTM A143/A 143M-07 (2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.3 Canadian Standards Association (CSA International)

.1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA-A23.3-14, Design of Concrete Structures.

.3 CAN/CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement, A National Standard of Canada.

.4 CSA-G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada.

.6 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.7 CSA S6-14, Canadian Highway Bridge Design Code.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

### 1.4 ACTION AND INFORMATIONAL 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, except as noted herein. Shop drawings are to be submitted at least four (4) weeks prior to commencing fabrication for review and approval. The Contractor retains responsibility for correctly detailing reinforcement, but the shop drawings must be

approved for conformity with the design. Fabrication shall not proceed until the final approval of shop drawings. Shop drawings shall be stamped by a Professional Engineer licensed to practice in the Province of New Brunswick.

.3 Submit shop drawings, including placing of reinforcement, and indicate:

.1 Bar bending details (Reference Table 3.3.1, Minimum Bend Diameter for Reinforcing Steel (400W)).

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices as specified, 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.

.4 Detail lap lengths and bar development lengths to CSA-S6-14, unless otherwise indicated.

.1 Provide Class B tension lap splices unless otherwise indicated.

### 1.5 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 00 – Quality Control, and as described in Part 2.3 – Source Quality Control.

.1 Mill Test Report: Provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum four (4) weeks prior to beginning reinforcing work.

.2 Upon request, submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

## 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 400W (weldable), deformed bars to CAN/CSA G30.18, unless indicated otherwise.

.3 All reinforcing steel shall be hot dipped galvanized in accordance with CAN/CSA G-164-M with a minimum zinc coating of 610 g/m2 permitted after coating. All minor damage to the galvanizing shall be touched up with organic zinc paint.

.4 Cold-drawn Annealed Steel Wire Ties: to ASTM A497/ A497M. All tie-wires, chairs and bar supports and other material used for the installation of galvanized reinforcing bars shall be covered, either with powdered epoxy resin, or acceptable material, at all contact points and within 50mm of exposed faces, or be comprised of an acceptable non-metallic material to avoid galvanic reaction with galvanized repair/damage to galvanized coating.

.5 Chairs, bolsters, bar supports, spacers: to CSA A23.1/ A23.2.

.6 Anchor Bolts and Pilaster Cap Dowels: to ASTM A307 (or better). Anchor bolts and pilaster cap dowels to be galvanized as per this specification.

**2.2 FABRICATION**

.1 Fabricate reinforcing steel in accordance with CSA A23.1/ A23.2, ACI 315 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, except as noted herein (see Table 3.3.1).

.2 Obtain Departmental Representative's 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 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

**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 four (4) weeks prior to beginning reinforcing work.

.2 Upon request, inform Departmental Representative of proposed source of material to be supplied.

## Part 3 Execution

**3.1 PREPARATION**

.1 All steel reinforcing bars shall have the necessary net sectional area, and shall be cut to the exact lengths, and bent cold to the exact forms and dimensions shown on the approved plans, or otherwise required, before galvanizing or being placed in position. Bending shall be accurately done, in a bending machine and no welding or heating or any bars shall be allowed, except with written approval from the Departmental Representative. All stirrups and hoops shall accurately fit the rods, and all bends shall be taken out of bars to be used as straight members.

**3.2 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, apply slow and steady pressure.

.3 Replace bars which develop cracks or splits.

**3.3 PLACING REINFORCEMENT**

.1 Place reinforcement steel as indicated on placing drawings.

.2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.3 Ensure cover to reinforcement is maintained during concrete pour.

.4 All reinforcing bars shall be placed and held rigidly in the exact positions in the forms as shown on the approved plans, or otherwise required, and there shall be no displacement of the same by the placing and tamping of the concrete. Adjusting or moving the bars, while the concrete is being placed shall not be permitted, unless specified on the plans.

Concrete protection required for reinforcing steel shall be in accordance with the contract documents or as directed by the Departmental Representative. All bars shall be tied and properly braced to prevent displacement. No concrete shall be placed until the reinforcement, after being cleaned and placed in position, has been examined and approved by the Departmental Representative. The minimum bend diameter shall conform to Table 3.3.1 below. Bending of galvanized reinforcing steel will not be permitted after coating.

.5 To avoid contact between dissimilar metals, galvanized reinforcing shall either be separated from black steel (uncoated steel; ie., steel girder top flange studs) with a clear space of at least 30mm, otherwise the galvanized reinforcing shall be locally wrapped with denso tape to provide the required separation.

Table 3.3.1
Minimum Bend Diameter for Reinforcing Steel (400W)

| Bar Size (mm) | Bend Diameter (mm) |
|---|---|
| 10 | 70 |
| 15 | 90 |
| 20 | 150 |
| 25 | 200 |
| 30 | 250 |
| 35 | 300 |
| 45 | 450 |
| 55 | 600 |

## 3.4 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of galvanized reinforcing steel with zinc rich paint that is a compatible finish to provide continuous coating. Cold galvanizing touch-up procedure and product shall meet with the approval of the Departmental Representative.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED WORK

.1 Section 03 10 00 – Concrete Forming and Accessories

.2 Section 03 20 00 – Concrete Reinforcing

### 1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 The measurement and payment procedure for this section shall meet the requirements in Section 01 29 00 - Payment Procedures.

### 1.3 REFERENCES

.1 ACI-211.1-91, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.

.2 ASTM C260-10a, Standard Specification for Air- Entraining Admixtures for Concrete.

.3 ASTM C457-10a, Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete.

.4 ASTM C494-10a, Standard Specification for Chemical Admixtures for Concrete.

.5 ASTM C1202-10, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.

.6 ASTM D1751-04(2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

.7 CAN/CGSB 51.34-M86 AMEND, Vapour Barrier, Polyethylene Sheet for use in Building Construction.

.8 Canadian Standards Association (CSA International):

.1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.

.2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.

.3 CSA A3000-08, Cementitious Materials Compendium.

### 1.4 ABBREVIATIONS AND ACRYNYMS

.1 Cement: hydraulic cement or blended hydraulic cement (XXb – where b denotes blended).

.1 Type GU or GUb – General use cement.

.2 Type MS or MSb – Moderate sulphate-resistant cement.

.3 Type MH or MHb – Moderate heat of hydration cement.

.4 Type HE or HEb – High early-strength cement.

.5 Type LH or LHb – Low heat of hydration cement.

.6 Type HS or HSb – High sulphate-resistant cement.

.2 Fly Ash:

.1 Type F – with CaO content less than 8%.

.2 Type CI – with CaO content ranging from 8 to 20%.

.3 Type CH – with CaO greater than 20%.

.3 GGBFS – Ground, granulated blast-furnace slag.

**1.5 SUBMITTALS**

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

.2 Submit copies of WHMIS MSDS, Material Safety Data Sheets.

**1.6 QUALITY ASSURANCE**

.1 Quality Assurance: 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 When plant does not hold valid certification, 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 the following items:

.1 Falsework erection;

.2 Hot weather concrete;

.3 Cold weather concrete;

.4 Curing;

.5 Finishes;

.6 Formwork removal;

.7 Joints.

.4 Health and Safety Requirements: Do construction occupational health and safety requirements in accordance with Section 01 35 29 – Health and Safety Requirements.

**1.7 DELIVERY, STORAGE AND HANDLING**

.1 Delivery and Acceptance Requirements:

.1 Concrete Hauling Time: deliver to site of work and discharge within 120 minutes maximum after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Departmental Representative.

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

**Part 2 Products**

**2.1 MATERIALS**

.1 Cement: to CSA A3000, Type GU.

.2 Water: to CSA A23.1.

.3 Aggregates: to CSA A23.1/A23.2.

.4 Admixtures:

.1 Air Entraining Admixture: to ASTM C260.

.2 Chemical Admixture: to ASTM C494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.5 Shrinkage Compensating Grout: MasterEmaco 928 non- shrink grout or approved equivalent.

.1 Compressive Strength: 50 MPa at 28 days.

.6 Chemical Adhesive Anchoring System: Hilti RE500 Chemical Adhesive Anchoring System or approved equivalent.

.7 Curing Compound: to CSA A23.1/A23.2 white, Type 1 – chlorinated rubber.

.8 Pre-Moulded Joint Fillers:

.1 Bituminous Impregnated Fiber Board: to ASTM D1751.

.2 Sponge Rubber: to ASTM D1752, Type I, firm grade.

.9 Dampproofing:

.1 Emulsified asphalt, mineral colloid type, unfilled.

.10 Polyethylene Film: 0.15mm thickness to CAN/CGSB 51.34.

## 2.2 MIXES

.1 Mixture proportions shall be selected on the basis of a 75 year design life and all concrete in the structure shall have a minimum compressive strength of 45 MPa in 28 days. The Contractor shall perform all tests required to demonstrate the long-term performance and durability of the materials and concrete mixtures.

.2 Performance Method for specifying Concrete: to meet Departmental Representative performance criteria to CAN/CSA A23.1/A23.2 and CSA S6.

.3 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative #1. High Performance Concrete in bridge decks, curbs, abutments, wingwalls and approach slabs shall be proportioned using Portland cement, Type SF silica fume, fine and coarse aggregates, air entraining, water reducing, and/or set regarding admixtures. Concrete mixtures shall be designed to meet the following:

.1 Minimum Compressive Strength at 28 days: 45 MPa.

.2 Design life of 75 years.

.3 Class of Exposure: C1.

.4 Chemical Admixtures: type as approved and in accordance with ASTM C494.

.5 Normal Size of Coarse Aggregate: 20mm.

.6 Maximum Water to Cement Ratio: 0.35.

.7 Cementitious Content: minimum 420 kg/m3, maximum 480 kg/m3.

.8 Air Content: 6 +/- 1% (7 +/- 1% with super- plasticizer).

.9 Maximum Slump before Superplasticizer: 60 mm.

.10 Slumps after Superplasticizer: 180 +/- 30 mm.

.11 Maximum spacing factor of hardened concrete not to exceed 230 $\mu$m.

.12 Chloride Ion Permeability @ 56 days: <1000 coulombs.

.13 Maximum Concrete Temperature (from delivery equipment):

.1 Thickness >2 meters: 18oC.

.2 Thickness <2 meters: 25ºC.

.14 Maximum Concrete Temperature (in situ): 70oC.

.15 Maximum Temperature Gradient: 20oC/meter.

.16 Superplasticizer shall be used in all concrete.

## Part 3 Execution

### 3.1 PREPARATION

.1 Obtain Departmental Representative's written approval before placing concrete.

.1 Provide 48 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 facilities placing with minimum of re-handling and without damage to existing structure or work.

.4 Pumping of concrete will not be permitted, and is 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 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.8 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 epoxy grout to anchor and hold dowels in positions as indicated.

.9 Do not place load upon new concrete until authorized by Departmental Representative.

.10 Apply bonding agent to all existing concrete surfaces in accordance with manufacturer's instructions prior to the placement of new concrete.

### 3.2 INSTALLATION/APPLICATION

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

.2 Sleeves and Inserts:

.1 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

.2 Sleeves and openings greater than 100x100mm not indicated, must be reviewed by Departmental Representative.

.3 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.

.4 Confirm locations and sizes of sleeves and openings shown on drawings.

.5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor Bolts:

.1 Set anchor bolts to templates in coordination with appropriate trade prior to placing concrete.

.2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.

.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.4 Set bolts and fill holes with epoxy grout.

.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

.4 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

.5 Finishing and Curing:

.1 Finish concrete to CSA A23.1/A23.2.

.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.

.6 Joint Fillers:

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.

.2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Install joint filler.

## 3.3 SURFACE TOLERANCE

.1 Concrete tolerance to CSA A23.1.

## 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 – ACTION AND INFORMATIONAL SUBMITTALS.

.1 Concrete pours

.2 Slump

.3 Air content

.4 Compressive strength at 7, 28 and 56 days.

.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 Owner will pay for costs of tests as specified in Section 01 29 83 – Payment Procedures for Testing Laboratory Services.

.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 Inspection or testing by Owner 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 in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

# Part 1 General

## 1.1 RELATED REQUIREMENTS

.1 Section 01 35 29.06 – Health and Safety Requirements

.2 Section 01 45 00 – Quality Control

.3 Section 01 74 21 – Construction/Demolition Management and Disposal

.4 Section 03 10 00 – Concrete Forming and Accessories

.5 Section 03 20 00 – Concrete Reinforcing

.6 Section 03 30 00 – Cast-in-Place Concrete

## 1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 The measurement and payment procedure for this section shall meet the requirements in Section 01 29 00 - Payment Procedures.

## 1.3 REFERENCES

.1 Canadian Standards Association (CSA):

- .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-A5-03, Portland Cement, in accordance with CAN/CSA A3000-08, Cementitious Materials Compendium.
- .3 CAN3-A266.1-M78, Air Entraining Admixtures for Concrete.
- .4 CAN3-A266.2-M78, Chemical Admixtures for Concrete.
- .5 CAN3-A266.4, Guideline for the use of Admixtures in Concrete.
- .6 ACI 117-10, Standard Tolerances for Concrete Construction and Materials.

.2 American Society for Testing and Materials:

- .1 ASTM Standard D6297-13, "Standard Specification for Asphaltic Plug Joints for Bridges."
- .2 NCHRP Standard 244-82(R2013), "Concrete Sealers for Protection of Bridge Structures."
- .3 ASTM C1438-13, "Standard Specification for Latex and Powder Polymer Modifiers for use in Hydraulic Cement Concrete and Mortar.

## 1.4 CERTIFICATES

.1 Minimum 2 weeks prior to starting concrete work, submit to Departmental Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that the following materials will meet specified requirements:

- .1 Portland Cement
- .2 Blended Hydraulic Cement
- .3 Supplementary Cementing Materials
- .4 Grout
- .5 Admixtures

.6 Aggregates

.7 Water

.2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1/A23.2, and that mix design is adjusted to prevent alkali aggregate reactively problems.

.3 Provide certification from a qualified independent inspection and testing company that plant, equipment, and materials to be used in concrete, comply with requirements of CSA-A23.1/A23.2.

## 1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with the Section 01 74 21 – Waste Management and Disposal.

.2 Use trigger operated spray nozzles for water hoses.

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

.4 Carefully coordinate the specified concrete work with weather conditions.

.5 Ensure emptied containers are sealed and stored safely for disposal away from children.

.6 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.

.7 Choose least harmful, appropriate cleaning method which will perform adequately.

## 1.6 DESIGN REQUIREMENTS

.1 Alternative 1 – Performance; in accordance with CSA A23.1/A23.2, and as described in MIXES of PART 2 – PRODUCTS.

## 1.7 SUBMITTALS

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

.2 At least 2 weeks prior to commencing work, inform Departmental Representative of proposed source of aggregates and provide access for sampling.

.3 As a minimum, submit repair concrete mix information for each mix containing the following information:

.1 Cement type

.2 Minimum compressive strength at 28 days

.3 Exposure classification

.4 Slump at time of discharge

.5 Nominal size of course aggregate

.6 Air content (%)

.7 Supplementary cementing materials type

.8 Percentage of supplementary cementing materials by weight of total cementing materials

.9 Cement content (kg/m3)

.10 Water-to-cement ratio

.11 Proposed admixtures

.12 Latex modifier

**1.8 QUALITY ASSURANCE**

.1 Quality Assurance: in accordance with Section 01 45 00 – Quality Control.

.2 Provide Departmental Representative, minimum 2 weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete.

.1 When plant does not hold valid certification, provide test data and certification by qualified independent inspection and testing laboratory that materials used in concrete mixture will meet specified requirements.

.3 Minimum 2 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on the following items:

.1 Falsework erection

.2 Hot weather concrete

.3 Cold weather concrete

.4 Curing

.5 Finishes

.6 Formwork removal

.7 Joints

.4 Health and Safety Requirements: Do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

**1.9 DELIVERY, STORAGE AND HANDLING**

.1 Concrete Hauling Time: Maximum allowable time for concrete to be delivered to site of work and discharged within 120 minutes maximum after batching.

.1 Modifications to maximum time limit must be agreed to by Departmental 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.

**1.10 RESPONSIBILITY**

.1 Any damage incurred to vehicles or their cargo or injury sustained to their occupants as a direct or indirect result of the Contractor's actions, procedures or negligence, shall be the sole responsibility of the Contractor.

**Part 2 Products**

**2.1 MATERIALS**

.1 Portland Cement: Type GU to CSA A23.1/A23.2 and CAN/CSA-A5.

.2 Supplementary Cementing Materials:

.1 Type "F" fly ash replacement to CSA A3001.

.2 Ground Granulated blast furnace stag type S to CAN/CSA A3000-08.

.3 Silica Fume Type SF to CAN/CSA A3000-08.

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

.4 Aggregates: to CSA A23.1/A23.2. Coarse aggregates to be normal density.

.5 Air Entraining Admixture: to CSA A23.1/A23.2 and CAN3 A266.1. Add air entraining agent to all mixes as indicated.

.6 Chemical Admixtures: to CSA A23.1/A23.2, clause 6.3 and to CAN3 A266.4. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing. Admixtures shall not contain more than 1% chloride ion content by weight.

.7 Obtain approval from Departmental Representative prior to use of super plasticizing admixture.

.8 Concrete shall be normal and shall have a unit weight of 2,350 kg/m3.

.9 Concrete Retarder: to ASTM C494/C494M-10. Do not allow moisture of any kind to come in contact with the retarder film.

.10 Epoxy Based Crack Sealant:

.1 Two component, 100% solids moisture insensitive epoxy adhesive.

.2 For sealing vertical and overhead applications, use gel consistency. Use low viscosity consistency for injection.

.3 Primer to be compatible with sealant.

.4 Acceptable products include:

.1 Euclid Chemical Dural Fast Set Epoxy.

.2 BASF: SCB Concresive 1446.

.3 Dayton Superior: Sure Inject (J56).

.11 Cement paste primer for repair areas and coating for existing rebar:

.1 Portland cement mortar consisting of a mixture of 1 part cement to ¾ to 1 part fine aggregate and sufficient water to make a heavy cream consistency. Maximum water-to-cement ratio of 0.40.

