
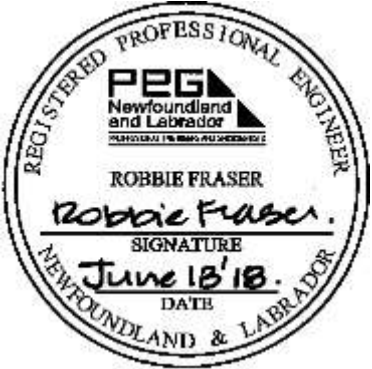


Parks Canada Agency

**McKenzies Brook Forest
Access Bridge
Project No. 1955**

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| 0 | Issued for Tender | REF | June 13, 2018 | <i>Robbie Fraser</i> |
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Appendix A – Environmental Documents

Appendix B – Geotechnical Report

1. List of Drawings

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Part 1 General

1.1 PROJECT LOCATION

- .1 The project is located in Gros Morne National Park, Newfoundland and Labrador. The work is located on a woods access road crossing McKenzies Brook located off Highway 431, approximately 2.4 km east of Glenburnie.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Parks Canada is preparing to replace the McKenzies Brook Forest Access Bridge. The bridge that existed at the site was damaged during a major storm (January 2018) and has subsequently been removed. The new bridge is to be constructed at the location of the previous bridge with minimal changes to the existing roadway.
- .2 Work includes the construction of new cast-in-place reinforced concrete abutments and supply / erection of a 15.24 m modular panel bridge crossing McKenzies Brook.
 - .1 The access road will be closed to public traffic during construction.
 - .2 Supply and erection of the modular panel bridge are the responsibility of the Contractor. The Contractor shall submit drawings sealed by a Professional Engineer licensed to practice in the province of Newfoundland and Labrador. Submissions are subject to review and approval of Departmental Representative.
- .3 Road maintenance of the access road to access the bridge site is the responsibility of the Contractor. Access also includes providing an environmentally friendly crossing of McKenzies Brook to gain access to the south side of McKenzies Brook to undertake work on this project. Other work includes:
 - .1 Construction of the approaches to the new bridge.
 - .2 Armour rip-rap of slopes.
 - .3 Final finishing of all construction slopes.
 - .4 Removal of all excavated materials including remnants of timber abutments and retaining walls.
 - .5 Temporary traffic control during all phases of construction.
- .4 The above listed work is subject to the following constraints during construction:
 - .1 Work shall be in accordance with Basic Impact Analysis and accompanying documents completed for this project.
 - .2 In-water work will be limited to work in installing Armour Rip-Rap and the crossing of the McKenzies Brook for access to the south side of the watercourse. Means of temporary access to cross McKenzies Brook must be done in an environmentally friendly manner, subject to review and approval of the Departmental Representative.
 - .3 Construction activities shall not detrimentally impact the surrounding environment or the waterway.
- .5 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.

1.3 CONTRACT METHOD

- .1 Construct Work under combined unit price and lump sum items contract.

1.4 CODES AND STANDARDS

- .1 Perform work in accordance with National Parks Act, Code of Practice of the Department of Labour, as it pertains to Provincial traffic control requirements (Department of Transportation & Works) 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 at the date of Tender 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.

1.5 SITE CONDITIONS

- .1 The Contractor will be responsible to visit the site and review existing site conditions.
- .2 Before submitting a bid, it is recommended that bidders visit the site to review and verify the form, nature and extent of the work, materials needed, the means of access and the temporary facilities required to perform the Work.
- .3 Obtain prior permission from the Departmental Representative before carrying out such site inspection.
- .4 Contractors, bidders or those they invite to site are to review specification Section 01 35 29.06 – Health and Safety Requirements before visiting site. Take all appropriate safety measures for any visit to site, either before or after acceptance of bid.
- .5 For geotechnical and borehole information, refer to the report: Geotechnical Investigation, McKenzies Forest Access Road Bridge (Horseback Brook Bridge), Gros Morne National Park, NL, File No: 183008, prepared by Harbourside Geotechnical Consultants, dated May 29, 2018.

1.6 INTERPRETATION OF DOCUMENTS

- .1 Supplementary to the Order of Precedence article of the General Conditions of the Contract, the Division 01 Sections take precedence over the technical specification sections in other Divisions of the Specifications Manual.

1.7 TERM ENGINEER

- .1 Unless specifically stated otherwise, the term Engineer where used in the Specifications and on the Drawings shall mean the Departmental Representative as defined in the General Conditions of the Contract.

1.8 SITE SURVEY AND SETTING OUT WORK

- .1 Survey used in the preparation of these Contract Documents was from LIDar. Refer to Drawings for survey details and control points.
- .2 A georeferenced CAD file of the site will be provided to the Contractor for use in layout. Parks Canada assumes no responsibility for the accuracy of this information.
- .3 Contractor to carry out all layout. The Contractor is responsible for the layout of grade stakes at every construction stage. Establish and maintain stakes at 20 m stationing and placement of offsets at 20 m stations (top of backslope, toe of slope, subgrade, granulars, shoulders, etc.) on which is written chainage and centreline offset. All stakes to be removed at the completion of the work.
- .4 The Contractor shall assume full responsibility for and execute complete layout of work locations, lines and elevations indicated.
- .5 The Contractor shall supply such devices as straight edges and templates required to facilitate Departmental Representative's inspection of work.
- .6 The Contractor shall provide coordinates, elevations and dimensions in the field, as required by the Departmental Representative.

1.9 WORK WITHIN PARK BOUNDARIES

- .1 The project is within a national park and it is essential that 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, the Contractor is responsible to bear the expense to immediately restore such damaged areas to the satisfaction of Departmental Representative.
 - .2 If Contractor fails to repair damage to the satisfaction of the Departmental Representative, the Departmental Representative may have repairs completed by others at the Contractor's expense.
 - .3 The Contractor shall ensure that contracted work meets the standards outlined in the contract specification and drawings.
 - .4 The Contractor shall ensure that no damage will be done to any existing utilities.
 - .5 All sources of aggregate must be submitted to the Departmental Representative for approval at least two weeks prior to the start of any work.
 - .6 The Contractor is responsible to follow the Provincial requirements regarding the following:
 - .1 Pit and Quarry Guidelines
 - .2 Environmental Construction Practice Specifications
 - .7 The Contractor will 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.

- .8 Water extraction from within the Park boundaries is strictly forbidden. Water extraction may be permitted following detailed proposal submitted by the Contractor and subject to approval by the Departmental Representative.
- .9 Special move permits for over-weight and over-dimensional vehicles required to travel provincial highways must be secured by the Contractor and submitted to the Departmental Representative for review and approval prior to movement within Park boundaries.

1.10 MAINTENANCE OF WORK DURING CONSTRUCTION

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

1.11 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 and Lump Sum items.
- .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 The final completion date shall be **September 14, 2018**.
- .4 Work must be undertaken without environmental impact to McKenzies Brook.
- .5 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.
- .6 No work will begin until the pre-construction meeting is held and the Environmental Protection Plan, Health and Safety Plan and Traffic Control Plan have been accepted by the Departmental Representative.
- .7 Following the pre-construction meeting and approval of the schedule, traffic control plan environmental protection plan and occupational health and safety plan, the work will be so scheduled to meet the time restraints and have the project completed on time.