.12 100% Silane Solution Concrete Sealer to NCHRP 244, Series II Reduction of Water Absorption.

.13 Latex Modifier:

.1 Latex emulsion in accordance with ASTM C1438, Type II. Modifier shall be specifically formulated as a concrete repair mortar admixture and shall contain an anti-foam agent.

.2 Latex modifier shall contain 46-49% solids.

.14 Hot-Applied Binder:

.1 At asphalt plug joint location, use hot-applied binder as recommended by plug joint manufacturer.

.15 Asphalt Plug Joint System:

.1 System comprising of layers of specifically modified binders and aggregate to provide a homogeneous expansion medium and smooth running surface.

.2 Movement range shall be up to +/-20mm.

.3 Binder: Plasticized polymer or rubberized bitumen blend with additional modifiers. Minimum softening point: 70°C minimum.

.4 Aggregate: Graded and dried crushed rock used in the construction of Asphaltic Plug Joints. Colour to match existing asphalt surface.

.5 Glass transition temperature shall be lower than or equal to -27°C.

.6 Material supplier shall be ISO 9000 certified.

.16 Cast-in-place concrete can be used for concrete repairs or concrete pier bases. Refer to Section 03 30 00.

**2.2 MIXES**

.1 Proportion normal density, repair concrete in accordance with CSA A23.1/A23.2, Alternative 1 – Performance.

.2 All repair concrete shall conform to the following requirements unless noted otherwise herein.

Latex-Modified** Repair Concrete (Abutments, Walls, Piers and Culverts:

.1 Portland Cement: Type GU

.2 Minimum Compressive Strength at 28 days: 35 MPa.

.3 Exposure Classification: N/A

.4 Slump at time of Discharge: As per CAN/CSA A23.1/A23.2, not to exceed 125 mm.*

.5 Nominal Size of Coarse Aggregate: 3-6%.

.6 Air Content: 3-6%.

.7 Maximum w/cm Ratio: 0.37.

* Read in conjunction with Part 2.2 – Mixes for additional requirements regarding mix design, slump and admixtures.

** .1 Solids content of Latex shall be 46-49%. The water content of the latex shall be included when calculating the total water content of the mixture. Maximum w/cm ratio includes the water in the latex.

.2 Use a ratio of 15% latex solids to Portland cement by mass.

.3 Obtain approval from Departmental Representative prior to use of pre-packaged repair concrete material for site mixing. Submit product data.

.4 Slump values are before addition of plasticizer. Add plasticizer as approved by Departmental Representative to achieve workability. Pay for all plasticizer required to achieve workability.

.5 In sufficient time before placement, submit the repair concrete mix designs to the Departmental Representative for approval. No concrete shall be placed before the design is approved.

.6 Obtain the Departmental Representative's approval before using chemical admixtures other than those specified.

.7 Provide Quality Management Plan to ensure verification of concrete quality to specified performance.

.8 Use of Calcium Chloride not permitted.

.9 Total repair concrete mix shall not contain more than 0.1% chloride ion by weight of cement.

**Part 3 Execution**

**3.1 PREPARATION**

.1 Obtain Departmental Representative's approval before placing concrete. Provide 24 hours minimum notice prior to placing of concrete.

.2 Place consolidate, finish, cure and protect concrete to CAN/CSA A23.1, except where specified otherwise.

.3 Pumping of concrete is permitted only after approval of equipment and mix.

.4 Secure in position reinforcing steel, embedded parts, etc., prior to placing concrete and ensure these are not disturbed during concrete placement.

.5 Secure in position anchor bolts during placement of concrete. Place anchor bolts with templates.

.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 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.8 Do not place load upon new concrete until authorized by Departmental Representative.

.9 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilities placing with minimum of rehandling, and without damage to existing structure or work.

.10 Ensure that reinforcement and formwork are thoroughly clean before placing.

.11 Remove all rust and chlorides from existing steel prior to application of cement paste primer.

.12 Place concrete in dry conditions.

.13 Roughen surface of parent concrete and remove all loose material prior to application of cement paste primer.

.14 Apply cement paste primer to prepared surfaces of parent concrete and coat all exposed rebar surfaces. Apply immediately prior to placement of repair concrete.

.15 For latex-modified repair concrete, use mobile mixer to mix with latex. Mix for three minutes or as recommended by manufacturer. Do not over mix. Mix, place and finish within 30 minutes.

.16 Do not allow cement paste primer to dry prior to placing repair concrete.

.17 Where form fixing requirements do not allow placement of repair concrete within sufficient time before cement paste primer is dry, apply repair concrete directly to parent concrete prepared as follows:

.1 Parent concrete shall be kept continuously wet for a period of 24 hours prior to repair. Prior to placing repair concrete, pat surface of parent concrete dry and remove free water.

.18 Ensure reinforcement and inserts are not disturbed during concrete placement.

.19 Protect previous work from staining.

.20 Bond fresh concrete to hardened concrete to CAN/CSA A23.1.

.21 Do not permit vertical free fall of concrete mix to exceed CSA maximum limits.

.22 Concrete trucks, highway traffic or any other vehicles are not permitted to drive on reinforcing mats.

.23 Preparation of Bridge Decks for Application of Asphaltic Plug Joint Material:

.1 Treat the existing surface of the concrete by abrasive blast cleaning, or other methods approved by the Departmental Representative to achieve a sound, laitance-free concrete surface. Remove any curing compounds.

.2 Remove all dirt and debris and clean with a jet of oil-free compressed air to remove all dust and foreign material immediately prior to application of binder.

.24 Sizes, location and configuration of existing reinforcing steel are based on existing drawings when available. Confirm all existing rebar conditions and report discrepancies to Departmental Representative prior to commencing work.

.25 For concrete coating installation, apply coating over mechanically cleaned surface. Surface must be clean, dry and free of all contaminants. Coating application must also follow manufacturer's recommendations.

## 3.2 CONSTRUCTION

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

.2 Construction Joints:

.1 Construction joint locations shall be approved by the Departmental Representative wherever they are not specifically designated on the drawings.

.3 Prior to removal of any concrete from load-bearing structure, provide adequate temporary bracing and shores to support the structure during the work.

.4 Determine areas of existing concrete to be removed including all loose, damaged, deteriorated or unsound concrete. Consider extending the area to some line where the boundary of the new work will fit in with a feature of the structure.

.5 Mark Repair Areas:

.1 Chalk used for chalk-lining sawcuts shall not be red or any colour with a dye that would stain the concrete. Use white or light grey chalk only.

.6 Sawcut around areas of existing concrete to be removed:

.1 Pre-drill corners.

.2 Cut the edges of the area to be removed with a perpendicular sawcut. Overhead areas excluded.

.3 Do not cut through reinforcing bars.

.4 For areas where sawcutting is not possible, use chipping tools to remove concrete. Ensure that edges of repair area are cut perpendicular to the surface.

.5 Mark the repair area prior to cutting. Avoid sharp acute angles and re-entrant corners.

.6 Slightly roughen sawcut face with a needle gun prior to placement of repair concrete.

.7 Finish the concrete in such a way as no joint is visible between parent concrete and new repair concrete. Overlap the new concrete over parent concrete to avoid visible joint.

.8 If additional areas are found after concrete removal, the new perimeter shall be sawcut as per procedure above.

.7 Remove all loose, damaged, deteriorated or unsound concrete from within sawcut boundaries down to sound concrete in existing deck, abutments and piers.

.1 Where corroded reinforcing steel is exposed, continue to remove the concrete to expose the bars completely with minimum 25mm clearance behind the bars or as noted on drawings. Continue to expose reinforcing steel along its length until at least 50mm of sound, rust-free metal is exposed.

.2 In deck soffit repairs, provide profile of removed concrete to allow escape of air during re-casting. Do not drill vent holes through the deck.

.3 Remove concrete in a manner so as to prevent damage to adjacent concrete, other components and utilities that are to remain in place. Reinforcing steel, prestressing tendons, shear connectors, structural steel and other components that are to remain in place shall not be damaged or loosened.

.4 Hammers shall not come in contact with reinforcing bars, which may cause debonding of bars in adjacent concrete areas not being repaired.

.5 Concrete removal shall not be permitted within 1 m of newly placed concrete for a period of 72 hours.

.6 Extend removals to existing nearby vertical and horizontal construction joints and edges where applicable.

.7 Do not feather edges of repair concrete. Remove existing concrete to 25mm minimum depth at edges of patch area.

.8 Maximum permissible size of chipping hammers to be 3.2 kg. Vehicle driven chipping hammers are not permissible unless authorized by departmental representative.

.8 Drill holes, provide dowels and grout as indicated.

.9 After removal of damaged concrete, remove loose particles and dust with high pressure water or vacuum cleaning. Provide equipment with oil trap where air blowing is used.

.10 Clean all reinforcement with loose corrosion or pits with water abrasive blast cleaning to achieve SSPC-SP6, commercial blast clean.

.11 Where area of concrete removed with exposed reinforcing exceeds 2 $m^2$, re-tie reinforcing steel at every second intersection point and secure in place prior to placement of repair concrete.

.12 Where existing reinforcing steel is found to have greater than 15% loss of section, provide additional new bars to splice with existing unless noted otherwise.

.13 Water blast exposed sound concrete and treat with approved cement primer.

.14 Concrete debris shall be removed completely from the site. Dispose of debris in accordance with applicable environmental regulations and in such a manner as to prevent any unsightly appearance from the highway.

.15 Apply repair concrete to prepared surfaces immediately after placement of cement paste primer.

.16 Concrete shall not be placed on or against any surface (including rebar) that is at a temperature below 5°C.

.17 Concrete at time of deposit shall be between 10°C and 30°C.

.18 Pour concrete continuously between predetermined construction joints.

.19 Carry out winter concreting in strict accordance with CSA A23.1/A23.2.

.20 Repair Cracks in Sound Concrete:

.1 Repair cracks in sound concrete as indicated on drawings. Repair shrinkage cracks that develop in new concrete repairs and along the cold joints between new and existing concrete. Conduct patch repair for wider cracks and for cracks in unsound concrete.

.2 Remove laitance, curing, compounds, dust, dirt, sludge, oil and other debris from surfaces prior to application of crack repair.

.3 All concrete surfaces shall be dry unless a water-insensitive coating is used. Surface temperature shall be at least 4°C.

.4 Install injection ports at appropriate intervals to accomplish full penetration of injection material.

.5 Seal the exposed crack between the injection ports with epoxy based crack sealant.

.6 Install injection epoxy sealant material with pressure.

.7 Immediately remove excess epoxy sealant applied or spilled beyond desired areas.

.8 Remove all injection ports by grinding or other appropriate method. Fill core holes with grout.

.21 Asphaltic Plug Joints:

.1 Asphaltic plug joints shall be supplied, installed and tested in accordance with ASTM D6297.

.2 Pre-mix manufacturer's specified aggregate with binder. Fill the joint block-out with mix as recommended by manufacturer. Compact to level with the roadway. Broadcast clean, dry sand (colour to match adjacent roadway surface) on top of a hot-applied binder top coat in accordance with manufacturer's recommendations.

.3 Joint installer shall ensure that the materials are installed in accordance with manufacturer requirements.

.4 Install in accordance with ASTM D6297.

## 3.3 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated and paid by Departmental Representative in accordance with CSA A23.1/A23.2.

.2 For compressive strength testing of concrete, 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 $m^3$ or fraction thereof;

.5 Additional test specimen shall be taken whenever requested by the Departmental Representative to verify the concrete quality;

.6 Additional test specimen shall be taken during cold weather concreting.

.3 Cure cylinders on job site under same conditions as concrete which they represent.

.4 Non-Destructive Methods for Testing Concrete shall be in accordance to CSA A23.1/A23.2.

.5 Inspection and testing by testing laboratory will not augment or replace Contractor quality control, nor relieve Contractor of his contractual responsibility.

## 3.4 CONCRETE COVER OVER REINFORCEMENT

.1 Ensure reinforcing steel is placed to specified tolerances.

.2 Concrete cover around reinforcing steel shall be as follows unless noted on drawings:

.1 Cast again soil – 100mm

.2 Substructure above grade – 70mm

.3 Deck soffit – 50mm (maintain 40mm at drip)

.4 Top of deck with asphalt – 70mm

.5 Top of deck as wearing surface – 80mm

.6 Curbs – 70mm

.7 Other conditions as noted on drawings.

.3 The preceding clear covers to be maintained in accordance with CSA S6.

.4 Provide continuous supervision during the placement of concrete to ensure that the reinforcing steel is maintained in its correct position.

.5 Notify Departmental Representative where existing reinforcing steel to remain in place does not allow for requirements noted above.

## 3.5 FINISHING

.1 Finish concrete in accordance with CSA A23.1/A23.2.

## 3.6 CURING

.1 Complete all finishing operations before the repair concrete starts setting.

.2 Protect freshly finished surface from rain, running water or other damaging effects.

.3 Cure concrete in accordance with CSA A23.1/A23.2.

.4 Ensure that freshly placed concrete is protected from freezing, dehydration, mechanical shock and contact with injurious substances.

.5 Keep concrete moist by light water spray immediately after initial set, until curing methods are in place.

.6 Use curing compounds compatible with applied finish on concrete. 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 where finishes are incompatible with curing compound.

.7 Protect the concrete from premature drying and extremes of temperature, and cure at a temperature of at least 10°C for a minimum period of 3 days.

.8 Foot traffic shall be kept off curing concrete for 1 day.

.9 Allow concrete bridge deck repairs to air dry after curing for a minimum period of 48 hours prior to waterproofing.

.10 Vehicles shall be kept off new concrete for 7 days.

## 3.7 CONCRETE SEALING

.1 After all concrete patch repairs have cured and surface of concrete is dry, apply one coat of silane concrete sealer uniformly to patch repair surfaces.

.2 First application: 165 ml/$m^2$.

.3 Do not apply silane concrete sealer to damp surface.

## 3.8 DRILL AND EPOXY GROUT ANCHORAGE

.1 Set anchors or rebar into existing concrete in clean, dry holes of standard length and size as indicated by product manufacturer.

.2 Install anchors in strict adherence to manufacturer's specifications.

.3 Use only those injection tools and static mixing nozzles as recommended by manufacturer.

.4 Do not drill through existing rebar. Relocate drill hole as approved by Departmental Representative.

.5 Comply with edge distances as noted and as specified by manufacturer.

## 3.9 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.

## 3.10 TOLERANCES

.1 Concrete tolerance in accordance with CSA A23.1/A23.2.

**END OF SECTION**

## Part 1 General

### 1.1 STEELWORK INCLUDES

.1 Anchors, Anchor Bolts and Spacers.

.2 Sole Plates, Masonry Plates and Bevelled Plates.

.3 Barrier Cover/Armour Plates.

.4 Miscellaneous Steel Components.

### 1.2 RELATED SECTIONS

.1 Section 01 29 00 – Payment Procedures

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 35 29.06 – Health and Safety Requirements

.4 Section 01 35 43 – Environmental Procedures

.5 Section 01 61 00 – Common Product Requirements

.6 Section 01 74 11 – Cleaning

### 1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 The measurement and payment procedure for this section shall meet the requirements in Section 01 29 00 - Payment Procedures.

### 1.4 REFERENCES

.1 CSA International:

.1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.

.2 CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CAN/CSA S6-06, Canadian Highway Bridge Design Code.

.4 CSA S16-09, Design of Steel Structures.

.5 CSA W59, Welded Steel Construction.

### 1.5 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 structural steel and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements, and Section 01 35 43 - Environmental Procedures.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by a Professional Engineer registered or licensed within the Province of New Brunswick.

.2 Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners, rivets and welds. Indicate welds by CSA W59, welding symbols.

.3 Proposed welding procedures to be stamped and approved by Canadian Welding Bureau.

## 1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Provide protective blocking for lifting, transportation and storing.

.1 Exercise care during fabrication, transportation and erection of joints and bicycle railings.

.2 Do not cause excessive stresses.

.2 Mark mass on members weighing more than three (3) tonnes.

.3 Protect unpainted weathering steel, before erection, with waterproof covering.

.4 Ensure that no portion of steel comes into contact with ground.

## 1.7 QUALITY ASSURANCE

.1 Pre-construction Testing:

.1 Provide suitable facilities and cooperate with the Departmental Representative in carrying out inspection and tests required.

# Part 2 Products

## 2.1 BEARING SOLE, MASONRY AND BEVELLED PLATES

.1 Structural Steel Plates: to CSA G40.21, Grade 300W galvanized.

.2 Hot Dip Galvanizing: to CSA G164, Table 1, minimum zinc coating of 600 g/m$^2$.

.3 Field touch-up of galvanizing at field weld locations to be minimum two coats of brush applied zinc rich epoxy.

.4 Welding: to CSA W59.

## 2.2 BEARING ANCHOR RODS

.1 Anchor Rods: to ASTM F1554 Grade 105 galvanized.

.2 Hot Dip Galvanizing: to CSA G164, Table 1, minimum zinc coating of 600 g/m$^2$.

## 2.3 STEEL BICYCLE RAILINGS, CONNECTION BRACKETS, AND BARRIER COVER PLATES

.1 All steel bicycle railings, connections brackets, and barrier cover plates shall be supplied, fabricated and installed in accordance with the design drawings.

.2 Structural Steel HSS: to CSA G40.21, Grade 350W Class C galvanized.

.3 Structural Steel Plates: to CSA G40.21, Grade 300W galvanized.

.4 High Strength Bolts, Nuts and Washers: to ASTM A325M galvanized.

.5 Anchor Bolts: to ASTM F1554 Grade 55 galvanized.

.6 Hot-Dip Galvanizing: to CSA G164, Table 1, minimum zinc coating of 600 $g/m^2$.

.7 Welding: to CSA W59.

**2.4 MISCELLANEOUS STEEL WORK**

.1 All other miscellaneous steel work shall be supplied, fabricated and installed in accordance with applicable CSA International Provisions.

**2.5 SOURCE QUALITY CONTROL**

.1 Steel Producer Qualifications: certified in accordance with CSA G40.21/G40.21.

**Part 3 Execution**

**3.1 EXAMINATION**

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for structural steel installation in accordance with manufacturer's written instructions.

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

.2 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 Clean steel surfaces as directed by Departmental Representative when staining or defacing occurs.

.2 Prepare areas for field welding in accordance with CSA W59.

**3.3 CLEANING**

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

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

**END OF SECTION**

## Part 1 General

### 1.1 RELATED SECTIONS

.1 Section 01 35 43 – Environmental Procedures

### 1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM):

.1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-07, Standard Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort (12,400 ft-lbs/$ft^3$) (600 kN-m/$m^3$).

.5 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

### 1.3 DEFINITIONS

.1 Excavation Classes: three (3) classes of excavation will be recognized; common and rock excavation.

.1 Common Excavation: excavation of materials of whatever nature, other than rock excavation, including those unsuitable for use in work or surplus to requirements.

.2 Rock Excavation: excavation of solid rock materials, including naturally occurring boulders that are one (1) cubic metre or larger in volume, from the project area to provide required road grades which cannot be removed by conventional excavation equipment.

.3 Channel Excavation: excavation and placing of material excavated for improvement of existing watercourses and watercourse channel realignments.

.2 Unsuitable Materials:

.1 Weak and compressible materials under excavated areas.

.2 Frost susceptible materials under excavated areas.

.3 Frost Susceptible Materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

.2 Table:

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

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

.4 Unshrinkable Fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

## 1.4 QUALITY ASSURANCE

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

.2 For design of any temporary structures submit design and supporting data at least 2 weeks prior to installation or construction.

.3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Brunswick, Canada.

.4 Keep design and supporting data on site.

.5 Engage services of qualified professional Engineer who is registered or licensed in Province of New Brunswick, Canada in which work is to be carried out to design and inspect shoring, bracing and underpinning required for work.

## 1.5 SHORING, BRACING AND UNDERPINNING

.1 Shoring, bracing or underpinning may be required to prevent undermining of adjacent structures, underground utilities and/or traffic areas.

.2 Comply with safety requirements and applicable local legislation to protect existing features.

.3 Engage services of qualified professional engineer who is registered in the Province of New Brunswick to design and inspect cofferdams, shoring, bracing and underpinning required for work.

.4 At least 2 weeks prior to commencing work, submit design and supporting data.

.5 Design and supporting data submitted to bear the stamp and signature of qualified Professional Engineer licensed in the Province of New Brunswick.

# Part 2 Products

## 2.1 MATERIALS

.1 Class A Gravel:

.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.

.1 Gradation to follow Table 201-2 (Crushed Rock) for Granular Sub-Base.

.4 Gravel Base shall have a minimum of 40% of the particles, by mass, having at least one fractured face, when tested in accordance with ASTM D5821.

.5 Rock and Gravel materials shall conform to the physical properties of Table 201-1 of the NBDTI Standard Specifications.

.2 Unshrinkable Fill – very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

## Part 3 Execution

### 3.1 SITE PREPARATION

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

.2 Sawcut pavement neatly along limits of proposed removal in order that surface may break evenly and cleanly.

### 3.2 DEWATERING

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

.2 Protect open excavations against flooding and damage due to surface runoff.

.3 Dispose of water in accordance with Section 01 35 43 – Environmental Procedures to approved runoff areas and in manner not detrimental to public and private property, existing facilities, or portion of work completed or under construction.

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

.4 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

### 3.3 EXCAVATION

.1 During excavation, keep waste asphalt materials separate from excavated soil materials, and dispose of them in accordance with applicable permits.

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

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

.4 Dispose of surplus and unsuitable excavated material in approved location off site.

.5 Do not obstruct flow of surface drainage.

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

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

.8 Obtain Departmental Representative's approval of completed excavation.

.9 If encountered, remove unsuitable material from excavation bottom, including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.10 Naturally occurring boulders, after being measured by the Departmental Representative, shall be placed as directed by the Departmental Representative.

.11 Invasive soil species in areas indicated on the drawings or as identified by the Departmental Representative are to be excavated and removed and disposed at an approved location outside the Park boundary.

## 3.4 FILL TYPE AND COMPACTION

.1 Use types of fill as indicated, and compacted in accordance with the requirements stated elsewhere in this specification.

## 3.5 BACKFILLING

.1 Do not proceed with backfilling operation until Departmental Representative has inspected and approved installations.

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

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

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

.5 Backfilling around Installations:

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

.3 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 1.0 m.

## 3.6 RESTORATION

.1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.

.2 Clean and reinstate areas affected by work as directed by Departmental Representative.

.3 Restore site to its normal state prior to excavation.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 32 32 34 - Segmental Concrete Retaining Walls

### 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 32 32 34 – Segmental Concrete Retaining Walls.

## 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 WORK

.1 Section 01 74 21 – Construction/Demolition, Waste Management and Disposal

### 1.2 MEASUREMENT AND PAYMENT

.1 No measurement for payment will be made under this section.

### 1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM):

.1 ASTM C127-07, Test Method for Material Finer than 75 $\mu$m Sieve in Mineral Aggregate by Washing.

.2 ASTM C131-06, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

### 1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition, Waste Management and Disposal.

## Part 2 Products

### 2.1 RIP RAP

.1 Hard, dense, durable quarry stone, free from seams, cracks or other structural defects likely to impair its soundness during handling or by the actions of water and ice. Rip Rap to be placed at extents shown on contract drawings. Shale, slate or rocks with thin foliations shall not be acceptable. The greatest dimension of each stone shall not exceed two times the least dimension. The minimum density of the stone shall be 2,650 kg/m$^3$. Physical properties shall be defined as:

| Property | Test Method | Rip Rap |
|---|---|---|
| Absorption % maximum | ASTM C 127 | 1.5 |
| Los Angeles Abrasion, % maximum | ASTM C 131 | 35 |

Rip Rap is to be locally sourced with color to blend with rock visible at bridge site such that the end product blends well with the surrounding environment. The stone source and color shall meet with the approval of the Departmental Representative prior to transport and installation. Rip Rap the size distribution as indicated in the New Brunswick Department of Transportation and Infrastructure specification book.

## Part 3 Execution

### 3.1 PLACING

.1 Where Rip Rap is placed on slopes, excavate trench at toe of slope to dimensions as indicated.

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

.3 Place Rip Rap to thickness and details as indicated.

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

.5 The Rip Rap shall be placed to the lines and grades shown on the drawings or as directed by the Departmental Representative. Placement shall be by machine in order to avoid waste and to ensure that the stone is in a stable position.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

| | | |
|---|---|---|
| .1 | Section 03 30 00 | Cast-in-Place Concrete |
| .2 | Section 31 23 10 | 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 New Brunswick.

.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 10 – 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 SCOPE OF WORK

.1 This section specifies topsoil, topsoil amendments, the stripping of topsoil, the preparation of existing grades, the placement of topsoil, and finish grading.

### 1.2 RELATED REQUIREMENTS

.1 Section 32 92 19.16 – Hydraulic Seeding

### 1.3 REFERENCES

.1 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure, Item 613.

### 1.4 QUALITY ASSURANCE

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

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

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

### 1.5 TESTING

.1 All soil and sand used in this project shall be tested for compliance with texture specification by a laboratory designated by the Owner. Soil sampling, testing and analysis to be in accordance with Provincial regulations and standards. Contractor will arrange and pay for cost of tests.

### 1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

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

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

## Part 2 Products

### 2.1 TOPSOIL

.1 Topsoil for this project to consist of topsoil stripped from site and imported topsoil to be supplied by the Contractor, if required. The Contractor shall obtain imported topsoil locally and obtain approval from the Departmental Representative prior to importing

topsoil. The Departmental Representative will verify the location and/or stockpile of imported topsoil for any invasive species of plant that could be present.

.2 Topsoil composition shall consist of 20 to 70% sand and contain 2 to 10% organic matter by weight.

.3 Topsoil shall be free of debris and stones larger than 75mm in greatest dimension and large clods, roots and any other coarse vegetative material, of a size equal to or greater than the thickness of the layer of topsoil to be placed.

.1 In areas of lawn restoration, topsoil shall be free of debris and stones larger than 25mm in greatest dimension.

**2.2 SOURCE QUALITY CONTROL**

.1 The Contractor shall notify the Departmental Representative of the source(s) of topsoil to be obtained from outside the Work Site, at least 7 days prior to importing material from off site.

## Part 3 Execution

**3.1 STRIPPING OF TOPSOIL**

.1 Commence topsoil stripping of areas after all wood brush and grasses have been removed from site.

.2 Strip and pulverize topsoil to depths as indicated. Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.

.3 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 metres.

.4 Unused topsoil is to remain on site.

.5 Protect stockpiles from contamination and compaction.

**3.2 PREPARATION OF EXISTING GRADE AND PLACEMENT OF TOPSOIL**

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative.

.2 Areas to be topsoiled shall be scarified or otherwise loosened to a depth of at least 50mm within 1 day preceding the placement of topsoil.

.3 Topsoil placement in the Work Area shall be completed prior to the placement of any Roadbed materials above Subgrade, unless otherwise approved by the Departmental Representative.

.4 Topsoil shall be spread on the prepared area(s) to a depth of 100mm±25mm and shall be brought to a true and even surface meeting the required grade.

.1 Hand placement and raking shall be required in areas adjacent to finished lawns or in areas of restricted access.

.2 In areas of lawn restoration, topsoil shall be rolled using a lawn roller or approved equivalent.

.3 Topsoil shall be placed on foreslopes from Subgrade shoulder down in cuts and fills, including the slopes of the Borrow "A" quality material as identified in the Contract Documents; and on backslopes or as directed by the Departmental Representative.

.4 Placing of topsoil shall not be carried out on frozen materials or when materials are wetted to such a degree that balling and clumping results.

.5 Topsoil shall not be placed after the end of the week in which September 30th occurs without approval of the Departmental Representative.

.6 If excess topsoil material exists after completion of the Work, this material shall remain the property of the Owner.

## 3.3 ACCEPTANCE

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

## 3.4 CLEANING

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

.2 Clean all exposed rock and boulder surfaces to approval of Departmental Representative.

**END OF SECTION**

## Part 1 General

### 1.1 RELATED REQUIREMENTS

.1 Section 32 91 19.13 – Topsoil Placement and Grading

### 1.2 REFERENCES

.1 Standard Specifications for Highway Construction and Maintenance, New Brunswick Department of Transportation and Infrastructure, Items 614, 615 and 616.

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

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

### 1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Labelled bags of seed and fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number. 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.

.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 Seed and fertilizer shall be kept dry and protected from direct sunlight and other detrimental conditions.

.1 Seed and fertilizer that have been subjected to moisture shall not be used.

## 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

### 2.1.1 SEED

.1 All materials shall be supplied by the Contractor.

.2 Seed mix shall be as per Table 614-1 (Roadside Mix) of the NBDTI Standard Specifications, which includes the following species, by mass:

.1 40% Creeping Red Fescue;

.2 20% Hard Fescue;

.3 15% Canada Blue Grass;

.4 5% Alsike or White Clover;

.5 15% Annual Rye Grass;

.6 5% Red Top

.3 Fertilizer shall be a 15-25-15 (N-P-K) mix for seeding done May 1st to Labour Day and 10-20-20 (N-P-K) thereafter.

.4 Water shall be free of any impurities which would inhibit germination of the seed.

.5 Hydraulic mulch for hydroseeding as specified in Table 614-3 shall be a product made primarily for use in hydroseeding, and shall consist of shredded wood fibres, shredded newsprint coloured green with an environmentally acceptable dye, or shredded straw mixed with raw cotton fibres and/or shredded newsprint.

.1 Hydraulic mulch shall form a homogeneous slurry when agitated or mixed in water with the other specified materials and shall contain no growth-inhibiting chemicals or compounds.

.6 When applied, the hydroseeding mix shall be capable of forming an absorptive mat, which will allow moisture to percolate into the underlying soil.

.7 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.

.8 Binder may be supplied in liquid, flake or powder form.

.9 Applications rates shall be as per Table 614-3 of the NBDTI Standard Specifications and may vary by ±15%, depending on ground conditions.

.1 The application rate for the seed mix shall be a minimum of 125 kg/ha.

.2 The application rate for fertilizer shall be a minimum of 375 kg/ha.

.3 The application rate for the hydraulic mulch shall be a minimum of 500 kg/ha.

.4 The application rate for the binder shall be as per manufacturer's recommendations.

### 2.1.2 MULCH

.1 All materials shall be supplied by the Contractor.

.2 Mulch shall be locally grown straw and supplied in either of the following forms:

.1 Unprocessed form such as bales or rolls, free of noxious weeds and other undesirable material, and not so wet, decayed or compacted so as to inhibit even and uniform spreading; or

.2 Approved equivalent

.3 When applied the mulch shall form an absorptive mat, which will allow moisture to percolate into the underlying soil.

.4 Binder for mulch must be capable of joining together the mulch particles to secure the mulch to the ground and shall remain effective for 60 days from the time of application.

.5 Binder for mulch shall not form an impervious seal which would prevent the penetration of moisture to the underlying soil.

.6 Binder may be supplied in liquid, flake or powder form

.7 Water shall be contaminant-free and obtained from a source approved by the appropriate regulatory agency.

.8 Approved unprocessed straw mulch shall be spread evenly and uniformly at a rate of 4500kg/ha ±15%.

.1 Lumps and thick clumps of mulch shall be broken apart and dispersed.

.2 Binder shall be mixed in a solution of water with sufficient green dye or green-coloured wood-fibre or paper mulch and sprayed uniformly over the mulched ground.

.3 Binder application shall be completed within 48 hours after the unprocessed straw has been placed

## Part 3 Execution

### 3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections 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 PROTECTION OF EXISTING CONDITIONS

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

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

### 3.3 PREPARATION OF SURFACES

.1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water or temperatures which inhibit seed germination unless otherwise approved by the Departmental Representative.

.2 Areas to be hydroseeded shall be free of ruts, ridges, and deleterious materials such as weeds, sticks, roots and large rocks which would impede growth of the seed mix and mowing.

.1 Stones greater than 75mm in the least dimension shall be removed and disposed of outside the work area.

.3 Final shaping of slopes shall include 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 no sooner than 2 days prior to hydroseeding. Scarifying can be made by means of dozer treads or any other mechanical means such that scarifications meet the above noted specifications.

.2 Hydroseeding will not permitted on hardened, crusted or rutted soil.

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

### 3.4 HYDRAULIC SEEDING

.1 The Contractor shall carry out the work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative.

.2 The hydraulic mulch, seed, fertilizer and binder 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.

.3 Binder shall be used for all hydroseeding work.

.4 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.

.5 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 tower gun nozzle or extension hose.

.6 Hydroseeding shall be carried out in all cases withing 2 days after completion of the surface preparation, as defined by Section 3.3.

.1 The Departmental Representative shall approve and pre-measure all areas to be hydroseeded, in advance of the commencement of the hydroseeding of any area.

.2 The Departmental Representative shall be notified at least 24 hours in advance of the application of the hydroseeding.

.7 Hydroseeding done between May 1st and Labour Day must produce a satisfactory growth over at least 95% of the area hydroseeded in the growing season of that year.

.1 Areas of poor or no growth shall be reseeded as determined by the Departmental Representative.

.8 After Labour Day, and up to the end of the week in which September 30th occurs, only Hydroseed BM (Municipal Mix), incorporating a 10-20-20 fertilizer mix as per 2.1.1.3.

.1 The straw mulching operation, which forms part of the Hydraulic Seeding, shall be carried out within 48 hours of the hydroseeding operation.

.2 Growth will be based on the performance during the next growing season as per the conditions of 3.4.7.

.9 No hydroseeding shall be carried out after the week of September 30th without the prior approval of the Departmental Representative.

## 3.5 MULCH

.1 The Contractor shall carry out the work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative.

.2 Mulch shall be applied with binder at the manufacturer's recommended application rate.

.3 The Contractor shall maintain the mulched areas until mulch is no longer required during the Contract period.

.1 The Contractor shall apply additional mulch as required, to restore the area(s) exposed after the initial application of mulch.

.4 Ditches and areas requiring the hand placement of mulch may, subject to the approval of the Departmental Representative, be placed without binder.

**3.6 CLEANING**

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

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

.2 Keep pavement and adjacent areas clean and free from mud, dirt and debris.

.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.

**3.7 PROTECTION**

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

.2 Remove protection devices as directed by Departmental Representative.

**3.8 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.

**3.9 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.

**3.10 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**

# APPENDIX

# A

# PARKS CANADA BASIC IMPACT ANALYSIS

# Parks Canada Basic Impact Analysis

**1. PROJECT TITLE & LOCATION:** Structural Rehabilitation of the Bennett Brook Culvert, Fundy National Park

**2. PROPONENT INFORMATION**

Mark Belliveau2
Eastern Highway Engineering Services Manager
Parks Canada / Government of Canada
1045 Main St, Unit 114, Moncton, NB E1C 0N5
mark.belliveau@pc.gc.ca / Tel: 506-851-4660 / Cell: 506-871-2225

**3. PROPOSED PROJECT DATES**

Planned commencement: May 1, 2019
Planned completion: October 15, 2019

**4. INTERNAL PROJECT FILE #:** NBSouth-2019-EIA-1

**5. PROJECT DESCRIPTION**

Highway 114 is the main transportation route connecting Albert with Kent and Westmorland counties in the southeast corner of New Brunswick (Appendix II). Approximately 21.3 km of this highway passes through Fundy National Park. It is the main through way that link the park to other roads in the provincial network. This section of highway is federally owned and operated by Fundy National Park. It is managed and maintained in accordance with the adjacent provincial Highway 114 standards that is operated and managed by the New Brunswick Department of Transportation.

A number of culverts and bridges are located along this section of Highway 114 to facilitate the flow of water from various streams, brooks and lakes. The Bennett Brook culvert, located under Highway 114 at the outlet of Bennett Lake (Figure 1), enables water from Bennett Lake to flow downstream into Bennett Brook. Recent inspections indicate that the Bennett Brook culvert is deteriorating and in need of repairs. Failure to mitigate the current issues could result in a collapse of the structure and cause interruption in the normal flow of traffic through Fundy National Park.