1.12 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 Departmental Representative will specify the areas for work and storage.

1.13 SANITARY SERVICES

- .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.

1.14 PROJECT MEETINGS

- .1 Departmental Representative will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.
- .2 After receiving the Contractor's schedule, traffic control plan, health and safety hazard assessment, and environmental protection 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, health and safety, methods of construction, environmental protection methods and traffic control.

1.15 DEPARTMENTAL REPRESENTATIVE

- .1 Departmental Representative will be assigned after contract award.

1.16 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each of the following:
 - .1 Contract drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed drawings.
 - .5 Change orders.
 - .6 Other modifications to Contract.
 - .7 Copy of approved work schedule.
 - .8 Field test reports
 - .9 Manufacturer's installation and application instructions.
 - .10 Site specific Health and Safety Plan and other safety related documents.
 - .11 Other documents as stipulated elsewhere in the Contract Documents.

1.17 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.

1.18 MEASUREMENT FOR PAYMENT

- .1 Notify Departmental Representative sufficiently in advance of operations to permit required measurements for payment.

1.19 CUTTING AND PATCHING

- .1 Cut and patch as required to make work fit.
- .2 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.

1.20 RELICS, ANTIQUES AND 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.

1.21 NATIONAL PARKS ACT

- .1 For projects within boundaries of National Park, perform work in accordance with National Parks Act.

1.22 MEASUREMENT OF QUANTITIES

- .1 Linear: Items which are measured by metre are to be measured along centreline of installation unless otherwise shown on plans.
- .2 Area:
 - .1 Longitudinal and transverse measurements for areas to be measured horizontally.
- .3 Mass:
 - .1 Term "tonne" shall mean 1000 kg.
 - .2 Materials which are specified for measurement by mass shall be weighed on approved scales. 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.
- .4 Time:
 - .1 Unless otherwise provided for elsewhere or by written authority of the 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 actual hours of operation. Devices which only measure hours of running of motor will not be accepted.

1.23 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.

1.24 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 Newfoundland and Labrador Department of Transportation and Works (NLDTW Specification Book Division 10).

1.25 PROTECTION

- .1 Store all materials and equipment to be incorporated into work to prevent damage by any means.
- .2 Repair and replace all materials or equipment damaged in transit or storage to the satisfaction of the Departmental Representative and at no cost to Crown.
- .3 Exercise care so as not to obstruct or damage public or private property in the area.
- .4 At completion of work, restore area to its original condition. Damage to ground and property will be repaired by Contractor. Remove all construction materials, residue, excess, etc., and leave site in a condition acceptable to Departmental Representative.

1.26 EXISTING SERVICES

- .1 Carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to pedestrian and vehicular traffic.
- .2 Before commencing work, establish location and extent of service lines in area of work and notify Departmental Representative of findings.
- .3 Submit Schedule to and obtain approval from Departmental Representative for any shut down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.
- .4 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .5 Record locations of maintained, re-routed and abandoned service lines.
- .6 Ensure traffic is not unduly impeded, interrupted or endangered by execution or existence of work or plant.
- .7 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.
- .8 Verify locations of any underground utilities.

Part 2 Products

Not Used

Part 3 Execution

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, 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 Provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS

- .1 Execute work with least possible interference or disturbance to 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 obtain clearance reports from all utilities and ensure lines are not disturbed during the duration of this project. The Contractor will be required to coordinate their work with utility companies and schedule the works accordingly.
- .2 Provide for personnel, pedestrian and vehicular traffic

1.5 SPECIAL REQUIREMENTS

- .1 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.
- .2 The existing road is closed at the bridge. The road and bridge must be open to traffic by August 31, 2018.
- .3 Time work in accordance with Basic Impact Analysis completed for the project and included in Appendix A.
- .4 Approval from the Departmental Representative must be given prior to commencement of clearing operation.
- .5 Water extraction from within the Park boundaries is strictly forbidden. Water extraction may be permitted following detailed proposal submitted by the Contractor and subject to approval by Departmental Representative.
- .6 Time work in-water in accordance with Basic Impact Analysis completed for the project and included in Appendix A.
- .7 Maintenance to vehicles and equipment is prohibited within the Park boundaries.

- .8 Blasting within the Park boundaries is not permitted.
- .9 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .10 Keep within limits of work and avenues of ingress and egress.

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 10 – Measurement and Payment

1.3 PRIME COST SUM

- .1 Include in Contract Price a total Prime Cost Sum of \$100,000.
- .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 Earth work, granulars, cast-in-place reinforced concrete, erosion and sediment controls, removal and installation of guide rail, within Gros Morne National Park, NL.
- .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 RELATED SECTIONS

- .1 Section 01 11 00 – Summary of Work

1.2 DESCRIPTION

- .1 Mobilization and Demobilization consists of preparatory work and operations including but not limited to, those necessary for the movement of personnel, equipment, offices, supplies and incidentals to and from the project sites.
- .2 For the purposes of mobilization and demobilization, “project site” means the bridge site location.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 GENERAL

- .1 This section covers the measurement of Work done for payment purposes.
- .2 The estimated quantities shown in the Unit Price Table are provided for the purposes of comparing proposals, and are not guaranteed to be final, accurate or complete. Payment to the Contractor will be based on actual quantities of work completed in accordance with the drawings and specifications.
- .3 There shall be no measurement or payment for Work carried out beyond the limits defined on the Drawings.
- .4 The total of all Unit Prices and Lump Sum payments shall constitute full compensation for the entire Work of the Contract, as shown, specified, and intended.
- .5 The Contractor will only be entitled to payment when prior written authorization has been received from the Departmental Representative for utilization and then only to the extent of the work authorized by the Departmental Representative.
- .6 The unit and lump sum prices for all items in the Unit Price Table and Lump Sum Table shall represent the full compensation for the work of the item and shall include the cost of furnishing all materials, labour, tools, and equipment necessary to complete the work in accordance with the Contract, the Drawings and Specifications, and shall cover all costs of surety. Each item shall include all necessary supervision, plant and services, and all operations and allowances customary and necessary to complete each item and the Contract as a whole, notwithstanding the fact that not every such necessary operation is mentioned or included specifically for measurement. There shall be no measurement or payment for Work carried out beyond the limits defined on the Drawings.
- .7 Unless specified otherwise, all materials necessary to complete the items listed in the Unit Price Table, Lump Sum Table and the finished Work shall be new materials supplied by the Contractor and the cost of such material is to be included in the Contractor's prices.
- .8 All measurements for progress payment purposes shall be taken jointly by the Contractor and the Departmental Representative.
- .9 Items which are measured by the metre shall be measured along centreline of installation unless otherwise indicated.
- .10 Longitudinal and transverse measurement shall be made on the actual flat or sloped surface.
- .11 In computing volumes of excavation, average end area method will be used unless otherwise directed by Departmental Representative.
- .12 All volume measurements refer to in-place measures unless specified otherwise.
- .13 Materials which are specified for measurement by mass shall be weighed on scales approved by Departmental Representative refer to Section 01 54 30 – Temporary Weigh Scales. 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.
- .14 Overhaul will not be paid on this Contract.