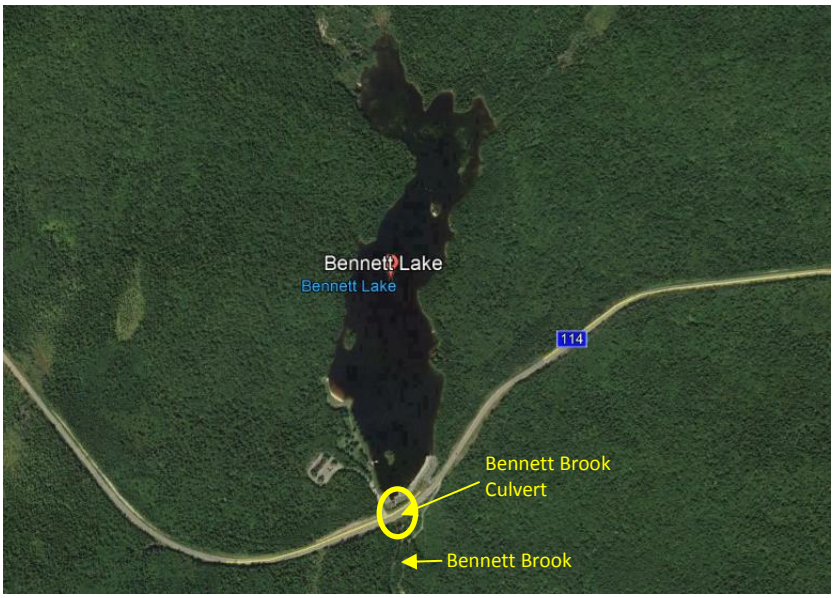


Figure 1: Bennett Brook Culvert, Fundy National Park

The original culvert was constructed sometime prior to 1955 during the realignment of Highway 114 when the covered bridge was still operational (Figure 2). The original design had a twin cell concrete box culvert

with two 3658 x 2438 mm openings. The culvert was later modified and two corrugated steel multi-plate pipe arches were inserted inside each cell and the space between the steel liners and original box was grouted with concrete (Figure 3). A dual concrete box extension and wingwalls were constructed at the outlet in 1972 (Figure 4).

Figure 2: Construction of Original Culvert Prior to 1955

Figure 3: Culvert Inlet View

Figure 4: Culvert Outlet View

An inspection conducted in 2016 revealed that the inlet and outlet concrete wingwalls and the corrugated steel liners are in very poor shape. Severe corrosion above and below the waterline was found in the corrugated steel liners with holes rusted through some areas. Stalactite like growth was found on some bolt and seam locations throughout the 2 culverts and severe scaling was observed in other areas. The headwall at the intersection of the steel culvert and the concrete box section is in very poor condition and

cracks of various sizes are found in all wingwalls. In addition, the water levels at the outlet are also much higher since the installation of downstream riffles in 2011 causing the west wingwall foundation to be mostly submerged.

**Scope of Work**

1) Downstream Riffle Construction (Figure 5)
    - Clear vegetation to open access to downstream riffle area. This will include the removal and disposal of several invasive plants (reed canary grass).
    - Import rock to reconstruct the 4 existing riffles by placing a 210 mm thick layer of new R50 rip-rap over entire riffle. New material will be blended with existing material to achieve final required elevation and maintain original profile shapes.
    - Import rock to construct a new rifle at station 0+87, located south of the existing 4$^{th}$ riffle. The new riffle will be constructed from R50 material and will be constructed to maintain the original profile shape.

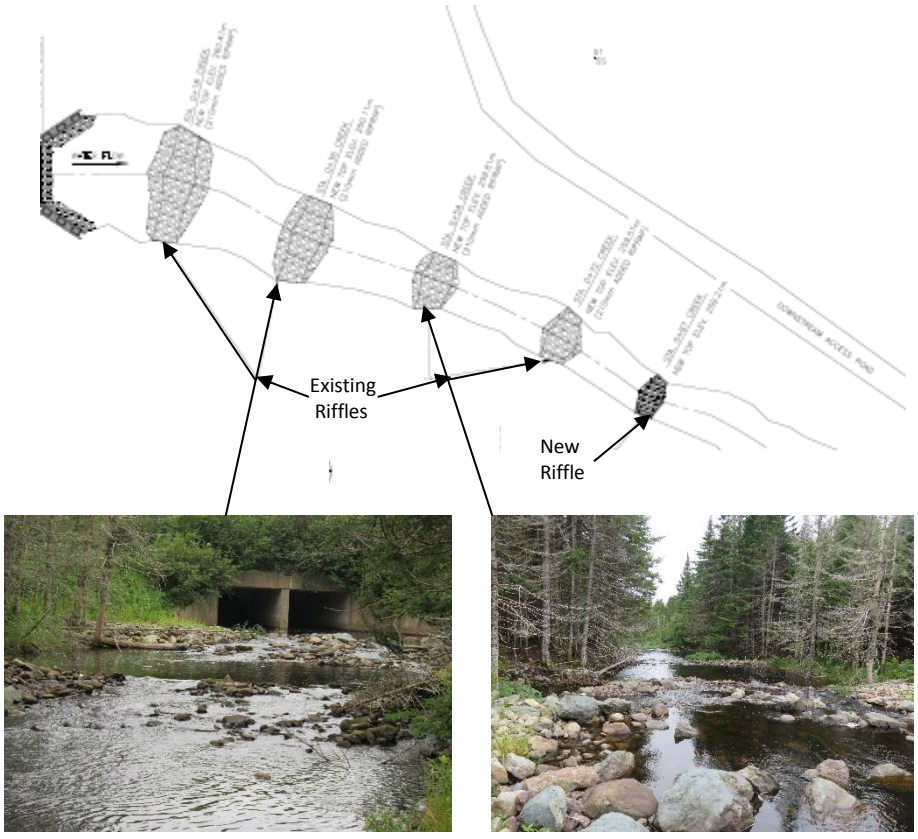


Figure 5: Existing and Proposed Downstream Riffles

2) Culvert Rehabilitation
    - Install a new 200 mm thick concrete liner to the floor of both existing CSP culverts. Liners will extend the full length of each culvert and extend up vertically for a minimum of 300 mm.

- Blend ramp height into the CSP culvert floor liner shape for the full width of the box culvert (both shafts).

3) Wingwall Rehabilitation (Figure 6)
    - Remove steel beam guide rail and posts to gain access to culvert inlet (north side). Reinstall guide rail and posts at the conclusion of work.
    - Remove vegetation and excavate soil to accommodate the placement of the new wingwall at all 4 quadrants.
    - Temporarily remove any existing rip-rap located in front of all wingwalls to facilitate construction of the new walls. Reinstate to existing conditions and add new R50 rip-rap to obtain a minimum 800 mm thickness along culvert and along full length of new retaining walls.
    - Demolish and remove existing concrete wingwalls to the top of the existing footings (footings and headwall to remain). Construct a 150 mm thick mud slab on top of remaining footings to accommodate new retaining walls.
    - Install new precast wingwall at all 4 quadrants. The top of the new wall must be stepped to match the required slope of the existing embankment.
    - Infill precast unit cores and between units with 25 mm clear stone.
    - Backfill behind retaining walls with class “A” gravel.

Figure 6: Wingwall located at Bennett Brook Culvert Outlet (South Side)

4) Inlet (North) North End Headwall (Figure 7)
    - Clean out existing drainage holes in headwall and install new sleeves to be extended through repaired wall surface.

- Repair 1.2 m long crack prior to new headwall refacing.
- Resurface lower section of north end headwall with 125 mm thick concrete surface.

Figure 7: Bennett Brook Culvert Inlet Headwall (North End)

5) Concrete Patching / Refacing / Crack Injection
    - Chip damaged areas to sound concrete and patch with new concrete flush with existing surface.
    - Transition headwall areas to be patched as required.

**Project Timing**

The project is expected to go to tender in February 2019. Following the tender period the successful Contractor will provide a more detailed construction schedule. The anticipated construction dates will be from May 1, 2019 until October 15, 2019. There is an identified sensitive period associated with tree removal and grubbing. To avoid nesting birds, this portion of the project may proceed in advance of the larger construction project to avoid the most critical period of the migratory bird breeding season, which is May 1st through August 31st. A breeding bird survey must be conducted prior to any clearing if the activity is to fall within the identified window of May 1st - August 31st. In addition to the breeding bird season, this project is time sensitive to instream work which must be completed between June 1st and September 30th to reduce risk of damage to spawning habitat, fish eggs, and juvenile fish and reduced impacts to adult and juvenile aquatic organisms that may be migrating, over-wintering or rearing.

## 6. VALUED COMPONENTS LIKELY TO BE AFFECTED

The Effects Identification Matrix located in Appendix I identifies valued components likely to be affected by this project. The components most likely to be impacted include air, soil/landforms, water/hydrology, flora, fauna, cultural resources, and visitor experience.

**Air**

Air quality is influenced by the concentrations of air contaminants in the atmosphere. Air contaminants are emitted by both natural and anthropogenic sources and are transported, dispersed, or concentrated by meteorological and topographical conditions. Air contaminants eventually settle or are washed out of the atmosphere by rain and are deposited on vegetation, wildlife, soil, water surfaces, and other objects. In some cases, contaminants may be redistributed into the atmosphere by wind.

The nearest air quality monitoring stations are located in Saint John and Moncton. Sulfur dioxide (SO2), total reduced sulphur (TRS), ground level ozone (O3), nitrogen dioxide (NO2) and fine particulate matter (FPM) are monitored at both stations. The current Government of Canada air quality health index rate both stations as low risk (https://weather.gc.ca/airquality/pages/provincial_summary/nb_e.html).

**Soils/Landforms**

Located in the Maritime Acadian Highland Region of Canada, Fundy National Park encompasses seven different biophysical land classifications, a system used to differentiate ecologically significant segments of the land surface with similar patterns of landscape, vegetation and drainage (Hirvonen and Madill, 1978). According to the Resource Description and Analysis, the Bennett Brook culvert is located within the Wet Plateau land classification system where soils are generally shallow podzols but there are localized areas of soils over 1 m thick. Soils are classified as sandy-gravelly loams in the Deed (poorly-drained) or Lomond (well drained) series.

Most of Fundy National Park is underlain by volcanic sedimentary rock and associated intrusive rocks of late Precambrain age (termed the Eastern Volcanic Belt of the Coldbrook group). The soil material covering these rocks is generally less than 1 m thick and is dominated by sandy or gravely loam that is augmented with small amounts of organic and disturbed soil components. The soils are coarse in texture and typically well drained (Cook & McKay).

**Water/Hydrology**

Bennett Brook, located within the Point Wolfe watershed (which drains an area of 130 km$^2$), flows southward from the outlet of Bennett Lake into the Point Wolfe River and discharges into the Bay of Fundy (Figure 8). According to the Resource Description and Analysis, Bennett Lake is the largest waterbody in Fundy National Park. This is largely due to the presence of a dam at its outlet which has increased its size by 50%. In 2010-11, a fish ladder was constructed adjacent to the dam to improve aquatic connectivity and allow fish migration between Bennett Lake and Bennett Brook.

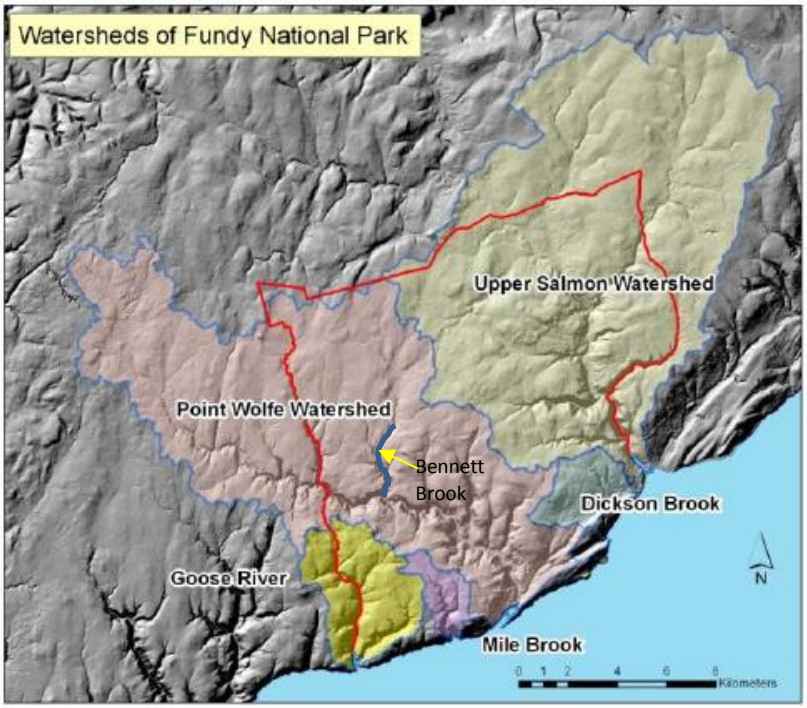


Figure 8: Watersheds of Fundy National Park

Instream work is scheduled for this project therefore a Request for Review was submitted to the Department of Fisheries and Oceans Canada – Fish Protection Program (DFO). A response was received on October 29, 2018, File #: 18-HGLF-00188, indicating that if the identified mitigation measures are incorporated, the proposed work will not result in serious harm to fish or prohibited effects on listed aquatic species at risk. As such, an authorization under the Fisheries Act or a permit under the Species at Risk Act is not required (Appendix III - Fisheries and Oceans Canada Response Letter).

DFO recommended the following mitigation measures to avoid potential serious harm to fish:

- Since work will be conducted in the dry (isolation of flow from the working area); you should consider the following:
    - Fish salvage should be conducted by a qualified biologist prior to the dewatering of any isolated section of a watercourse;
    - If any site is flooded during the works, another fish rescue should be conducted;
    - Any silt-laden water recovered should be pumped away from the watercourse, to an area with sufficient vegetation to facilitate filtration; or treated, if necessary to acceptable levels;
    - All pumps used in watercourses around the worksite should follow the "Department of Fisheries and Oceans Freshwater Intake End-of-Pipe Fish Screen Guideline (1995)".
- When switching water into the new culvert, a maintenance flow should be provided downstream to ensure no dewatering of the watercourse occurs as moderate to low flow conditions can take an extended period of time to refill;
- All rock material used should be clean and free of erodible material;
- Erosion control structures should be installed to prevent the release of sediment and/or sediment laden water from any on-land works into any waterbody or storm drain. The structure should be maintained by repairing structural problems after storm events and by removing accumulated sediment at regular intervals and disposing the sediment at an approved location;
- All exposed soils should be stabilized as soon as possible in order to control sediment runoff during and after construction;
- If any changes occur in the turbidity of the waters downstream of the sediment control area as a result of the construction activities, the work should be immediately stop to determine if further mitigation measures are required;
- All material removed from or brought to the site should be stored in a place and manner to prevent the release of sediment or other material into any watercourse;
- All instream work shall be completed between **June 1st and September 30th, 2019**.

**Flora**

With new species being identified each year, Fundy National Park is now home to some 800 plus species of vascular plants (fern, clubmosses, flowering plants), 270 plus bryophytes species (mosses and liverworts), and more than 400 species of lichens (Cook & McKay, 2010). The inlet to Bennett Brook is situated in close proximity to the Bennett Lake Day Use Area where much of the site is manicured lawns most likely consisting of non-native species. However, many native tree, shrub and plant species are found within the project limits and the riparian area of the lake and brook. Table 1 below identifies a number of

native flora species that were observed at the Bennett Lake Day Use Area during a site survey on May 29th, 2018. No species of concern were identified in the Bennett Lake area during the survey.

Table 1: Native Flora Species Identified at the Bennett Lake Day Use Area

| Common Name | Scientific Name | Common Name | Scientific Name |
|---|---|---|---|
| Balsam fir | *Abies balsamea* | Blackberry | *Rubus sp.* |
| Red spruce | *Picea rubens* | Tall meadow-rue | *Thalictrum pubescens* |
| Speckled alder | *Alnus incana* | Mountain wood fern | *Dryopteris campyloptera* |
| Leatherleaf | *Chamaedaphne calyculata* | Pale St. John's wort | *Hypericum ellipticum* |
| Blue flag iris | *Iris versicolor* | Velvet-leaved blueberry | *Vaccinium myrtilloides* |
| Lenticular sedge | *Carex lenticularis* | Low-bush blueberry | *Vaccinium angustifolium* |
| Sedges | *Carex sp.* | Bracken fern | *Pteridium aquilinum* |
| Grasses | *Poaceae* | Bristly black currant | *Ribes lacustre* |
| Rushes | *Juncus sp.* | Red-berried elder | *Sambucus racemosa* |
| Rough goldenrod | *Solidago rugosa* | Wild lily-of-the-valley | *Maianthemum canadense* |
| Small white violet | *Viola macloskeyi* | Skunk currant | *Ribes glandulosum* |
| Northern manna grass | *Glyceria borealis* | Rhodora | *Rhododendron canadense* |
| Pennsylvania bittercress | *Cardamine pensylvanica* | Small sundrops/ Little evening primrose | *Oenothera perennis* |
| Sweet gale | *Myrica gale* | | |

Fundy National Park is currently monitoring the abundance, distribution and spread of several invasive plant species including reed canary grass (*Phalaris arundinacea*), glossy buckthorn (*Frangula alnus*), Japanese knotweed (*Polygonum cuspidatum*) and woodland angelica (*Angelica sylvestris*). Varying patch sizes of all four species are co-located with native vegetation throughout the park including the Bennett Lake area (Figure 9). All four species are considered highly invasive given their potential threat to spread, rapidly reproduce and out-compete native vegetation. These species are also known to invade newly exposed soils reducing the ability for native species to germinate and survive. Continuous effort has been made by the park over the last several years to control the spread of these species. However, a survey conducted in 2018 along the Bennett Brook Trail and adjacent to Bennett Brook concluded that reed canary grass has spread considerably in the area. The Contractor will be responsible to eradicate populations of reed canary grass that fall within the project limits prior to the start of construction. Eradication efforts must follow the guidelines provided in the Fundy National Park Invasive Plant Action Plan (draft, 2014).


Figure 9: Locations of Invasive Plants in 2018

In addition to the above mentioned invasive plants, coltsfoot (*Tussilago farfara*), a non-native plant, can be found in Bennett Lake and Bennett Brook. This species is wide spread throughout the park and little to no effort has been taken to control or eradicate the species.

**Fauna**

Over 38 species of mammals reside in Fundy National Park. These mammal populations are diverse and are representative of the natural food chain, with animals ranging from top carnivores to lower herbivores and scavengers. The terrestrial animals that are most likely to be encountered include moose (*Alces alces*), coyote (*Canis latrans*), white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), beaver (*Castor canadensis*), muskrats (*Ondatra zibethicus)*, marten (*Martes americana)*, porcupine (*Erethizon dorsatum*), bobcat (*Lynx rufus)*, mink (*Mustela vison)*, and fisher (*Martes pennanti*).

American eel (*Anguilla rostrata*), listed as threatened by COSEWIC, is present in Bennett Lake and Bennett Brook. Brook trout (*Salvelinus fontinalis*), bull frog and tadpoles (*Rana catesbeiana*), red-spotted newt (Notophthalmus viridescens) and other aquatic species can also be found in Bennett Brook. Additionally, Fundy National Park is well positioned on the Atlantic migration route, and over 260 bird species have been identified in the park or on the adjacent bay (Parks Canada, 2007), 95 of these species are known to nest in the park. For the first time in recorded history a pair of Canada geese (*Branta canadensis***)** successfully nested on Bennett Lake in 2017. It is anticipated that further nesting may occur in this area.

On May 29, 2018 a breeding bird survey was conducted by park staff on the little island adjacent to the Bennett Lake Boat Concession. During the inspection an American black duck (*Anus rubripes*) was flushed from a nest on the northern end of the island. A cutch of nine eggs was observed before park staff vacated the area. In addition, a number of other migratory birds were observed in forested areas along the downstream access road adjacent to Bennett Brook including the American redstart (*Setophaga ruticilla*) (Figure 10). The American black duck, Canada goose and other migratory birds are federally protected under the Migratory Birds Convention Act. This act regulates actions against disturbing, destroying or taking the nests of migratory birds.

Figure 10: American Redstart

To avoid the most critical period of the migratory bird season, which is May 1st through August 31st, trees and ground material should be removed outside of this period. However, if there is a requirement to work in an area, remove trees and or vegetation during this critical period, a breeding activity survey must be conducted by a qualified biologist a maximum of 7 days prior to work commencing. Should breeding activity or an active nest be identified during the survey, the area must be left undisturbed with a suitable buffer zone established and maintained until the young have permanently left the vicinity of the nest. In addition, if breeding activity is observed while the work is underway, the Environmental Surveillance Officer assigned to the project will establish setback restrictions that must be followed until it can be proven that the young have permanently fledged the nest.

A survey conducted in 1988 identified six species of bats in Fundy National Park (Table 2). Although the Eastern pipistrelle (*Pipistrellus subflavus*) was identified in 1983 as a hypothetical species for occurrence in Fundy National Park, it was not recorded in the 1988 survey (Corbett *et al*, 1983). In addition, Tremblay identified that before 1979 *Myotis keeni* and *Myotis septentrionalis* were considered to be the same species. However, it was later determined that they were two different species. The 1988 survey in Fundy National Park recorded the name *Myotis septentrionalis* even though the species was considered to be *Myotis keeni* in the mammal survey of Fundy National Park.

Table 2: Bats Species Found in Fundy National Park in 1988

| SCIENTIFIC NAME | COMMON NAME | STATUS |
|---|---|---|
| *Myotis lucifugus* | Little Brown Bat | Common |
| *Myotis septentrionalis* | Northern Myotis | Rare |
| *Lasiurus borealis* | Red bat | Rare |
| *Lasiurus. cinereus* | Hoary Bat | Rare |
| *Lasionycteris noctivagans* | Silver-Haired Bat | Common |
| *Eptesicus. fuscus* | Big Brown Bat | Rare |

White-nose syndrome (WNS) is an emerging fungal disease that is severely depleting populations of bats across eastern North America. It was first detected near Albany, New York, in 2006; since then, WNS has quickly spread to 30 U.S. states and seven Canadian provinces, as of October 2018. Between 2006 and 2011, WNS was responsible for the deaths of well over one million bats across eastern North America (Government of New Brunswick Website).

White-nose syndrome was first detected in New Brunswick in a cave in Albert County near Moncton in March 2011. This cave is the province's most important bat hibernaculum (overwintering site). Approximately 6,000 bats used this site each year to overwinter. Researchers from the New Brunswick Museum discovered dead and dying bats around the entrance and inside the cave in March of 2011, and over the next few months, estimated that 80 to 90 per cent of the bat population in that cave had died. In addition, a bat that tested positive for WNS was found in Fundy National Park in March 2011 and another near Saint John in May 2011 (Government of New Brunswick Website). According to Donald McAlpine, New Brunswick Museum, 99 % of the bats from the 10 hibernacula that were being monitored in New Brunswick were lost by the spring of 2015 (McAlpine, pers. comm. 2016).

Currently, the little brown bat, northern myotis and the tri-colored bat (*Pipistrellus subflavus*) are all listed by the Species at Risk Acts as "Endangered" under Schedule 1. It was believed that all three species existed within Fundy National Park but there was no evidence to support the tri-colored bat in the 1988 survey. Any remaining bats, of these three species, in the Fundy National Park area are likely to be particularly important for the future repopulation as they may be the individuals that have a natural resistance to WNS.

Built assets can offer shelter for bats, especially in areas where suitable natural shelters are limited or absent. Built assets refer to buildings (attics, cellars, eaves, loose siding, walls, chimneys, etc.), picnic shelters, outdoor washrooms, bridges, tunnels, kiosks, signs, and other human-made structures such as culverts (Figure 11). Culverts can provide warm, dark and quiet places where bats like to roost or even hibernate. Bats do not create openings but rather use existing entry points (Parks Canada BMP for Management of Bats in Built Assets). A qualified Parks Canada representative must conduct a bat survey prior to the start of construction to ensure that there are no bats present in or around the Bennett Brook

culvert. If bats are found during the survey, the Contractor will be notified and further action will be taken by Parks Canada to protect individual bats.

Figure 11: A Bat Hanging Inside a Culvert

Eighteen species of reptiles and amphibians have been identified in the park. Five of these species are considered rare; these include the leopard frog (*Lithobates pipiens)*, the ring-neck snake (*Diadophis punctatus)*, the four-toed salamander (*Notophthalmus viridescens)*, northern dusky salamander (*Desmognathus fuscus)*, and the blue-spotted salamander (*Ambystoma laterale*). This project is not expected to have an impact on these species but it is possible that other species are present in the area.

**Cultural Resources**

Although Fundy National Park is thought to fall within the traditional territory of both the Mi'kmaq and Wolastoqiyik (Maliseet) people, no physical evidence related to their use or occupation of the park has been found. The Mi'kmaq, Wolastoqiyik (Maliseet), and Peskotomuhkatie Aboriginal Peoples have a long history in Fundy National Park and its greater ecosystem (Fundy Biosphere) region and consider the area as part of their traditional territory, a landscape woven by a labyrinth of water, over which they travelled extensively on its rivers, lakes and coastlines. These people co-occupied the region in permanent villages and semi-permanent, seasonal encampments, for purposes such as salmon fishing. To date, little archaeological evidence of past aboriginal use has been found in the park, perhaps largely due to the fact that the sites preferred for traditional encampments in this rugged landscape were also the same sites appropriated for construction of logging mills and modern communities whose activities have obliterated the archaeological record. In addition, other nearby locations, known to have been used until well within living memory, such as Indian Island near Mary's Point, are slowly being lost to coastal erosion and sea-level rise (Cook and McKay, 2010).

An Archaeological Overview Assessment (AOA) and a Cultural Resource Impact Assessment (CRIA) were requested for this project to evaluate the archaeological potential and the possible impacts of the

proposed work on known or potential archaeological resources. The AOA (Appendix IV) concluded that there is low potential of archaeological find in the project area. Most area within the project limits was heavily disturbed during the realignment of Highway 114 and the construction of the Bennett Lake Dam. In addition, the AOA identified that there was no archaeological concern with the concept design for the Structural Rehabilitation for the Bennett Brook Culvert project. As a result, further investigation through an Archeological Impact Assessment (AIA) was not recommended for the project. Mitigations measures identified in the AOA are included in this BIA to minimize potential impacts to archeological resources.

Archaeological and historical research has identified many cultural resources related to European settlement and use of the park area. Logging operations and other activities such as fishing, farming and hunting became the way of life and brought settlement to locations along the coast and the interior. According to 1862 "Topographical Map of Westmorland and Albert Counties" several homestead locations were inventoried in the Bennett Lake and surrounding area. Bennett Lake and Bennett Brook bears the name of Benjamin Bennett who according to records was the first settler in the Bennett Lake area. It appears that Bennett petition for a piece of land near the head of Bennett Brook in 1843. At the time the land was surveyed in 1845, the surveyor noted that Bennett had cleared some land, built a house and sawmill at the head of the Bennett Brook. By August of the same year a logging operation was being conducted at the south end of the lake. In the end, Bennett was not granted the title to his land and sold his operation to James and Gideon Vernon. A sawmill was in operation on the western banks of Bennett Lake when the land was surveyed in 1948 for the national park.

Around 1897 a covered bridge was constructed at the south end of Bennett Lake to facilitate passage over Bennett Brook. The covered bridge was in operation until 1955 when the highway was realigned and a culvert installed over Bennett Brook to replace the bridge. At the time of realignment, the landscape south of the highway was excavated to extract roadbed material for the highway and ramps to the Bennett Brook culvert (Figure 12).

Figure 12: Bennett Lake Covered Bridge & Area South of the Highway (1950)

**Visitor Experience**

Fundy National Park receives approximately 350 000 visitors each year. Visitors engage in several activities including camping, hiking, cycling, golfing and boating. Visitors can experiences a number of activities at the Bennett Lake Day Use Area (Figure 13). Here the park maintains an artificial sandy beach situated along the western shore of the lake. Although this beach provides an area for unsupervised swimming, visitors are free to swim any part of the lake. There are several picnic tables, designated fire pits, a fresh water spout and two open kitchen shelter for visitors to use and enjoy while partaking in leisure activities. A washroom building with changing rooms is also available for visitor convenience.

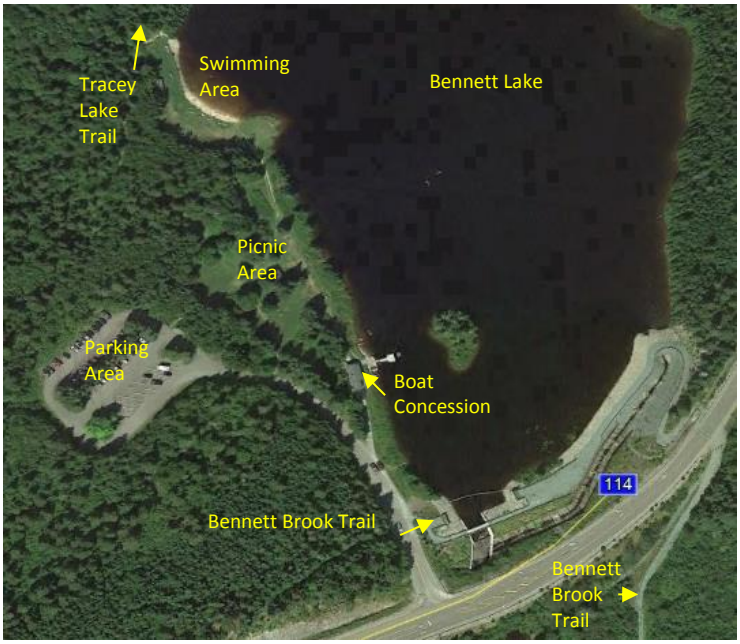


Figure 13: Visitor Opportunities at Bennett Lake

Wolfe and Bennett lakes are the only waters in Fundy National Park open to sport fishing. With the purchase of a national park fishing permit the holder of the permit can fish for brook trout anywhere on Bennett Lake. Non-motorized vessels are also permitted on all areas of the lake and visitors can rent by the hour canoes, rowboats and kayaks from the Bennett Lake Boat Concession (Figure 14). On occasion, Fundy National Park hosts guided paddles where park interpreters communicate the importance of the lake ecosystem and how it integrates with maintaining ecological integrity within the park.

Figure 14: Boating on Bennett Lake

A large paved parking area with information panels are located just west of the picnic area and can accommodate 54 regular size vehicles and 12 large recreational vehicles (Figure 13). Trailheads for Tracey Lake and Bennett Brook trails are located in the Bennett Lake area. Hikers walking the Bennett Brook or Tracey Lake hiking trails are permitted to leave their vehicles in the Bennett Lake parking lot. Both of these trails are part of the Fundy Circuit which is a 48 km loop of 7 linked hiking trails. Overnight parking is permitted for vehicles of hikers registered at backcountry campsites.

It is evident in summer that Bennett Lake is one of the most popular destinations for park visitors. On weekends more especially, the Bennett Lake area can be extremely busy, which often result in congestion on the beach and in the picnic area. During these peak times the parking area can be filled to capacity and

overflow vehicles park along the road way. Park users and those travelling on Highway 114 may experience some delays during the construction progress. However, these inconveniences should be temporary in nature and the end product will provide a safe and more enjoyable experience.

## 7. EFFECTS ANALYSIS

Described below is a list of effects that could potentially impact the identified components at risk.

**Air**

- Exhaust emissions from vehicles, equipment and small gas operated equipment could potential have an effect on air quality.
- Dust created from excavation activities and from cutting and sanding of concrete, rebar and precast wall blocks could potentially have an effect on air quality.

**Soil/Landforms**

- Potential runoff, erosion and sedimentation from excavation activities and exposed soils.
- Soil compaction from foot and equipment traffic.
- Potential loss or damage of native flora during excavation for the retaining wall and conducting modifications to the downstream riffles.
- Potential loss or damage of native fauna and habitat.
- Possible disturbance or destruction to aquatic species and habitat during the placement of riffles and the modifications to the culvert.
- Potential impact to landscape and visual aesthetics of the Bennett Lake area.
- Potential contamination of soil and/or water from potential fluid leaks and sediment release.
- Potential spread or introduction (from imported rock and topsoil material) of non-native or invasive species.
- Potential damage or change to waterways during modifications to the culvert and the downstream riffles.
- Potential dust particle pollution.
- Introduction of building materials potentially harmful to the environment.

**Water/Hydrology**

- Potential runoff, erosion and sediment release into Bennett Brook as a result of excavation and exposed soils.
- Potential contamination of water if vehicles and equipment leak fluids.
- Potential change in water level from dewatering activity.
- Potential alteration or damage to the natural water flow or drainage.
- Possible disturbance or destruction to aquatic and terrestrial habitat.
- Potential introduction of dust particles and debris into Bennett Brook during construction activities.
- Possible damage or change to water drainage from the adjacent landscape.

**Flora**

- Potential loss or damage of native flora from vehicle travel, foot traffic, excavation and the placement of downstream riffles.
- Potential decrease in flora diversity from vegetation removal, excavation and movement of equipment.
- Possible disturbance, destruction or fragmentation to habitat.
- Introduction of non-native or invasive species through the movement of seed from other areas of the park or outside the park.
- Air pollution from exhaust or movement of dust particles.
- Introduction of building materials that could be potentially deleterious to flora habitat.
- Potential runoff, erosion and release of sediment into Bennett Brook.
- Potential contamination of soil from potential machinery fluid leakage.

**Fauna**

- Possible damage or loss of native fauna in areas requiring clearing, excavation and backfilling.
- Potential decrease in fauna diversity.
- Possible disturbance, destruction or fragmentation to aquatic and terrestrial habitat.
- Possible disruption to nesting or denning activity during vegetation and construction activities.
- Possible loss of food supply.
- Potential change in water level.
- Possible damage or change to water drainage.
- Air pollution from exhaust emissions or from the movement of dust particles.
- Potential noise disturbance to wildlife.
- Potential wildlife corridor disruption.
- Introduction of building materials that could be potentially deleterious to fauna and aquatic habitat.
- Potential runoff, erosion and release of sediment into Bennett Brook.
- Potential contamination of water from potential machinery fluid leakage.

**Cultural/Aboriginal Resources**

- Unidentified cultural/aboriginal resources could be directly impacted by construction activities.
- Deviating from the original scope of work could result in negative impact to areas not covered under the existing Archaeological Overview Assessment.

**Visitor Experience**

- Negative impacts to the natural resources and the landscape could potentially affect visitor enjoyment and expectation of the park.
- Increase in construction traffic and activity near the Bennett Lake Day Use Area entrance could result in safety concerns and negative visitor experience.

- Excessive noise in the Bennett Lake area could reduce the appeal for visitor use of the Bennett Lake Day Use Area thus potentially resulting in a loss of business at the Bennett Lake Boat Concession.
- Work scheduled for the Structural Rehabilitation for the Bennett Brook Culvert project may require some disruption in the normal flow of traffic along Highway 114 near the Bennett Lake area. In addition, it may result in temporary closures of the Bennett Brook Trail, affecting visitor access to the trail and the Fundy Circuit.
- Inadequate signage, alerting visitors of construction activities, can affect visitor experience and create safety concerns. Without barriers, visitors may wander into an active construction site without knowing the dangers and safety concerns.