1.2 ITEMS – LUMP SUM TABLE

1. Prime Cost Sum

- .1 This item is an allowance to cover miscellaneous work which may occur during the work on the project. Payment will be made against it for miscellaneous work not included under items specified in the Lump Sum Table or Unit Price Table ordered under GC 6.1 of the General Conditions. Prime Cost Sum is not a sum due the Contractor.

2. 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.

3. 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.

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

5. Concrete Reinforcing

- .1 Unit of Measurement is Lump Sum

- .2 This item includes supply and installation of reinforcing steel for Cast-In-Place Concrete as indicated and necessary for this work. Approximate steel reinforcing quantities are provided solely for information purposes and PCA makes no claims with respect to their accuracy. The Contractor shall review the drawings and is responsible to prepare their own quantities. The approximate reinforcing quantity is 4000 kg.
6. Modular Panel Bridge
 - .1 Unit of Measurement is Lump Sum
 - .2 This item includes supply of a 15.24 m panel bridge. This item includes supply, transportation, erection of panel bridge, bearing assemblies, bridge barrier system and all coordination, submittals and design required for a complete installation of a modular panel bridge
7. Road Maintenance and Access
 - .1 Unit of Measurement is Lump Sum
 - .2 This item includes provision of road maintenance of access road to access the site and provision of means for temporary access to cross McKenzies Brook to access the south side of McKenzies Brook. Also included under this item is Clearing and Grubbing required to complete work on this project.
8. Excavation for Bridge
 - .1 Unit of Measurement is Lump Sum
 - .2 This item includes excavation of all material of whatever nature encountered (unclassified), required for the construction of the new abutments including removal of material for the placement of Fill Against Structure and Armour Rip-Rap slopes surrounding each abutment and along side slopes, as indicated on the Contract Drawings. This item shall also include temporary supports, removal of remnants of existing structures (timber, rock filled gabion wire baskets, etc.), widening of existing watercourse and disposal of all excavated material.
9. Dewatering / Water Control
 - .1 Unit of Measurement is Lump Sum
 - .2 This item includes provision of dewatering / water control required during the excavation and construction of the new abutments.
10. 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, temporary structures, cold weather protection and curing of materials, water control and dust control.

1.3 ITEMS – UNIT PRICE TABLE

1. Cast-In-Place Reinforced Concrete
 - .1 Unit of Measurement is Cubic Metre (m³)
 - .2 This item includes supply, formwork, placing, compacting and finishing of all concrete for the bridge abutments and wingwalls. Measurement shall be based on Contract Drawings with no deduction for displacement by reinforcement.
2. Galvanized Armour Angles
 - .1 Unit of Measurement is Each
 - .2 This item includes shop drawings, supply and installation of the armour angle assembly at each backwall.
3. Unclassified Excavation Roadway and Drainage
 - .1 Unit of Measurement is Cubic Metre (m³)
 - .2 This item includes excavation of unclassified material after removal of grubbing, topsoil and pavement and for placement and compacting of approved common fill from on-site sources to lines and elevations indicated. This item shall also include excavation for the removal of culverts which will not be replaced and disposal of excess and unsuitable material off-site.
4. Fill Against Structure
 - .1 Unit of Measurement is Tonne (t)
 - .2 This item includes supply, placement and compaction of fill against abutments to lines and elevations identified. Supply and installation of perforated pipe drain system as shown on the Contract Drawings are included under this item.
5. Rock Fill
 - .1 Unit of Measurement is Cubic Tonne (t)
 - .2 This item includes supply, transportation, placement and compacting of approved rock fill material from areas off site, required for construction of embankments or for other portions of work as directed by the Departmental Representative.
6. Armour Rip Rap
 - .1 Unit of Measurement is Cubic Metre (m³)
 - .2 This item includes supply and placement where indicated. This item also includes the supply and installation of geotextile material beneath the armour rip rap. Measurement shall be based on Contract Drawings.
7. Clear Stone
 - .1 Unit of Measurement is Tonne (t)
 - .2 This item includes supply, placement and compaction of Clear Stone as indicated on the drawings and as directed by the Departmental Representative. This item also includes the supply and installation of geotextile material beneath the clear stone.
8. Aggregate Base Course (Granular A)
 - .1 Unit of Measurement is Tonne (t)

- .2 This item includes supply, haulage, placement and compaction of Granular A material to the limits and at the locations indicated on the drawings or as directed by the Departmental Representative.
9. Hydraulic Seeding
- .1 Unit of Measurement is Square Metre (m²)
 - .2 This item includes supply of all materials, preparation of surface, application and maintenance to areas identified or as directed by the Departmental Representative.
10. Steel W-Beam Guide Rail – Bridge Approach
- .1 Unit of Measurement is Metre (m)
 - .2 This item includes supply of all materials including reflectors, installation, backfilling, compaction, disposal of excess material and reinstatement of disturbed surfaces.
11. Sign and Signpost Installation
- .1 Unit of Measurement is Each
 - .2 This item includes supply and installation as indicated. Work considered incidental to this item are the removal of existing signs and posts being replaced including filling of holes and reinstatement of disturbed surfaces.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 APPOINTMENT AND PAYMENT

- .1 Departmental Representative will appoint and pay for services of testing laboratory except as follows:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing, adjustment and balancing of equipment and systems.
 - .4 Mill tests and certificates of compliance.
 - .5 Tests specified to be carried out by Contractor under supervision of Departmental Representative.
 - .6 Additional tests specified as follows in the following paragraph.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

1.3 CONTRACTOR'S RESPONSIBILITIES

- .1 Provide labour, equipment and facilities to:
 - .1 Provide access to Work for inspection and testing.
 - .2 Facilitate inspections and tests.
 - .3 Make good Work disturbed by inspection and test.
 - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
- .2 Notify Departmental Representative 48 hours minimum in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

END OF SECTION

Part 1 General

1.1 PRECONSTRUCTION MEETING

- .1 Within 7 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 4 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: to be in GANTT Chart format.
 - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
 - .5 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
 - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .7 PCA provided products.
 - .8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
 - .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
 - .11 Monthly progress claims, administrative procedures, photographs, hold backs.
 - .12 Appointment of inspection and testing agencies or firms.
 - .13 Insurances, transcript of policies.

1.2 PROGRESS MEETINGS

- .1 During course of Work, Departmental Representative will schedule progress meetings monthly.
- .2 Contractor, major Subcontractors involved in Work, and Departmental Representative are to be in attendance.
- .3 Departmental Representative will notify parties minimum 4 days prior to meetings.
- .4 Departmental Representative will record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 days after meeting.
- .5 Progress 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 Review of off-site fabrication delivery schedules.
- .6 Corrective measures and procedures to regain projected schedule.
- .7 Revision to construction schedule.
- .8 Progress schedule, during succeeding work period.
- .9 Review submittal schedules: expedite as required.
- .10 Maintenance of quality standards.
- .11 Review proposed changes for effect on construction schedule and on completion date.
- .12 Other business.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Refer to Technical Specifications which reference "SUBMITTALS" under PART 1 – GENERAL of each section.

1.2 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.

1.3 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 bearing stamp and signature of qualified professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.
 - .1 When requested by the Departmental Representative, the Contractor shall provide CV and proof of Errors and Omissions insurance of the professional engineer who will be stamping drawings.
- .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 ten (10) business days, unless otherwise noted, 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, in duplicate, 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 copy of product data sheets or brochures for requirements requested in specification Sections and as requested by the Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copy of test reports for requirements requested in specification Sections and as requested by 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 accordance with specified requirements.
 - .2 Testing must have been within 2 years of date of contract award for project, unless otherwise noted.
- .13 Submit electronic copy of certificates for requirements requested in specification Sections and as directed 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 copy of manufacturer's instructions for requirements requested in specification Sections unless otherwise directed 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 copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Documentation of the testing and verification actions by manufacturer's representative to confirm compliance with manufacturer's standards and instructions.
- .16 Delete information not applicable to project.
- .17 Supplement standard information to provide details applicable to project.
- .18 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, electronic copy will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .19 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of

responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

- .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.4 SAMPLES

- .1 Submit for review samples as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's site office.
- .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.

1.5 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.
- .3 Submit Certificates of Conformance to the Departmental Representative, stating that the component(s) has been installed in conformance with the approved shop drawings. Certificate of Conformance to bear the seal and signature of a Professional Engineer licensed in the province of Newfoundland and Labrador.
- .4 Certificates of Conformance required for, but not limited to, the following:
 - .1 All components where shop drawings are required (unless otherwise directed by the Departmental Representative).
 - .2 Dry film thickness of each coating of paint.
 - .3 As specified elsewhere in the Contract Documents.

1.6 PROCEDURES

- .1 Provide procedures required as specified in the Contract documents or as directed by the Departmental Representative.

1.7 OTHER SUBMISSIONS

- .1 Provide a construction schedule and cash flow forecasts updated every month.
- .2 Provide all other submissions as required by law and the Contract documents.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS)
- .2 Government of Canada
 - .1 Canada Labour Code – Part II (entitled Occupational Health and Safety)
 - .2 Canada Occupational Health and Safety Regulations (COHS)
- .3 Province of Newfoundland and Labrador
 - .1 Occupational Health and Safety Act
 - .2 Occupational Health and Safety Regulations made pursuant to the Act
 - .3 Department of Transportation and Works (NLDTW) Traffic Control Manual (TCM).
- .4 Part 8 of the National Building Code
- .5 Municipal by-laws and ordinances.

1.2 DEFINITIONS

- .1 Competent Person: means a person who is:
 - .1 Qualified by virtue of personal knowledge, training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace;
 - .2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work; and
 - .3 Knowledgeable about potential or actual danger to health and safety associated with the Work.
- .2 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
- .3 Work site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

1.3 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit site specific Health and Safety Plan: within 10 days of notification of Bid Acceptance and prior to commencement of work.
- .3 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments. Revise plan as appropriate and resubmit within ten (10) working days after receipt of comments.

- .4 Submit revisions and updates made to the Contractor's Health and Safety plan during the course of the Work.
- .5 Submit records of Contractor's Health and Safety meetings when requested.
- .6 Submit Construction Safety Checklists after completion.
- .7 Submit copies of reports of directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .8 Submit copies of incident and accident reports.
- .9 Submit WHMIS MSDS – Material Safety Data Sheets.
- .10 Submit proof of Workers' Compensation Coverage through submission of Letter of Good Standing. Contractor must maintain good standing throughout the duration of the contract.
- .11 Contractor's responsibility for Health and Safety is not relieved in any way by the Department Representative's review or lack of review of these submittals.

1.4 COMPLIANCE REQUIREMENTS

- .1 Comply with the Occupational Health and Safety Act for the Province of Newfoundland and Labrador, and the Regulations made pursuant to the Act.
- .2 Comply with Canada Labour Code Part II, and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.
- .3 Observe and enforce construction safety measures required by:
 - .1 2015 National Building Code of Canada, Part 8;
 - .2 Provincial Worker's Compensation Board;
 - .3 Municipal by-laws and ordinances.
- .4 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.
- .5 Maintain Workers Compensation Coverage for duration of Contract. Submit Letter of Good Standing to Departmental Representative upon request.
- .6 Medical Surveillance: Where prescribed by legislation or regulations, obtain and maintain worker medical surveillance documentation.

1.5 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons and environment adjacent to the site to the extent that they may be affected by the conduct of Work.
- .2 Comply with and enforce compliance by all workers, sub-contractors and other persons granted access to work site with safety requirements of Contract Documents, applicable federal, provincial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.6 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 non-authorized persons from circulating within construction areas and remove from site.
- .2 Implement procedures for granting permission to enter onto 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, boarding and temporary lighting as required. See Section 01 56 00 – Temporary Barriers and Enclosures for minimum type of barriers acceptable.
- .4 Erect signage at entry points and at other strategic locations indicating restricted access and conditions of access. Signage must be professionally made in both official languages or by use of well understood graphic symbols.
- .5 Secure work site against entry when inactive or unoccupied and to protect persons against harm. Provide security guard as deemed necessary to protect site against entry.
- .6 Ensure persons granted access is 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.

1.7 PROTECTION

- .1 Provide temporary facilities for protection and safe passage of vehicular traffic around and adjacent to work site.
- .2 Provide safety barricades, lights and signage on work site as required to provide a safe working environment for workers.
- .3 Carry out work placing emphasis on health and safety of public, site personnel and protection of the environment over cost and schedule consideration for work.
- .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.

1.8 FILING OF NOTICE

- .1 File Notice of Project and other Notices with Provincial authorities prior to commencement of work.

1.9 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 work.
- .3 Post all permits on site. Submit copies to Departmental Representative.

1.10 HAZARD ASSESSMENTS

- .1 Implement and carry out a health and safety hazard assessment program as part of the work. Program to include:
 - .1 Initial hazard assessment carried out immediately upon notification of contract award and prior to commencement of work.
 - .2 On-going hazard assessments performed during the progress of work identifying new or potential health risks and safety hazards not previously known. As a minimum hazard assessments shall be carried out when:
 - .1 New sub-trade work, new subcontractor(s) or new workers arrive at the site to commence another portion of the work.
 - .2 The scope of work has been changed by Change Order.
 - .3 Potential hazard or weakness in current health and safety practices are identified by Departmental Representative or by an authorized safety representative.
 - .3 Hazard assessments to be project and site-specific, based on review of contract documents, site and weather conditions.
 - .4 Each hazard assessment to be made in writing. Keep copies of all assessments on site for duration of work. Upon request, make available to Departmental Representative for inspection.

1.11 PROJECT/SITE CONDITIONS

- .1 The following are known or potential project related safety hazards at site:
 - .1 Running water, potential heavy flows.
 - .2 Highway traffic.
 - .3 Working over water.
 - .4 Heavy equipment.
 - .5 Slope stability and temporary shoring.
 - .6 Wildlife.
 - .7 Working at heights.
 - .8 Working overhead.
 - .9 Suspended scaffolding.
 - .10 Demolition.
 - .11 Exposure.
 - .12 Remote site.
- .2 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.
- .3 Include above items into the hazard assessment program specified herein.

1.12 SAFETY MEETINGS

- .1 Prior to commencement of work attend health and safety meeting conducted by Departmental Representative. Departmental Representative will advise of time and location. Ensure attendance of:

- .1 Superintendent of Work.
 - .2 Designated Health and Safety Site Representative
 - .3 Subcontractors.
- .2 Conduct regularly scheduled tool box and safety meetings during the Work in conformance with Occupational Health and Safety regulations.
 - .3 Keep documents on site.