## 8. MITIGATION MEASURES

The following mitigation measures are to be followed in order to reduce or eliminate potential negative impacts to the valued components identified for this project:

**General**

1. The Project Manager is responsible to ensure all parties receive a copy of this BIA and have them handy at all times.
2. The conditions presented in this BIA will be considered part of the project. Failure to comply may result in work being suspended pending rectification of problem(s).
3. All activities must conform to relevant Occupational Health and Safety Guidelines and shall be governed by and carried out in accordance with the Canada National Parks Act and Regulations and with all applicable Municipal, Provincial and Federal regulations.
4. Before commencing construction activities or delivery of materials to the site, the Contractor must submit an Environmental Protection Plan (EPP) for review and approval by Parks Canada. The EPP must include a comprehensive overview of known or potential environmental issues to be addressed during construction.
5. The Contractor is required to notify the Project Manager of the proposed work schedule at least one week in advance of potential start up.
6. A pre-construction meeting will be held on-site and attended by the Contractor, Project Manager, and the Environmental Assessment Officer. The meeting is to ensure construction personnel are aware of the environmental concerns, laws, rules and regulations that are associated with this project.
7. An emergency contact list with phone numbers is to be compiled and posted in a conspicuous location at the construction/project site.
8. Site access and the work area will be defined by the park representative prior to initiating project activities. Work will be confined to the identified disturbance footprint.
9. During construction phases, provide barricades, signs, and/or fencing as required to protect the public. Site access during construction must be restricted to authorized personnel only.
10. A designated Environmental Assessment Officer shall be kept informed of project scheduling and will be notified of changes at all times.
11. The Contractor must be aware that they are working in a National Park where emphasis is on ecological/cultural integrity and resource protection.

**Soil, Landforms & Flora**

1. The Contactor must set project limits prior to the start of construction. No trees and vegetation will be cut or removed outside these limits. Tree removal will be limited to individuals within the construction site that have been identified by the park representative.
2. Equipment operators shall take extreme caution to avoid striking vegetation, including trees and tree bark that is outside of the construction corridor. Efforts will also be taken to minimize damage to tree roots.
3. Measures shall be taken to protect vegetation remaining on the site and not intended for removal. The park representative must be informed if there is a requirement to remove unmarked vegetation. Removal shall only commence with the approval of the park representative. Root systems shall be left intact whenever possible.
4. Prune limbs close to the tree trunk. For a clean cut, make a shallow undercut first, then follow with the top cut. This prevents the limb from peeling bark off the tree as it falls. Do not use an axe for pruning.
5. Disturbance of soil and vegetation must be kept to an absolute minimum. This will minimize disturbance and disruption to plant and wildlife communities and habitat.
6. Clearing of riparian vegetation should be kept to a minimum: use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction. When practical, prune or top the vegetation instead of grubbing/uprooting.
7. Slash generated from vegetation removal shall be disposed of in an appropriate manner. All work will be done with the goal of having a low aesthetic impact on the landscape.
8. If over half of a tree needs pruning, it is recommended to cut it down. Trees should be cut at ground level and do not leave pointed stumps.
9. To minimize the introduction of invasive species, all construction equipment and materials must be clean and free of any contaminates and non-native species (refer to invasive plant section below).
10. Minimize equipment travel outside of the existing disturbance footprint. Equipment shall be stored within the project limits.
11. Cover devegetated areas if heavy rains are expected in erosion prone locations.
12. Keep excavation to a minimum and reduce disturbance to ground surface and vegetation.
13. Keep soils at their current location unless they are placed in an area that will be actively managed.
14. If soil become saturated during extreme wet weather, operations shall be suspended until soil conditions are more favourable.
15. All exposed soils must be stabilized as soon as possible in order to control sediment runoff during and after construction.
16. Ensure fine materials being transported are covered with tarps or equivalent material.
17. Use appropriate sediment control materials including coverings tarps, polyethylene sheeting or vegetative cover to prevent erosion from rain or wind.
18. Excavated soil that is suspected of or known to be contaminated (i.e. fuel, oil) is to be placed in covered bins or stockpiled and covered with plastic until the material can be transported to a provincially approved waste treatment disposal facility.
19. The project will not result in wasteful and inefficient use of non-renewable resources. Where practical, soils from the existing project shall be used in all aspects of construction or restoration.
20. Where restoration is required, reshape the existing area to the original contour.

21. Any required re-planting for landscaping purposes must utilize native species approved by a park representative.

**Water / Hydrology**

1. In the province of New Brunswick, instream work shall be conducted within the authorization window between June 1st and September 30th. All proposed work must respect this timing window to protect fish, including their eggs, juveniles, spawning adults and /or the organisms upon which they feed.
2. A Department of Fisheries and Oceans (DFO) – Fisheries Protection Program Project Review was completed for instream work or work adjacent to waters that feed directly into fish bearing waterbodies. All mitigation measures identified in the DFO Response Letter must be followed.
3. Conduct instream work during low flow periods and not when flows are elevated due to local rain events or seasonal flooding. Low flow periods usually occur in late summer in Fundy National Park.
4. Ensure contingencies are in place for occurrence of unexpected high flow conditions during construction activities.
5. Minimize the extent and duration of work within watercourses and bank areas.
6. If work is required on flowing streams it will be necessary to temporary divert the flow (e.g., coffer dam, diversion channel) to keep the work site in the dry and prevent the movement of sediment downstream.
7. Monitor local weather forecast and avoid excavation near watercourses when there is heavy rainfall events predicted.
8. Do not use watercourse beds for borrow material below the normal high water mark.
9. Do not dump excavated fill, waste material, slash or debris in watercourse.
10. Aquatic species and habitats can be greatly affected by runoff sediment. Protect exposed slopes and reduce surface erosion and the amount of sediment entering waterways.
11. Cuts and fills near waterways are to be stabilized, and ditch run-outs constructed to prevent entry of silt into waterways. In the vicinity of stream banks, maintain and preserve as much of the existing vegetation as possible.
12. Do not skid logs or construction materials across waterways.
13. Do not operate equipment in waterways. Temporary crossings must be placed outside of wetted areas and constructed of materials free of contaminants. If a crossing is expected to be used during periods of flooding, structures should be placed above the high water mark.
14. Locate temporary crossings at straight sections of the watercourse, perpendicular to the bank whenever possible. Avoid crossing on meander bends, braided streams, alluvial fans, or any other area that is inherently unstable and may result in the erosion or souring of the bed.
15. Building material or waste material shall be stored at least 10 m above the high water mark.
16. It will be necessary to eliminate the migration of concrete chips, dust and debris into Bennett Brook during culvert patching and refacing activities. The Contractor must identify in the project Environmental Protection Plan how chips, debris and dust will be captured at the sites to avoid migration into Bennett Brook and the adjacent landscape.
17. Avoid disturbance to slopes (bank and bed), if unavoidable ensure adequate erosion protection measures are used (e.g., swamp/blast mats, pads) if minor rutting is likely to occur.
18. Minimize the removal of natural woody debris, sand or other materials from banks, shoreline or bed of waterbodies below high water mark. If material is removed, set it aside and return it to the original location once restoration activities are completed.
19. Restore bed and banks of the watercourse to the original contour and gradient by grading slopes in the direction away from the watercourse and never into the stream itself. If the original

gradient cannot be restored due to instability, a stable gradient that does not obstruct the natural water flow should be restored.

20. No rock, silt, cement, grout, asphalt, petroleum product, lumber, vegetation, domestic waste, or any deleterious substance shall be placed or allowed to be dispersed into any stream, river, pond, wetland, lake or other watercourse.
21. When rock material is used in or near a watercourse:
    - Use clean durable non-ore-bearing, coarse granular aggregate material that is appropriately sized to resist displacement during peak flood events.
    - Do not obtain rocks from below the high water mark of any watercourse.
    - Do not use acid-generating rock or rock that fractures and breaks down easily.
    - Install rock at a similar slope to maintain a uniform stream bank and natural stream alignment.
    - Ensure rock does not constrict the natural stream width.
22. Explosives should not be detonated in or near fish habitat.

**Mammals/Birds/Fish**

1. To avoid the risk of nest destruction, the Contractor shall avoid vegetation clearing during the most critical period of the migratory bird breeding season, which is May 1st through August 31st.
2. Try to avoid construction in areas during breeding season. In the event that vegetation clearing is to take place inside the May 1st to August 31st window, a qualified biologist must inspect the area prior to construction activities to ensure there will be no adverse impacts to birds, wildlife and their habitat.
3. To reduce impact to fish and fish habitat, follow all mitigation measures identified by Fisheries and Oceans Canada-Fish Protection Program located on page 7 of this report.
4. Bat maternity roosts may be active until the end of summer and into early fall in Fundy National Park. If possible, construction activities should be scheduled outside of this timeframe.
5. The Bennett Brook culvert must be checked for bat activity by Resource Conservation staff prior to the start of construction activity. The inspection must follow the guidelines set out in “Fundy National Park Guidance for Inspecting Built Assets for Bats”.
6. If bat activity is observed during construction, cease work and contact the Project Manager or Environmental Surveillance Officer as soon as possible.
7. Feeding wildlife is not permitted. The work site must be kept free of edible and other garbage that could attract or harm wildlife.
8. Before cutting of trees, knock their trunks repeatedly with a stick (or similar object) to awaken hibernating mammals.
9. Wildlife dispersal or migration may be temporarily altered during construction. Ensure that alternate routes adjacent to the work area, suitable for wildlife movement, remain open during construction activities.
10. All construction activities shall be designed to have minimum effect on fish and fish habitat.

**Invasive Plants**

1. All invasive plant species found within the project limits shall be immediately reported to the Environmental Assessment Officer. The removal of such invasive plants shall be carried out in accordance to the Fundy National Park Invasive Plant Action Plan.

2. Construction equipment may facilitate the movement and spread of invasive plants by moving invasive plant seeds from infested areas. Contractors/site workers are responsible to pressure wash equipment before entering the park or moving from an infested area within the park.
3. Hand tools and footwear should be cleaned between work sites to prevent cross contamination and reduce the risk of invasive species introduction.
4. Materials to be used on construction projects must be stored in areas free of invasive plant species.
5. Freshly disturbed ground created by equipment during construction activities provide suitable habitat for invasive plants. Ensure that exposed soil is planted with native vegetation species as soon as feasible to reduce the risk of invasive species invasion.
6. Reduce the spread of invasive plants by prohibiting the movement of soil, vegetation and materials from infested areas.

**Machinery/Equipment**

1. Work associated with site preparation and construction will rely on the minimal amount of heavy machinery use and be fairly brief. Consequently, noise pollution will be minimized and will not significantly influence park visitors or wildlife.
2. All mechanical construction equipment shall be properly maintained, in good operating order, and fitted with standard air emission control devices. Detection of leaks or exhaust issues shall be fixed immediately or work is suspended until repairs can be made.
3. Any required cleaning of tools and equipment must be done greater than 30 meters from waterbodies to prevent the release of wash water that may contain deleterious substances.
4. Equipment operators must be fully trained and experienced.
5. Avoid using equipment in sensitive sites. Use hand tools instead or use equipment with low bearing weight, low PSI tires, or rubber tracked vehicles or access matting where feasible to minimize soil compaction and ground disturbance.
6. Daylight operation of all mechanized equipment will be respected.
7. If operating chainsaws directly over or adjacent to waterbodies is unavoidable, use measures such as tarps to trap and prevent debris from entering the waterbody as much as possible.
8. Gas generators must be secured to prevent movement during operation and set up on an impermeable fuel mat with a berm or within a container that can contain 150% of the volume of fuel in the generator.
9. Fueling of vehicles or equipment will not be permitted within 30 m of any watercourse or critical habitat. Increase the 30 m buffer depending on level of risk and site specific conditions.
10. Refueling (e.g., excavators, tracked loaders, chainsaws, generators) must not take place in locations were runoff could carry contaminants into drainage pathways. If not on compacted ground, an absorbent pad, tarp or portable berm must be placed beneath or around the machine to capture small spills.
11. Consider using bio-degradable chain oil/vegetable oils in chainsaws, especially when working within 30 m of waterbodies.
12. Select equipment appropriate to the nature of work being conducted (e.g., avoid using large scale machinery when hand tools or smaller scale machinery could be used).
13. The crossing of any watercourse by construction equipment, or the use of such equipment within waterbodies must be approved by designated Parks Canada staff. If approved:
    - Consult with designated Parks Canada staff prior to project start-up, to determine single entry and exit points for any watercourse crossings.

- Use small scale equipment when at all possible (e.g., mini excavator, ATV,)
- Use established/constructed fords when available.
- Protect access points (e.g., swamp mats, pads).

14. When water crossings are not required, operate machinery above the high water mark to minimize disturbance to banks and watercourse.
15. Minimize idling of gas and diesel operated engines by shutting down if not needed for a period greater than 5 minutes (contingent on operating instructions and temperature consideration) to reduce noise and emissions.
16. Keep dry leaves and twigs cleared from radiators and other hot spots on equipment.
17. All equipment and vehicles should have an appropriately sized fire extinguisher easily accessible and firefighting hand tools should be on-site.

**Storage and Handling of Fuels and Hazardous Fluids**

1. Develop a Spills Prevention and Response Plan and keep a copy on site at all times.
2. Prevent the release of hazardous substances into the environment, including but not limited to, petroleum products and their derivatives, antifreeze or solvents.
3. All on-site personnel must be briefed on reporting requirements for hazardous materials spills. In the event of a spill, the designated park representative must be notified immediately and action taken to clean the spill in accordance with the Provincial Spill Reporting Regulation. If the park representative is unavailable, contact Jasper Dispatch (1-877-852-3100). In addition, the Contractor is required by law to report all toxic spills and petroleum spills >20 litres to Environmental Emergency / Canadian Coast Guard at 1-800-565-1633.
4. A spill contingency response kit including sorbent material and berms to contain 110% of the largest possible spill (e.g., fuel or other toxic liquids) related to the work must be available on site at all times. On-site personnel must be aware of its location and trained in its use. Any contaminants must be recovered at source and disposed according to applicable laws, policies and regulations.
5. Cleanup, repair and rehabilitation resulting from any spill shall be to the satisfaction of the park representative.
6. Fuel storage shall be located a minimum of 30 m from any watercourse or critical habitat. Depending on level of risk and site specific conditions, the 30 m buffer can be increased if required.
7. Ensure fuels are stored overnight under lock and key in a Parks Canada approved enclosure.
8. Minimize quantity of hazardous materials on site to that absolutely necessary to perform the work.
9. Where possible, use paints and stains that are certified by Environment Choice logo (http://www.environmentalchoice.com/) or equivalent, with minimal harmful chemicals/heavy metals and low volatile organic compounds (VOCs).
10. If preserved wood is used, use the appropriate wood preservative that will minimize environmental impacts, particularly by following the guidelines by Western Wood Preservatives Institute for use of wood preservatives in aquatic environments. In addition, The Parks Canada Guidelines for the Use, Handling and Disposal of Treated Wood will be applied where possible to mitigate environmental impacts.
11. Disposal of debris or waste into any drain, and/or waterway, is strictly prohibited.
12. Any hazardous material/waste is to be stored, handled, transported and disposed of in compliance with the Canadian Environment Protection Act, Transportation of Dangerous Goods Act and Workplace Hazardous Materials Information System (WHMIS). Disposal shall

be at an approved provincial waste management site and proof of disposal provided to the Project Manager.

13. Any hazardous waste or contaminated material uncovered during excavation/construction, must be investigated, source identified, removed and disposed of outside the protected heritage place at an approved facility. Disposal documentation must be provided to designated Parks Canada staff.
14. Dispose of all waste materials at an appropriate provincial waste/recycle facility.

**Cultural Resources**

1. Consult with the Project Manager if there is a requirement to deviate from approved construction plans. Any changes to the scope of work must be submitted to Parks Canada's Terrestrial Branch for further review.
2. Vehicular access routes and staging areas will be restricted to present-day roadways, parking lots, exposed bedrock areas and significantly disturbed areas. If this is not possible, the use of protective covering such as geotextile protective mats with wood chip lift or granular "A" gravel is required. All protective measures employed must be removed following the construction and the area restored to a pre-construction state. Excavation is not permitted during installation or removal of protective covering.
3. Cultural resources found within the project limits shall be identified in the field and all construction activities are to avoid these areas.
4. Cease work immediately and contact the designated Parks Canada representative if a significant feature (e.g., structural remains and/or artifact concentrations) is encountered during construction activities. Leave encountered features in place and mark the location (e.g., with prominent flagging). The park representative will contact Parks Canada's Terrestrial Archaeology Branch for advice and assessment of significance, which will in turn determine the requirement to mitigate the find.
5. Stockpiled material must not be permitted to damage or bury known cultural resources.

**Erosion Control**

1. Before the project begins, develop and implement an Erosion and Sediment Control Plan, as part of the Environmental Protection Plan for the site. Erosion and sediment control measures will be maintained until all disturbed ground has been permanently stabilized. The plan should, where applicable, include:
    - Installation of effective erosion and sediment control measures before starting work to prevent surface runoff from carrying sediment off-site or into any waterway. (e.g., silt fences, blankets).
    - Manage water flow onto the site as appropriate as well as filter water being pumped/diverted from the site; silt laden water must not be pumped directly into a waterbody (e.g., pump/divert water to a vegetated area 30 m from the waterbody, to a constructed settling basin or other filtration systems).
    - Regular inspection and maintenance of erosion and sediment control measures and structures during the course of construction. The structures should be maintained by repairing structural problems or damages and by removing accumulated sediment at regular intervals and disposing the sediment at an approved location.
    - Removal of temporary erosion and sediment control products, especially non-biodegradable materials, when the site is stabilized and materials are no longer required.