1.13 HEALTH AND SAFETY PLAN

- .1 Develop written site-specific Project Health and Safety Plan, based on hazard assessments, prior to commencement of work. Submit plan to Departmental Representative within 10 calendar days of Contract Award date.
- .2 Health and Safety Plan shall contain the following components:
 - .1 List of health risks and safety hazards identified by hazard assessments.
 - .2 Control measures used to mitigate risks and hazards identified.
 - .3 On-site Contingency and Emergency Response Plan as specified below.
 - .4 On-site Communications Plan as specified below.
 - .5 Name of Contractor's designated Health and Safety Site Representative and information showing proof of their competence and reporting relationship in Contractor's company.
 - .6 Names, competence and reporting relationship of other supervisory personnel used in the Work for occupational health and safety purposes.
 - .7 On-site Contingency and Emergency Response Plan shall include:
 - .1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.
 - .2 Evacuation plan: site layouts showing escape routes, marshalling areas. Details of alarm notification methods, fire drills, location of firefighting equipment and other related data.
 - .3 Name, duties and responsibilities of persons designated as Emergency Warden(s) and deputies.
 - .4 Emergency Contacts: name and telephone number of officials from Contractor, Sub-Contractors, federal and provincial departments having jurisdiction, local emergency resource organization.
 - .5 Harmonize plan with Facility's Emergency Response and Evacuation Plan. Departmental Representative will provide pertinent data including name of PCA and Facility Management contacts.
 - .8 On-site Communications Plan:
 - .1 Procedures for sharing of work related safety information to workers and Sub-Contractors, including emergency and evacuation measures.
 - .2 List of critical work activities to be communicated with Facility Manager which have a risk of endangering health and safety of Facility users.
 - .9 Address all activities of the Work including those of Sub-Contractors.

- .10 Review and update Health and Safety Plan regularly during the Work. Update as conditions warrant addressing additional health risks and safety hazards, such as whenever new trade or Sub-Contractors arrive at Work site.
- .11 Departmental Representative will respond in writing, where deficiencies or concerns are noted and may request re-submission of the Health and Safety Plan with correction of deficiencies or concerns.
- .12 Post copy of the Health and Safety Plan, and updates, prominently at Work site.

1.14 SAFETY SUPERVISION AND INSPECTIONS

- .1 Designate Health and Safety Site Representative to be present on site at all times during work, responsible for supervising health and safety and conducting safety inspections of work site.
- .2 Health and Safety Representative shall be assigned the responsibility and authority to:
 - .1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work.
 - .2 Conduct site safety orientation session to persons granted access to the Work site.
 - .3 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work site.
 - .4 Authority to stop and start work as deemed necessary for reasons of health and safety.
- .3 Conduct regularly scheduled safety inspections of work site as follows:
 - .1 Informal Inspections: carry out a minimum bi-weekly basis. Note deficiencies and remedial action taken in a log book or diary.
 - .2 Formal Inspections: carry out on a minimum monthly basis. Use standardized safety checklist forms. Prepare written report for each formal inspection. Document deficiencies, remedial action needed and assign responsibility for rectification to appropriate subcontractor or worker.
- .4 Cooperate with Facility's Health and Safety Site Coordinator responsible for the entire site or facility, should one be designated by Departmental Representative.
- .5 Maintain safety inspection documentation on site

1.15 TRAINING

- .1 Ensure that workers, subcontractors and other authorized persons granted access to site are effectively trained in occupational health and safety and practices pertinent to their assigned tasks.
- .2 Maintain employee records and evidence of training received.
- .3 Make training records readily available for review by Departmental Representative upon request.
- .4 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of Work immediately stop work and advise Department Representative verbally and in writing.

- .5 Follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative.

1.16 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 personnel protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat, safety footwear (and eye protection where appropriate).
 - .2 Immediately report unsafe activities, conditions, near-miss accidents, injuries and damages.
 - .3 Maintain site and storage areas in tidy condition free of hazards causing injury.
 - .4 Obey warning signs and safety tags.
- .2 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.

1.17 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by the Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative will stop Work if non-compliance of health and safety regulations are not corrected in a timely manner.

1.18 INCIDENT REPORTING

- .1 Investigate and immediately report to Departmental Representative incidents that:
 - .1 Require reporting to Provincial Department of Occupational Safety and Health, Workers' Compensation Board or to other regulatory agency.
 - .2 Medical aid injuries.
 - .3 Property damage in excess of \$10,000.00,
 - .4 Interruption to Facility operations resulting in an operational loss to a Federal department or client in excess of \$5,000.00,
 - .5 Required notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable regulations.
- .2 Submit report in writing.

1.19 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 Post all MSDS data sheets on site, in a common area, visible to workers.

1.20 BLASTING

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

1.21 POWDER ACTUATED DEVICES

- .1 Use powder actuated fastening devices only after receipt of written permission from Departmental Representative.

1.22 CONFINED SPACES

- .1 Abide by occupational health and safety regulations regarding work in confined spaces.
- .2 Safely for Inspectors:
 - .1 Provide PPE and training to Departmental Representative and other persons who require entry into confined spaces to perform inspections.
 - .2 Be responsible for efficacy of equipment and safety of persons during their entry and occupancy in the confined space.

1.23 POSTING OF DOCUMENTS

- .1 Post documents indicated herein and as required by Authority having jurisdiction.

1.24 RECORDS ON SITE

- .1 Ensure applicable items, articles, notices and orders are posted in a conspicuous location on Work site in accordance with Acts and Regulations of Province of Newfoundland and Labrador.
- .2 Post other documents as specified herein, including:
 - .1 Site specific Health and Safety Plan.
 - .2 WHMIS data sheets.
 - .3 Incident reports.
 - .4 Tool box and safety meeting minutes.
- .3 Make available to Departmental Representative, or authorized safety representative, for inspection upon request.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

- .1 National Parks Act.
- .2 Canadian Environmental Protection Act.
- .3 Newfoundland and Labrador Provincial Standards.
- .4 Guidelines for Protection of Freshwater Fish Habitat, DFO Canada.
- .5 Basic Impact Analysis (BIA) McKenzies Brook Forest Access Bridge Replacement, Parks Canada.
- .6 Parks Canada National Best Management Practices Roadway, Highway, Parkway and Related Infrastructure.
- .7 Geotechnical Investigation, McKenzies Forest Access Road Bridge (Horseback Brook Bridge), Gros Morne National Park, NL, File No: 183008, prepared by Harbourside Geotechnical Consultants, dated May 29, 2018.

1.4 ENVIRONMENTAL PERFORMANCE

- .1 The Contractor shall comply with all mitigative measures, terms and conditions outlined in the attached Basic Impact Analysis (BIA) McKenzies Brook Forest Access Bridge Replacement, Parks Canada and Parks Canada National Best Management Practices Roadway, Highway, Parkway and Related Infrastructure. The BIA and BMP are attached as Appendix A of this specification.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 An Environmental Briefing will be held prior to work commencing at the site, which will outline environmental factors to be considered during the work. It is mandatory that all current staff of the Contractor attend this meeting with the Departmental Representative and Environmental Protection Officer (EPO).
- .3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Environmental Protection Plan: include as applicable:

- .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
- .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
- .3 Names and qualifications of persons 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 and regulations.
- .6 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 including methods for protection of features to be preserved within authorized work areas.
- .7 Spill Contingency Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .8 Non-Hazardous Solid Waste Disposal Plan identifying methods and locations for solid waste disposal including clearing debris and recycling of decommissioned bridge materials.
- .9 Air Pollution Control Plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
- .10 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.
- .11 Waste Water Management Plan identifying methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

1.6 FIRES

- .1 Fires and burning of rubbish on site is not permitted.
- .2 The Contractor is required to comply with the Fire Protection Regulations of the National Parks Act.
- .3 In accordance with these Regulations, the Park Superintendent may restrict activities, or access to work areas, in the interest of fire prevention.
- .4 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.
- .5 Vehicles and stationary equipment must be equipped with fire suppression equipment such as an operable fire extinguisher.

- .6 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.
- .7 The Departmental Representative and the Duty Warden of the Park must be contacted immediately in the event of a fire. The Contractor is held responsible to make all reasonable efforts to extinguish any fires on the site.

1.7 DRAINAGE

- .1 As part of the Environmental Protection Plan, the Contractor shall provide an Erosion and Sediment Control Plan that identifies type and location of erosion and sediment controls to be provided. Plan: include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
- .2 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .3 Do not pump water containing suspended materials into waterways, or drainage systems.
- .4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Provincial authority requirements.

1.8 SITE CLEARING AND PLANT PROTECTION

- .1 Restrict vegetation removal to areas indicated or designated by Departmental Representative.
- .2 Sensitive areas should be cleared in a manner which will minimize disturbance to surface vegetation and soils. Areas such as stream crossings should only be cleared immediately prior to construction using light equipment.
- .3 Bulldozers, graders, and other clearing and grubbing equipment should not be operated outside of designated clearing boundaries and should have a restricted turning radius.
- .4 Vegetation and topsoil should not be removed to obtain fill for road construction purposes.
- .5 Whenever possible, organic debris and topsoil removed during grading operations should be stored for use during site restoration. Such stockpiles should be located well away from any stream or water body and should be covered with coarse material to minimize wind and water erosion.
- .6 Should cultural resources artifacts be unearthed or discovered during project excavation, work in that area should be stopped and the Departmental Representative contacted immediately.
- .7 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .8 Minimize stripping of topsoil and vegetation.

1.9 SITE SET-UP AND USE

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

- .2 Office trailer(s) will be permitted to be located within the boundaries of Gros Morne National Park. Location is subject to approval of the Departmental Representative.
- .3 Work sites will be equipped with appropriate and properly maintained sanitary facilities.
- .4 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). All material must be removed, transported and disposed of in accordance with existing provincial-municipal and Park solid waste disposal guidelines, project waste management plan and/or regulations.
- .5 Temporary storage parking areas, and turn-a-round facilities for contractor-related equipment and vehicles will be limited to those areas agreed to and designated by the Departmental Representative.
- .6 To reduce potential negative impacts on Park fauna, noise control measures, such as properly functioning mufflers on equipment, must be in place.
- .7 Littering is prohibited.
- .8 Water extraction from within the Park boundaries is strictly forbidden. Water extraction may be permitted following detailed proposal submitted by the Contractor and subject to approval by Department Representative.

1.10 DISPOSAL OF WASTES

- .1 Do not bury rubbish and waste material on site. Remove all garbage from site daily.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.11 WORK ADJACENT TO WATERWAYS

- .1 In-water work will be limited to work in installing Armour Rip-Rap and the crossing of the McKenzies Brook for access to the south side of the watercourse. Means of temporary access to cross McKenzies Brook must be done in an environmentally friendly manner, subject to review and approval of the Departmental Representative.
- .2 Do not operate construction equipment in waterways.
- .3 All work aside from installing Armour Rip-Rap and temporary access across McKenzies Brook is to be done in the dry. Environmental controls required to separate the work from the waterway is the responsibility of the Contractor.
- .4 All work is to be carried out with siltation control which separates the work area from the watercourse. The method of siltation control shall be provided as part of the Erosion and Sediment Control Plan.
- .5 No fresh concrete, lime, cement, or other construction materials or debris is to enter the watercourse.
- .6 All heavy equipment to be used on the project site is to be cleaned of mud, soil or debris prior to being brought to the site, in good working order, without leaks of fuel, oil, grease or lubricants.
- .7 Fueling of equipment must not take place within 100 m of a watercourse.
- .8 The movements of fish through the project site will be unimpeded at all times.

- .9 Contractor is to have a copy of the environmental assessment (Basic Impact Analysis (BIA) McKenzies Brook Forest Access Bridge Replacement), Environmental Protection Plan and all applicable permits at the project site at all times.
- .10 Do not use waterway beds for borrow of material.
- .11 No excavated fill, waste material or debris from the removal of the existing bridge structure is to enter the watercourse.
- .12 Do not clean or drain equipment in waterways.
- .13 Blasting is prohibited.
- .14 Temporary diversion ditches, approved by the Departmental Representative are to be plastic lined.
- .15 Temporary storage sites for debris and soil generated from clearing operations should be deposited away from watercourses, should be surrounded by a natural vegetative buffer, should be screened from the road and should be selected by the Departmental Representative.
- .16 All temporary structures, piles, falseworks and debris are to be completely removed from the waterway.
- .17 Dredged material is not to re-enter the waterway.
- .18 Design and construct temporary crossings to minimize erosion to waterways.
- .19 Do not skid logs or construction materials across waterways.

1.12 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 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.13 EARTH MOVEMENT

- .1 Clearing and grubbing of project site is to be kept to a minimum.
- .2 Where engineering requirements can be met, excavated materials from this project must be used for backfilling.
- .3 There are no borrow areas available in the Park.
- .4 All surplus excavated material must be removed from the Park as soon as possible and disposed of at an approved location and in an approved manner.
- .5 Any proposed sources of borrow material shall be approved by the Departmental Representative prior to start-up.
- .6 When vegetation must be removed, then the extent and duration of exposure should be kept to a minimum. Plan the phases of development so that only areas which are actively being developed are exposed.

- .7 Topsoil from excavated sections shall be stockpiled for subsequent application to side slopes requiring revegetation. Steep slopes on stockpiles should be avoided in order to prevent erosion.
- .8 Sediment traps, basins, or ponds, whether temporary or permanent, shall be installed before construction begins on the rest of the site.
- .9 Dust control measure will be necessary, especially when asphalt is removed. The use of chemical dust control agents must be pre-approved by the Departmental Representative.
- .10 Where there is potential for severe erosion and/or downstream siltation the Contractor shall cover excavations during major precipitation events as directed by Departmental Representative.