2. The Contractor will maintain a stockpile of appropriate erosion and environmental protection materials (e.g. silt fences, straw bales, wood chips, clean rock fill and aggregate base course) on site and have it readily available at all times for use in the event of a silt release. Workers must be knowledgeable in the function and installation of all materials.
3. On disturbed slopes where soil erosion is a greater concern, spread seeds, plant vegetation, spread mulch or use erosion control mats for stabilization.
4. Maintain effective sediment and control measures until revegetation of disturbed areas is achieved.
5. Minimize the amount of dust created by construction activities on adjacent vegetation and waterbodies and reduce the impact to air quality. Use suppression methods to reduce dust in sensitive areas as required to control off-site migration of dust particles.
6. Divert upland surface runoff away from exposed areas.
7. Construct check dams or similar devices in drainage swales and ditches.
8. Minimize slope length and gradient of disturbed areas. Backslopes must be sloped to a 45 degree angle or less or to match existing side slopes.
9. Cover erodible soils with mulch, vegetation or rip-rap.
10. Select erosion and sediment control products that correspond with the nature and duration of the project.
11. Use erosion and sediment control products made of 100% biodegradable material (e.g., jute, sisal or coir fiber) when possible. Ensure backing materials are also biodegradable.
12. Use sediment and erosion control products that reduce potential for wildlife entanglement when possible. These options include:
    - Net-less erosion control blankets made of excelsior or loose mulch and unreinforced silt fence.
    - Netting with a loose-weave wildlife safe design.
13. Schedule operations to avoid wet, windy and rainy periods or very dry periods that may increase erosion and sedimentation.
14. Cover devegetated areas if heavy rains are expected in erosion prone locations.
15. In areas prone to erosion, install erosion and sediment control measures before starting work, especially within 30 m of a waterbody.
16. Phase activities whenever possible to limit duration of soil exposure.
17. Immediately stabilize disturbed/exposed areas, shoreline or banks, preferably through revegetation, with native species approved by designated Parks Canada staff. If there is insufficient time remaining in the growing season, the site should be stabilized, (e.g., cover exposed areas with erosion control blankets to keep soil in place) and/or vegetate the following spring; maintain effective sediment and erosion control measures until revegetation of disturbed areas is achieved.
18. Temporarily stabilize exposed soil where sediment is currently migrating from the site until permanent restoration can occur.
19. Areas that are not prone to erosion need contouring and can be scarified to prepare the site for planting or natural regeneration.
20. Wood bark or wood chips prepared from on-site debris can be used as a mulch or temporary ground cover to prevent sheet erosion and promote seed germination.
21. Leaf litter collected from the adjacent area can be spread evenly over open soil to aid in soil stabilization.
22. Hay mulch may contain non-native or invasive seed therefore it is not permitted in Fundy National Park. It is recommended to use locally grown straw mulch on exposed soils in the park.

23. Store excavated soils on tarps to limit damage to underlying vegetation and cover with weighted tarps if left for an extended period of time.
24. Do not begin excavations that cannot be closed in within one day as wet weather approaches.
25. Ensure fine materials being transported are covered with tarps or equivalent material.
26. Use appropriate sediment control materials including covering tarps, polyethylene sheeting or vegetative cover to prevent erosion from rain or wind.

**Access/Staging/Laydown**

1. Access for emergency response, fire suppression and site maintenance must be reflected in the safety plan for the project.
2. Whenever possible, only existing roadways/trails or disturbed areas shall be used for site access and travel within the site to minimize damage to vegetation and reduce soil compaction or erosion. Any new access trails must be preapproved by the park representative prior to start of work.
3. Staging and parking areas for material and equipment must be identified, including duration of use, within an existing disturbed footprint (e.g., roadway, gravel surface, previously disturbed area with high resiliency).
4. Material drop sites must be approved by designated Parks Canada staff.
5. All access trails must be rehabilitated to the satisfaction of the park representative, before the site is vacated after project completion.
6. Consider transporting materials when the ground is still frozen to minimize compaction and damage to vegetation. If not possible, consider the use of rig mats or other appropriate measures to minimize impacts.
7. Control access to the site before, during and after rehabilitation activities.
8. Post interpretive signage to educate the public of the rehabilitation project and to alert of changes in regular travel corridors.
9. If necessary, place barriers to deter unnecessary traffic until the site stabilizes.

**Facilities/Waste**

1. Leave No Trace wilderness ethic principles shall be communicated to/observed by all of the construction crew.
2. Temporary washroom facilities must be provided on the construction site unless permission has been granted by the park authority to use existing washroom facilities.
3. Store food, garbage and other smelling products in sealed containers. Pack all garbage out from the site daily, unless permanent garbage facilities exist at the site. Garbage structures must minimize the opportunity for wildlife to feed from the garbage.
4. Daily maintenance of the site shall be done to ensure that it is free from accumulations of waste, debris and garbage.
5. Remove all construction materials from site upon project completion (e.g., refuse material, waste petroleum, construction material).
6. Any refuse such as old culverts, pressure treated lumber, or other garbage uncovered during construction activities must be collected and disposed of at an approved waste facility outside of Parks Canada.
7. The Contractor will be responsible for a complete site cleanup including restoration of exposed and damaged areas (roads, trails, driveways, day use areas, landscaping), to the satisfaction of the park representative, before the site is vacated after project completion.
8. Fires are only permitted in approved structures at designated sites within the park.

**Safety & Visitor Experience**

1. Before the project commences, a project safety plan must be in place and Occupational Health and Safety (OHS) Attestation forms submitted and approved. In addition, for Parks Canada staff, job specific Safe Work Practices must be developed or identified indicating work activities and use of tools and equipment. Proper safety procedures must be followed throughout the duration of the project as per applicable municipal, provincial, and federal regulations.
2. If possible, schedule construction activities outside peak visitor season.
3. The Project Manager is responsible to take necessary precautions to ensure there is no safety concerns related to visitors of the park.
4. Site access must be restricted to authorized workers only.
5. If closing the area is not possible, maintain a safe working distance between work activities and visitors; consider the use of lookouts or detours to manage traffic through the hazard area.
6. Interpretive signage should be posted to educate the public on the purpose and nature of the project, work to be completed and expected date of completion. Information should be positive and focus on the benefits of the project.
7. If there is a threat to public safety, the area must be declared closed to public access. Public closure notices must be placed at trailheads and other visitor use areas including East and West Gate Victor Reception Centres.
8. As much as possible, schedule noisy activities to minimize impact to visitors, especially around day use areas, campgrounds and other high visitor use areas.
9. Onsite work crews must comply with all applicable health/safety regulations, including use of appropriate protective equipment. In addition, employees must be trained in health and safety protocols (e.g., safe work practices, emergency response).
10. When working in steep terrain conditions use experienced operators who are knowledgeable in the limitations of the equipment.
11. Workers in contact with hazardous materials must be provided with and use appropriate personal protective equipment.
12. The Contractor must determine the exact location of all existing buried utilities before commencing work.
13. The Contractor must provide and maintain signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from the project.
14. Secure and clearly mark unattended safety hazards (e.g., excavations, unsecured decking on bridge, debris piles) with fencing, warning signs, area closures or combination thereof.
15. Immediately contact the Project Manager if non-authorized persons are encountered within the active work site.
16. Every construction vehicle or work crew must have a first aid kit readily available.
17. Blasting is not permitted unless authorized by the park representative.

## 9. PUBLIC/STAKEHOLDER ENGAGEMENT & ABORIGINAL CONSULTATION

**9 a)** Indicate whether public/stakeholder engagement was undertaken in relation to potential adverse effects of the proposed project:

☒ No

☐ Yes (describe the process to involve relevant parties and indicate how comments were taken into consideration).

**9 b)** Indicate whether Aboriginal consultation was undertaken in relation to potential adverse effects of the proposed project:

☒ No

☐ Yes (describe the process to involve relevant parties and how the results were taken into consideration).

**10. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS**

If appropriate mitigation measures described in this report are followed and carried out, the environmental effects should be reduced to minor or insignificant levels. Thus, the level of disturbance is considered to be localized and of low magnitude. This project is not likely to cause significant adverse environmental effects in the short or long term. Impact to visitor experience can be expected during the construction period and could potentially affect park user enjoyment and expectation of the park. These impacts are expected to be short term and all efforts will be taken to mitigate the issues.

**11. SURVEILLANCE**

☐ Surveillance is not required

☒ Surveillance is required (An Environmental Surveillance Officer will conduct daily site inspections to determine if construction activities comply with the mitigation measures, set out in this report, to reduce negative impacts to the site. Items to be monitored during the inspection include maintenance of water flow to Bennett Brook, protection of aquatic species and habitat, fuel management, erosion and sediment control, work adjacent to a waterway, waste management, invasive species removal and general condition of the site).

**12. FOLLOW-UP MONITORING**

Follow-up monitoring is:

☐ not required

☐ required by legislation or policy (indicate basis of requirement – e.g. required by the *Species at Risk Act*; *Fisheries Act*, or the *Parks Canada Cultural Resource Management Policy*)

☒ required to evaluate effectiveness of mitigation measures and/or assess restoration success (annual year-end report on operations required)

**13. SARA NOTIFICATION**

Notification is:

☒ not required

☐ required under the *Species at Risk Act* (outline the nature of and response to any notification).

**14. EXPERTS CONSULTED**

| | |
|---|---|
| Department/Agency/Institution:<br>Parks Canada | Date of Request: 2019-01-15 |
| Expert's Name & Contact Information:<br>Neil Vinson<br>neil.vinson@canada.ca | Title: Resource Management Officer |
| Department/Agency/Institution:<br>Parks Canada | Date of Request: 2019-01-25 |
| Expert's Name & Contact Information:<br>Darren Hoar<br>darren.hoar@canada.ca | Title: Technical Service Officer |

| | |
|---|---|
| Department/Agency/Institution:<br>Parks Canada | Date of Request: 2019-01-17 |
| Expert's Name & Contact Information:<br>Doug Watson<br>doug.watson@canada.ca | Title: FII Project Manager |
| Department/Agency/Institution:<br>Parks Canada | Date of Request: 2019-01-15 |
| Expert's Name & Contact Information:<br>Shirley Butland<br>shirley.butland@canada.ca | Title: A/ Impact Assessment Officer |
| Expertise Requested: project information, invasive plants, breeding birds, existing culvert conditions, and cultural resource history. | |
| Response: Vinson supplied information on invasive plants and breeding birds, Hoar on the existing condition of the Bennett Brook culvert, Watson on the project description and Butland on the cultural history of the area. | |

## 15. DECISION

Taking into account implementation of mitigation measures outlined in the analysis, the project is:

☒ not likely to cause significant adverse environmental effects.

☐ likely to cause significant adverse environmental effects.

*FOR SARA REQUIREMENTS:*

☒ There are no residual adverse effects to species at risk and therefore the SARA-Compliant Authorization Decision Tool was not required

**OR**, the SARA-Compliant Authorization Decision Tool was used and determined:

☐ There is no contravention of SARA prohibitions

☐ Project activities contravene a SARA prohibition and CAN be authorized under SARA

☐ Project activities contravene a SARA prohibition and CANNOT be authorized

## 16. RECOMMENDATION AND APPROVAL

| | |
|---|---|
| **Prepared by:**<br>Shirley Butland<br>Acting Impact Assessment Officer, NBSFU | Date: 2019-01-31 |
| **Recommended by:**<br>Mark Belliveau<br>Functional Manager / Eastern Highway Engineering Services Manager<br>Parks Canada Agency | Date: 2019-01-18 |
| **Approval signature:**<br>Julie M. LeBlanc<br>New Brunswick South Field Unit Superintendent<br>Julie LeBlanc | Date:<br>2019-02-13 |

## 17. ATTACHMENTS

Appendix I: Environmental Impact Analysis Tools: Effects Identification Matrix
Appendix II: Location of Highway 114 & Bennett Brook Culvert, Fundy National Park – Site Map
Appendix III: Fisheries and Oceans Canada Response Letter
Appendix IV: Archaeological Overview Assessment

## 18. NATIONAL IMPACT ASSESSMENT TRACKING SYSTEM

☐ Project registered in tracking system
☒ Not yet registered *(CEAA 2012 requires PCA submit a report to Parliament annually. EIAs must be entered in the tracking system* ***by the end of April*** *to enable reporting*.

## 19. REFERNCES

Cook, Richard and Michelle McKay. 2010. Bennett Lake Dam Reconstruction. Environmental Assessment Screening Report. Fundy National Park. pp 47.

Corbett, G., S. Woodley and G. Janes. 1983. A Review of Mammals in Fundy National Park, Natural Resource Conservation, Atlantic Region, pp 56.

Government of New Brunswick, Website. White Nose Syndrome. http://www2.gnb.ca/content/dam/gnb/Departments/nr-rn/pdf/en/Wildlife/Bats-WhiteNoseSyndrome.pdf

Hirvonen, R., R.J. Madill, 1978. Fundy National Park, N.B. and the Proposed Western Extension, Integrated Resource Study. Forest Management Institute Information Report. FMR-X-105, Canadian Forestry Service, Environment Canada.

Kerekes, Joseph. 1978. Limnological Conditions - Aquatic Resources Inventory, Fundy National Park, New Brunswick.

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Parks Canada, Fundy National Park Website http://www.pc.gc.ca/pn-np/nb/fundy/index_e.asp, 2007.

Tremblay, E. 1989. A Brief Survey of the Chiropteran Fauna of Fundy National Park. Natural Resources Conservation, Fundy National Park.

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**Appendix I: Environmental Impact Analysis Tools: Effects Identification Matrix**

***Section A*** *focuses on direct effects of the project and* ***Section B*** *on indirect effects that are caused by changes to the environment.*

| **A. Direct Effects** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *You may wish to change the components listed under the headings to specify the natural or cultural resources that are priority considerations for your PCA site or for the specific project being reviewed.* | | **Valued components potentially directly affected by the proposed project** | | | | | | | |
| | | | Natural Resources | | | | | Cultural Resources | | |
| | | | Air | Soil & landforms | Water (surface, ground, crossings, etc.) | Flora | Fauna | Cultural Artifacts | Visitor Experience | |
| | Phase | Examples of Associated Activities | | | | | | | | |
| **Project Components** | Preparation / Construction / Operation / Decommissioning | Supply and storage of materials | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | |
| | | Burning | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | |
| | | Clearing | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | |
| | | Demolition | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | |
| | | Disposal of waste | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | |
| | | Blasting/ Drilling | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | |
| | | Dredging | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | |
| | | Drainage | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | |
| | | Excavation | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | |
| | | Grading | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | |
| | | Backfilling | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | |
| | | Use of machinery | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | |
| | | Transport of materials/ equipment | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ | |
| | | Building of fire breaks | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | |
| | | Use of Chemicals | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | |
| | | Set up of temporary facilities | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ | |
| | | Other… | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | |

| A. Direct effects continued | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *You may wish to change the components listed under the headings to specify the natural or cultural resources that are priority considerations for your PCA site or for the specific project being reviewed.* | | Valued components potentially affected by the proposed project | | | | | | |
| | | | Natural Resources | | | | | Cultural Resources | |
| | | | Air | Soil & landforms | Water (surface, ground, crossings, etc.) | Flora | Fauna | Cultural Artifacts | Visitor Experience |
| | **Phase** | **Examples of Associated Activities** | | | | | | | |
| **Project Components** | Preparation / Construction / Operation / Decommissioning | Waste disposal | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ |
| | | Wastewater disposal | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ |
| | | Maintenance | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ |
| | | Use | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | Use/Removal of temporary facilities | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ |
| | | Active fire stage | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | Prescribed burn cleanup | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | Planting | ☐ | ☒ | ☒ | ☒ | ☒ | ☐ | ☐ |
| | | Culling | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | Vehicle Traffic | ☒ | ☒ | ☒ | ☒ | ☒ | ☐ | ☒ |
| | | Mowing… | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

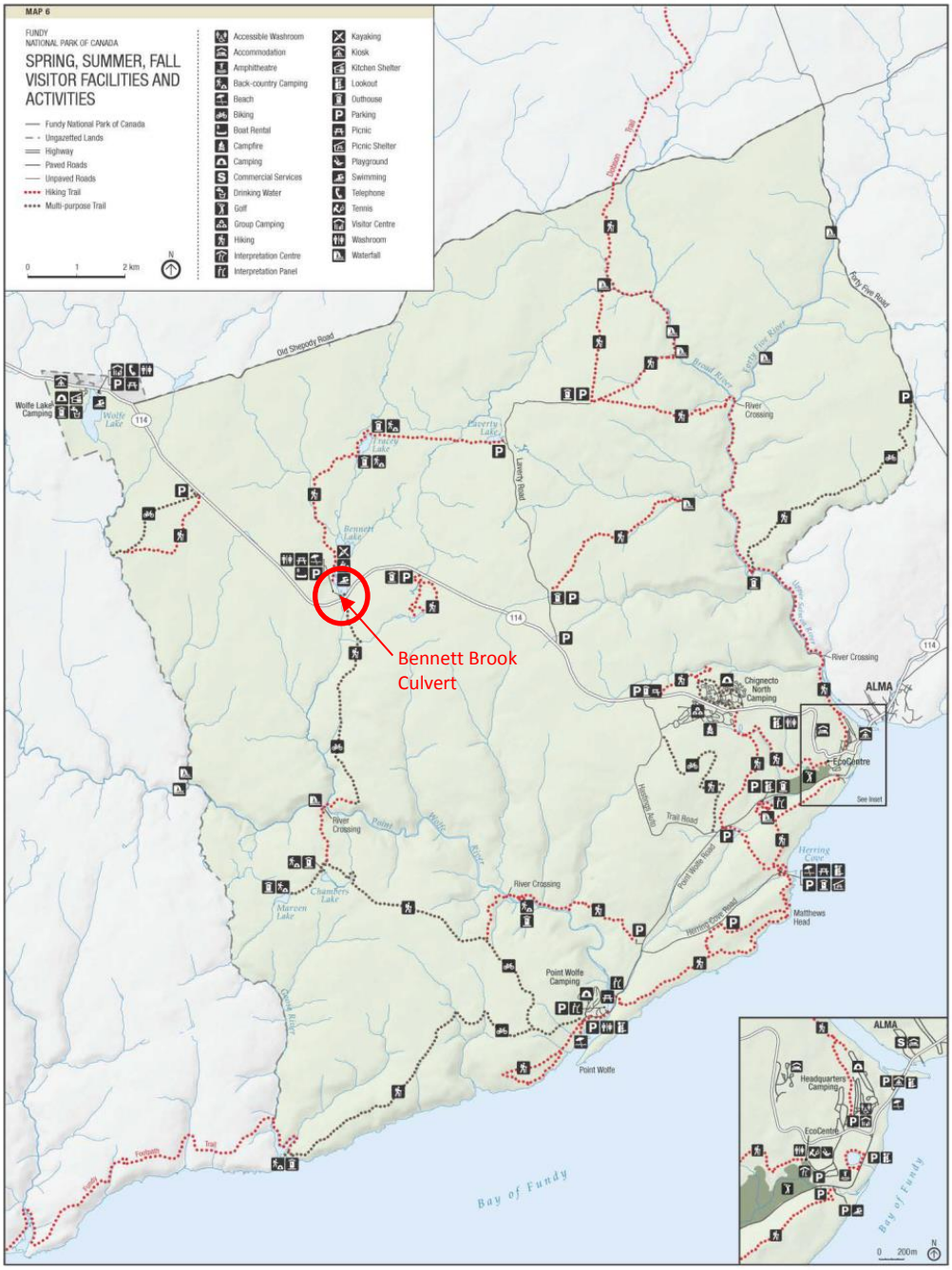
***Section B*** *of the matrix should be used to identify potential indirect effects that may result from impacts of the project to components of the environment you have identified on the preceding pages (see Section A - direct effects to natural resources). Consideration of indirect effects is required under CEAA 2012 Sections 5(1)(c) and 5(2)(b), and by the PCA mandate. For example:*