1.14 EROSION AND SEDIMENTATION CONTROL

- .1 Appropriate preventative controls shall be in place at all times during construction to prevent undue erosion and sedimentation. As part of the Environmental Protection Plan, the Contractor is required to provide to the Departmental Representative seven days before start-up an Erosion and Sedimentation Control Plan. Such a plan shall incorporate necessary silt fences, silt / sediment traps, plastic lined trenches and ditches, temporary culverts or diversions as approved by the Departmental Representative
- .2 Backfilled slopes shall be mechanically compacted and grades should be consistent with the prevailing down-slope grade. Exposed soils should be immediately stabilized against erosion by covering with seed and hay mulch, clean rock, gravel or other suitable materials. Hydroseeding operations with approved seed mix will be carried out, as directed by Departmental Representative. All environmental controls must be monitored on a daily basis and following precipitation events. Any required maintenance or remediation must be done immediately.

1.15 HAZARDOUS MATERIALS

- .1 As part of the Environmental Protection Plan, the Contractor must submit a Fuel and Hazardous Materials Management and Spill Contingency Plan.
- .2 The management of fuels, lubricants and chemicals must meet with the requirements of the Newfoundland and Labrador Dangerous Goods and Hazardous Waste Management Criteria and all other appropriate provincial and federal regulations to include but not be limited to the following:
 - .1 Temporary fuel storage sites are to be located a minimum 200 m from any watercourse.
 - .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 Fueling and lubricating of equipment cannot be done closer than 100 m to any watercourse.
 - .4 All refuelling and lubricating operations should employ protection measures such as drip pans, to reduce the potential for escape of petroleum products to the environment.
- .3 No material toxic to fish or any aquatic life shall be permitted to enter any stream, river, or lake. This shall include, but not be limited to lubricants, fuels, testing fluids, insecticides, detergents, herbicides, cement, lime or concrete.

- .4 The Departmental Representative and the Park Warden must be immediately contacted after a spill of more than 10 L of fuel or lubricant, and after any amount of other chemical products has escaped. All stained soil resulting from the Contractor's use of chemicals and fuel is to be cleaned up and disposed of at an approved disposal site.
- .5 Storage of large amounts of fuel (more than 900 L) in the Park is not permitted. Refuelling 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 Park consent. The Contractor is expected to be prepared to effect the containment and cleanup of all spills related to the Work.
- .6 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.
- .7 Emulsion storage tanker and transfer of emulsion from tanker to spray vehicle are not permitted within National Park.
- .8 Equipment maintenance is not permitted within the Park boundaries.

1.16 TREATED WOOD

- .1 Creosote is not approved for use in Parks.
- .2 Workers should be made aware of the possible health risks associated with exposure to CCA or creosote treated timber as well as the recommended safe practices for handling such materials.
- .3 Disposal of treated wood wastes including saw-dust must be outside of the Park, and in accordance with all applicable Provincial and Municipal regulations. Similar attention must be given to disposal of the replaced guiderail posts which have been treated with creosote.

1.17 SITE DECOMMISSIONING

- .1 All work sites must be returned to a neat and tidy condition upon site abandonment.

1.18 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.
- .3 Relics and antiquities and items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found on site or in structures demolished, shall remain property of Canada. Protect such articles and request direction from Departmental Representative.
- .4 Give immediate notice to Departmental Representative if evidence of archaeological finds are encountered during construction and await written instructions before proceeding with work in the area.

1.19 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.

Part 2 Products

Not Used.

Part 3 Execution

3.1 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 77 00 – Closeout Procedures
- .3 Section 01 78 00 – Closeout Submittals

1.2 DEFINITIONS

- .1 Quality Control (QC): The process of checking specific product or services to determine if they comply with relevant quality standards and identify ways to eliminate causes of unsatisfactory product or service performed.
- .2 Quality Assurance (QA): The process of ensuring that the Contractor's Quality Management Plan (QMP) (QC, non-conformances, etc.) is being followed. The results of the QA are provided as feedback to both the Contractor and the Departmental Representative. Where required, the Contractor shall implement changes to the project based on the feedback received from the QA process.

1.3 INSPECTION

- .1 Allow Departmental Representative adequate time and access to Work. If part of Work is in preparation at locations other than Place of Work, allow time and 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, until particular inspections or tests have been fully and satisfactorily completed and until such time as Departmental Representative gives permission to proceed. Pay costs to uncover 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, Contractor to 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.
- .5 The Departmental Representative shall participate in the taking of survey of all quantities with the Contractor responsible to complete the surveys in the presence of the Departmental Representative.

1.4 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged and coordinated by Departmental Representative for purpose of inspecting and/or testing portions of Work. These agencies include, but are not limited to, concrete testing, aggregate tests and

compaction tests. Cost of such services will be borne by Departmental Representative. The Contractor remains responsible for:

- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Mill tests and certificates of compliance.
 - .4 Tests as specified within various sections designated to be carried out by Contractor under the supervision of Departmental Representative.
- .2 Provide equipment and materials required for executing inspection and testing by appointed agencies.
 - .3 Employment of inspection/testing agencies does not relax responsibility of Contractor 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 additional cost to Contract. Contractor shall pay costs for retesting and re-inspection.

1.5 ACCESS TO WORK

- .1 Allow inspection/testing agencies access and required time to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.
- .3 Make good work disturbed by inspections and tests.

1.6 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative sufficiently in advance of when work is ready for tests, in order for Departmental Representative to make attendance arrangements with Testing Agency. When directed by Departmental Representative, notify such agency directly.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Deliver in required quantities to Testing Agency. Submit with reasonable promptness and in an 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 on site for Testing Agency's exclusive use to store equipment and cure test samples.

1.7 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective or damaged products 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 damages to existing or new work, including work of other Contracts, resulting from removal or replacement of defective work.

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

1.8 TESTING BY CONTRACTOR

- .1 Provide all necessary instruments, equipment and qualified personnel to perform tests designated as Contractor's responsibilities herein or elsewhere in the Contract Documents.

1.9 REPORTS

- .1 Submit the original and electronic copy of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested.

1.10 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested and as specified in relevant Technical Specification section.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

1.11 MILL TESTS

- .1 Submit mill test certificates as required of specification Sections or as requested by Departmental Representative.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 35 29.06 – Health and Safety
- .3 Section 01 35 43 – Environmental Procedures
- .4 Section 01 55 26 – Traffic Regulation
- .5 Section 01 56 00 – Temporary Barriers and Enclosures

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121-M1978 (R2003), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-M1987 (R2003), Access Scaffolding for Construction Purposes.
 - .4 CAN/CSA-Z321-96 (R2001), Signs and Symbols for the Occupational Environment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for all temporary structures which are required to be engineered. Shop drawings submitted to bear signature and stamp of qualified professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.

1.4 INSTALLATION AND REMOVAL

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

1.5 SCAFFOLDING

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

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

1.6 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 cranes to be operated by qualified operator.

1.7 SITE STORAGE/LOADING

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.8 CONSTRUCTION PARKING

- .1 Parking will be permitted in the area of the site provided it does not disrupt performance of Work, interfere with normal traffic flow and only after obtaining agreement with the Departmental Representative. Parking will not be permitted within 3 m from the edge of pavement.
- .2 Provide and maintain adequate access to project site.
- .3 Keep parking areas clean and maintained during period of Contract.