- *if the proposed project could lead to adverse effects to water quality and quantity, could this then effect the quantity and quality of water resources (e.g. potable water) used by an Aboriginal community?*
- *could there also be adverse socio-economic effects to a community that relies on recreational fishing tourism?*
- *could changes to the environment (e.g. digging, clearing) affect visitor access, opportunities, or safety?*

| **B. Indirect Effects (all phases)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| *You may wish to change the components listed under the headings to specify the natural or resources that are priority considerations for your PCA site or for the specific project being reviewed.* | | **Impacts as a result of changes to the environment** | | | | | |
| | | With respect to non-Aboriginal peoples: | With respect to Aboriginal peoples: | | With respect to visitor experience | | |
| | | Health and socio-economic conditions | Health & socio-economic conditions | Current use of lands and resources for traditional purposes | Access & services | Recreation & accommod'n opportunities | Safety |
| **Phase** | **Natural resource components affected by the project** | | | | | | |
| Preparation /construction operation/implementation/decommissioning | Could impacts to <u>air</u> lead to adverse effects on… | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Could impacts to <u>soils and landforms</u> lead to adverse effects on… | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Could impacts to <u>water</u> (e.g. surface, ground water and water crossings) lead to adverse effects on… | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Could impacts to <u>flora</u> (including SAR) lead to adverse effects on… | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Could impacts to <u>fauna</u> (including SAR) lead to adverse effects on… | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | Other… | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |



Appendix II: Location of Highway 114 & Bennett Brook Culvert, Fundy National Park – Site Map



Appendix III: Fisheries and Oceans Canada Response Letter

Fisheries and Oceans Canada / Pêches et Océans Canada

Fisheries Protection Program
343 University Avenue
P.O. Box 5030
Moncton, New Brunswick
E1C 9B6

OCT 2 9 2018

*Our file*
18-HGLF-00188

Mark Belliveau, ing. / P. Eng.
A/Sr. Highway Engineer - Highway Engineering Services - East
Parks Canada / Government of Canada
1045 Main St, unit 114,
Moncton, NB
E1C 0N5

**Subject: [Bennett Brook - Fundy National Park - Culvert Repair] – Implementation of Measures to Avoid and Mitigate Serious Harm to Fish and Prohibited Effects on Listed Aquatic Species at Risk**

Dear Mr. Belliveau:

The Fisheries Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received the proposal on July 23, 2018 in which Parks Canada is proposing to repair a double barreled culvert at Bennet Brook under highway 114 in the Fundy National Park in Alma, NB (Lat. 45.623897; Long. -65.077849) that includes the following:

- Construct of new wing walls at all four quadrants;
- Repair and construct a new headwall at the inlet;
- Construct a new liner and weirs in the bottom of the existing culvert;
- Repair the concrete headwall between new and old culvert sections within culvert and place rip-rap at the culvert outlet;
- Build up the 4 existing downstream riffles with additional 210 mm thick layer of rip-rap by maintaining the original riffle shape and construct a new downstream riffle.

Our review considered the following information:

- The DFO Request for Review form dated July 20, 2018;
- Additional information received by E-mail on October 24, 2018.

Your proposal has been reviewed to determine whether it is likely to result in serious harm to fish which is prohibited under subsection 35(1) of the *Fisheries Act* unless authorized. Your proposal has also been reviewed to determine whether it is likely to affect listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act,* unless authorized.

Canada

.../2

To avoid and mitigate the potential for serious harm to fish, we recommend implementing the measures listed below:

- Since works will be conducted in the dry (isolation of flow from the working area); you should consider the following:
  - Fish salvage should be conducted by a qualified biologist prior to the dewatering of any isolated section of a watercourse;
  - If any site is flooded during the works, another fish rescue should be conducted;
  - Any silt-laden water recovered should be pumped away from the watercourse, to an area with sufficient vegetation to facilitate filtration; or treated, if necessary to acceptable levels;
  - All pumps used in watercourses around the worksite should follow the "Department of Fisheries and Oceans Freshwater Intake End-of-Pipe Fish Screen Guideline (1995)";
- When switching water into the new culvert, a maintenance flow should be provided downstream to ensure no dewatering of the watercourse occurs as moderate to low flow conditions can take an extended period of time to refill;
- All rock material used should be clean and free of erodible material;
- Erosion control structures should be installed to prevent the release of sediment and/or sediment laden water from any on-land works into any waterbody or storm drain. The structures should be maintained by repairing structural problems after storm events and by removing accumulated sediment at regular intervals and disposing the sediment at an approved location;
- All exposed soils should be stabilized as soon as possible in order to control sediment runoff during and after construction;
- If any changes occur in the turbidity of the waters downstream of the sediment control area as a result of the construction activities, the work should immediately stop to determine if further mitigation measures are required;
- All material removed from or brought to the site should be stored in a place and manner to prevent the release of sediment or other material into any watercourse;
- All in-stream work shall be completed between June 1st and September 30th, 2019.

Provided that you incorporate these measures into the plans, the Program is of the view that your proposal will not result in serious harm to fish or prohibited effects on listed aquatic species at risk. As such, an authorization under the *Fisheries Act* or a permit under the *Species at Risk Act* is not required.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to avoid causing serious harm to fish and avoid prohibited effects on listed aquatic species at risk, any part of their critical habitat or the residences of their individuals.

.../3

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, serious harm to fish that are part of or support a commercial, recreational or Aboriginal fishery. Such notifications should be directed to http://www.dfo-mpo.gc.ca/pnw-ppe/violation-infraction/index-eng.html.

It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

If you have any questions with the content of this letter, please contact Luc Savoie at our Moncton office at (506) 851-6082 or by email at luc.savoie@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

Angeline LeBlanc
A/ Senior Fishery Protection Biologist
Fisheries Protection Program

Cc. Shirley Butland (Parks Canada)
Wade Enman (WSP Canada Inc.)

# PARKS CANADA AGENCY
# ARCHAEOLOGY AND HISTORY BRANCH
# INDIGENOUS AFFAIRS AND CULTURAL HERITAGE DIRECTORATE

## ARCHAEOLOGICAL OVERVIEW ASSESSMENT (AOA)
## FUNDY NATIONAL PARK – BENNETT BROOK CULVERT REPAIR

André MILLER
FII Project Archaeologist, IACHD
National Office, Gatineau

***ABSTRACT***
*Parks Canada Agency (PCA) has proposed a structural rehabilitation of Bennett Brook Culvert in Fundy National Park. The current project involves the consolidation and improvement of Bennett Brook Culvert (Parks Canada 2018). This Archaeological Overview Assessment (AOA) will evaluate the archaeological potential of the project area and the potential impacts of the proposed work on known or potential archaeological resources. This AOA will determine if an Archaeological Impact Assessment and/or mitigation measures are required.*

### PROJECT INTRODUCTION
The Structural Rehabilitation Project for Bennett Brook Culvert objective is to rehabilitate the existing structure below Road 114 in Fundy National Park (Fig. 1). Based on 50% design submission for the Bennett Brook Culvert Replacement project, it entailed consolidation and improvement of the existing Bennett culvert, located about 12 kilometers, north-west, from Fundy NP Maintenance Buildings area.

### ASSESSMENT METHODOLOGY
This assessment is based on a review of documentation (plans and photos) provided by Fundy NP Field Unit, online resources and existing documentation at PCA Terrestrial Archaeology Branch, National Office, Gatineau, Quebec.

### HISTORICAL AND ENVIRONMENTAL BACKGROUND
The culvert site is under Road 114, on the south side of Bennett Lake. Downstream infrastructure improvements are anticipated. In the 90's, Fundy National Park 114 Road and the area were landscaped and made available for visitors (personal communication Doug Watson). The whole terrace and flat area are on glacial outwash deposits and it has lately been changed during construction of the dam, parking, access ramps and facilities (Fig. 2).

### PREVIOUS ARCHAEOLOGICAL WORK AT FUNDY NATIONAL PARK
Although physical evidence of Indigenous use or occupation within Fundy NP has not been located to date, the area is within traditional territory of the Mi'kmaq, Wolastokiyik (Maliseet), and Passamaquoddy peoples. Archaeological and historical research has identified many cultural resources related to European settlement and use of the park area, in general. There is limited knowledge of the condition of the park's cultural resources (further evaluations and inventories are required) and that cultural resource research and information has not been consolidated yet (Parks Canada 1976). The park has a fair understanding of the inventory of the cultural resources; however, a cultural resource management strategy and monitoring program for cultural resources in Fundy NP has not been developed to date (Parks Canada 2005 & 2011).

**ARCHAEOLOGICAL POTENTIAL**

Previously there was no archaeological investigations in the immediate area of this project at Fundy National Park. There is no known archaeological resources situated at proximity to be impacted by the rehabilitation of Bennett Brook Culvert and related works. However, there is low potential that construction activities may yield Aboriginal and/or historical artifacts, particularly in the footprint of the culvert. This area was presumably disturbed by the construction of the Dam and Culvert. Therefore, an Archaeological Impact Assessment (AIA) is not required for this project.

**ASSESSMENT OF PROPOSED DEVELOPMENT IMPACT ON POTENTIAL ARCHAEOLOGICAL RESOURCES**

After reviewing documents of the project provided by Fundy NP, there is low potential of archaeological find in the project area. Most of the parts of the project area were heavily disturbed resulting of the history development of the area, with the dam, access ramps and roads construction. The present AOA is based on a review of the 50% drawings and designs provided (Parks Canada 2018). There is no archaeological concern with the design concept for Structural Rehabilitation Project for Bennett Brook Culvert (Fig. 3-4).

**ARCHAEOLOGICAL REQUIREMENTS**

The following mitigation measures have been identified to ensure the structural rehabilitation activities, as outlined in documents and plans, will not have an impact on archaeological resources, but:

1. If there are any changes to the plans, all additional information and construction drawings must be submitted to Parks Canada's Terrestrial Branch for further review.
2. Vehicular access routes and staging areas will be restricted to present-day roadways, parking lots, and significantly disturbed areas. If this is not possible, the use of protective covering such as geotextile protective mats with a wood chip lift or granular "A" gravel is required. All protective measures employed must be removed following construction and the area restored to a pre-construction state. Excavation is not permitted during installation or removal of protective covering.
3. If significant features (i.e., structural remains and/or high artifact concentrations) are encountered during construction activities, excavation should cease in the immediate area, and the Parks Canada project manager will be informed. The project manager should then contact Parks Canada's Terrestrial Archaeology section for advice and assessment of significance, which will in turn determine the requirements to mitigate the find.

**OTHER CONSIDERATIONS:**

Much of the impact area for this project will and have been previously disturbed, but modern facilities (Dam, Culvert, Access Ramps, Road, etc.) are located on some of the best landscape within the park. In this context this is referring to easy access to Bennett Lake and Brook, flatter and more usable land for occupations, which we may assume increases the potential for its use in the pre-contact era; and the potential for discovery of Indigenous artifacts or contexts is higher in these zones.

**REFERENCES**

Parks Canada
2018 Structural Rehabilitation Project for Bennett Brook Culvert, Fundy National Park, New Brunswick, Project No. 1765. (On file at Parks Canada, Gatineau, Quebec).

2011 Fundy National Park of Canada, Management Plan. (On file at Parks Canada, Gatineau, Quebec).

2005 Fundy National Park of Canada, Management Plan. (On file at Parks Canada, Gatineau, Quebec).

1976 History of the National Parks of Canada, Fundy National Park, Vol. 1, p. 104-110. (On file at Parks Canada, Gatineau, Quebec).

Figure 1. Location of Bennett Brook Culvert in Fundy National Park (Aerial photo – Parks Canada - Digital Files).

Figure 2. Overview of the Dam area and the north side of Bennett Brook Culvert site for rehabilitation. (Aerial Photo- Parks Canada - Digital Files).

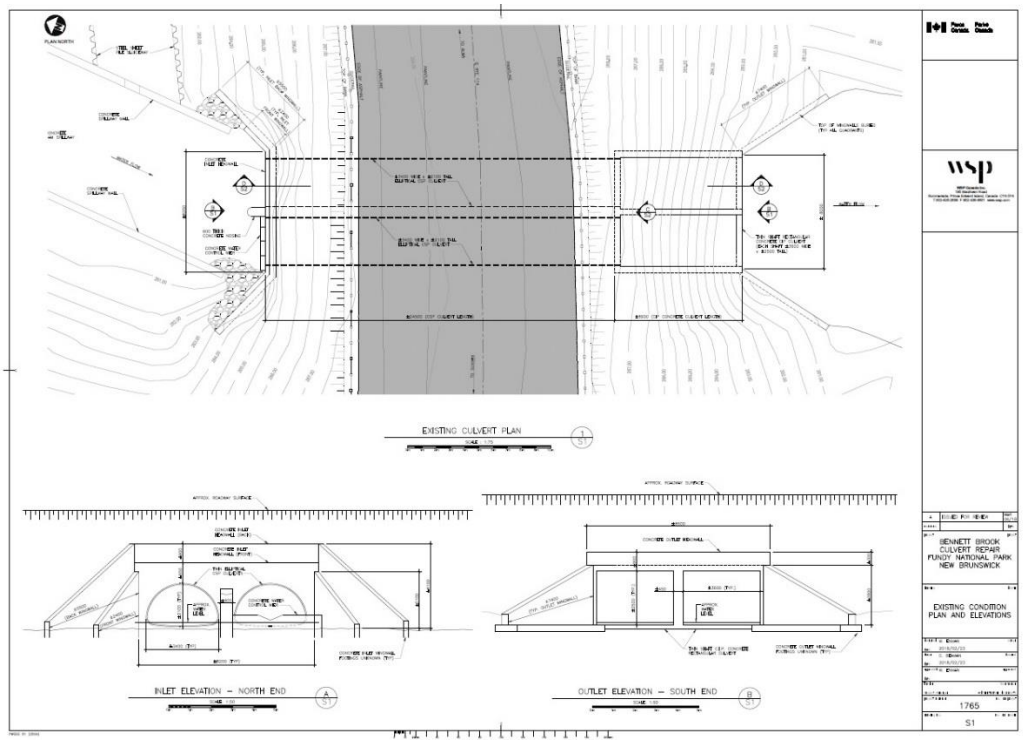



**Figure 3. Plan and elevations of existing condition of Bennett Brook Culvert (WSP/Parks Canada - Digital Files).**

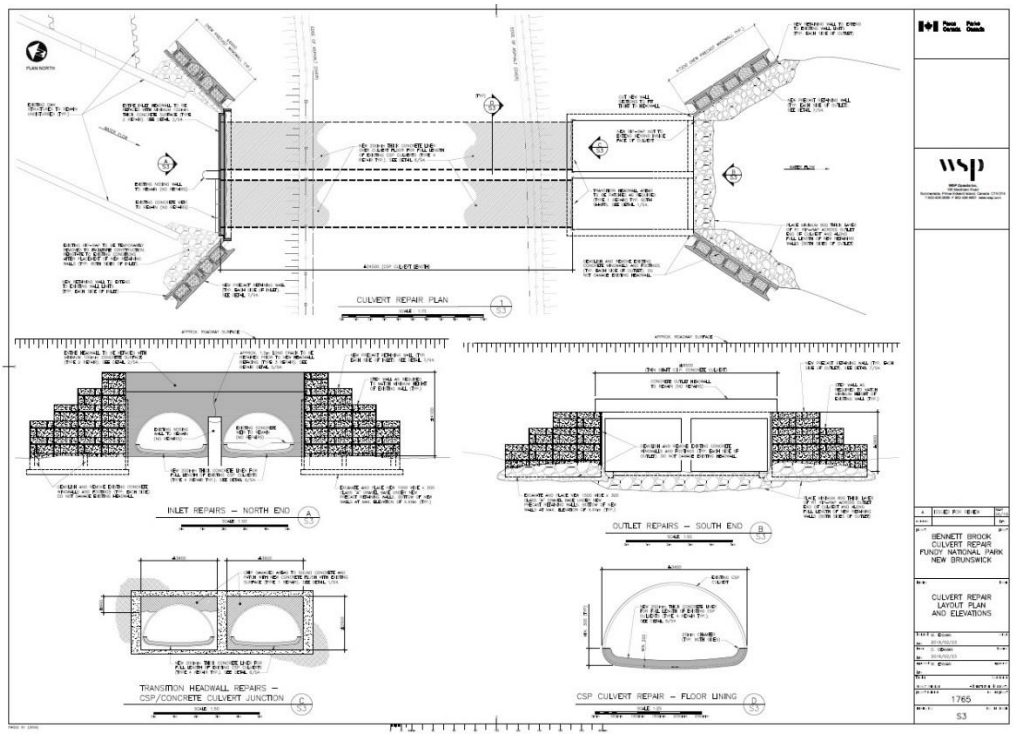



**Figure 4. Plan and Elevations layout of Culvert Repair (WSP/Parks Canada - Digital Files).**