1.9 SECURITY

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

1.10 OFFICES

- .1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.
- .4 Departmental Representative's Site office.
 - .1 Provide separate temporary office trailer for Departmental Representative.
 - .2 Trailer to be minimum 6.1 m in length, with floor 0.3 m above grade, complete with 4 50% opening windows and one lockable door.
 - .3 Trailer to be insulated and provide heating system to maintain 22 degrees C inside temperature at -20 degrees C outside temperature.
 - .4 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19 mm thick plywood.
 - .5 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10 % upward light component.

- .6 Provide telephone and fax machine and communications hook-up for telephone, fax and internet. Capacity of internet to be suitable for business applications. Hardware and all communication connections to be maintained throughout the project.
- .7 Provide private washroom facilities adjacent to office complete with flush or chemical type toilet, lavatory, mirror and hand wash facility (chemical or potable water and soap) and maintain supply of paper towels and toilet tissue.
- .8 Equip office with 1 x 2 m table, 4 chairs, 6 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.
- .9 Equip office with water cooler / filter and maintain supply of bottled water.
- .10 Maintain in clean condition.
- .11 If site office cannot provide telephone and internet connection, a second office within 3 km of the site is to be provided which conforms to all conditions including telephone and internet connection.

1.11 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.

1.12 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.

1.13 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Refer to Section 01 55 26 – Traffic Regulation.
- .2 Provide access and temporary relocated roads as necessary to maintain traffic.
- .3 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .4 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .5 Protect travelling public from damage to person and property.
- .6 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .7 Verify adequacy of existing roads and allowable load limit on these roads. Contractor responsible for repair of damage to roads caused by construction operations.
- .8 Construct access and haul roads necessary.

- .9 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .10 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .11 Dust control: adequate to ensure safe operation at all times.
- .12 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .13 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .14 Provide snow removal during period of Work.
- .15 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.14 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

Part 2 Products

Not Used.

Part 3 Execution

3.1 GENERAL

- .1 Construct and maintain construction facilities in accordance with applicable Sections contained in these specifications.

3.2 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, watercourses, and walkways, according to requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

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, and time of dispatch.
 - .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 face 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 DESCRIPTION

- .1 This section is to provide traffic control as stipulated in the Newfoundland and Labrador Department of Transportation and Works (NLDTW) Traffic Control Manual (TCM).
- .2 The existing road is closed to traffic at the bridge. The road and bridge must be open to traffic by August 31, 2018.
- .3 A Traffic Control Plan must be approved by the Departmental Representative prior to commencing any work for any road within the Park affected by construction activity relating to this project. Traffic Control Plan to be submitted prior to the pre-construction meeting.
- .4 The Departmental Representative reserves the right to direct the contractor to reduce either the number or length of traffic control work areas.
- .5 Two lanes of unrestricted access on roads within the Park must be maintained throughout construction except for limited single lane closures, which must be approved by the Departmental Representative.

1.2 REFERENCE STANDARD

- .1 Regulate traffic in accordance with the Public Highways Act (Newfoundland and Labrador) as stipulated in the TCM distributed by the Newfoundland and Labrador Department of Transportation and Works (NLDTW).
- .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 DEFINITIONS

- .1 Traffic delay: period of time for which vehicle(s) is stopped or delayed in travelling through the contract limits due to the performance of Work on this project. Traffic delay applies to both single lane operation and road closure.
- .2 Road closure: period of time for which the road within the contract limits is not open to the public.

1.4 RELATED SECTIONS

- .1 Section 01 11 00 – Summary of Work
- .2 Section 01 35 29.06 – Health and Safety
- .3 Section 01 56 00 – Temporary Barriers and Enclosures

1.5 REFERENCES

- .1 Manual of Uniform Traffic Control Devices (MUTCD) for Streets and Highways.
- .2 Newfoundland and Labrador Department of Transportation and Works (NLDTW) Traffic Control Manual (TCM) – Latest Edition.

1.6 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 present minimum of interference and hazard to travelling public.
 - .2 Keep equipment units as close together as working conditions will permit and preferably on same side of travelled way.
 - .3 Do not leave equipment on travelled way overnight.
- .3 Do not close any lanes of road without written approval of Departmental Representative. Before re-routing traffic, erect suitable signs and devices in accordance with instructions contained in TCM.
- .4 Provide and maintain reasonable road access and egress to the project site.
- .5 All flag persons and traffic control personnel shall have successfully completed a traffic control training course. Proof of training for all persons shall be available on site at all times.

1.7 INFORMATIONAL AND WARNING DEVICES

- .1 Provide and maintain NLDTW approved temporary: heavy barricades, signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project work which requires road user response.
- .2 All traffic signs are to be bilingual or symbolic.
- .3 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in TCM.
- .4 Place signs and other devices in locations recommended by TCM.
- .5 All flag persons and traffic control personnel shall have successfully completed a traffic control training course approved by the Workplace Health, Safety and Compensation Commission of Newfoundland and Labrador. Proof of training for all persons shall be available on site at all times. The contractor shall provide an Accredited Sign Supervisor to be on site at all times when active construction is taking place. The Accredited Sign Supervisor will be responsible to supervise the placement and dismantling of all temporary condition signs and devices that indicate to the road user that highway construction activity exists and also to ensure that proper traffic control procedures are carried out in accordance with the TCM. The Accredited Sign Supervisor is considered part of the contractor's supervision and administration staff and compensation and the provision of this individual is considered incidental to the work.
- .6 A traffic control plan and emergency response plan must be approved by the Departmental Representative prior to commencing any work.
- .7 Continually maintain traffic control devices in use by:
 - .1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

- .2 Removing or covering signs which do not apply to conditions existing from day to day.

1.8 CONTROL OF PUBLIC TRAFFIC

- .1 Provide traffic control personnel who have a valid provincial license and are trained in accordance with, and properly equipped as specified in TCM manuals in following situations:
 - .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 traffic signal system is not in use.
 - .3 When workers or equipment are employed on travelled way over brow of hills, around sharp curves or at 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 vehicles are required.
- .2 All Traffic Control Personnel shall be equipped with portable radios only, not cellular devices, of sufficient range to ensure continuous communication within the traffic control zone. Flag persons using a cellular device shall be removed from the site immediately. PCA will not be held responsible for loss of time or delay incurred due to removal of such an individual.
- .3 All construction vehicles shall operate in accordance with and subject to traffic control restrictions and operations in place on the project.
- .4 In addition to traffic control during the normal hours of work, the contractor shall have a responsible person on site at all times to monitor that the traffic signage is working properly (including nights, weekends and holidays).

1.9 TRAFFIC MANAGEMENT PLAN REQUIREMENT

- .1 Contractor to provide a Traffic Control plan, prior to construction, for approval by the Departmental Representative. The Traffic Control plan shall be site specific and cover all temporary traffic conditions during construction on the project. The Traffic Control plan shall include:
 - .1 Personnel responsible (both contractor and sub-contractor), credentials and contact information;
 - .2 Traffic Monitoring and Contacts, during work hours and after hours emergency contact;
 - .3 Response to incidents;

- .4 Temporary conditions during construction, including equipment delivery and set-up, entering and exiting site, girder delivery and erection procedures;
- .5 Signage and additional traffic control measures.

1.10 OPERATIONAL REQUIREMENTS

- .1 Conduct operations as to create the minimum of inconvenience to traffic.
- .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 herein and approved in writing by Departmental Representative to protect and control public traffic, existing conditions for traffic may be restricted as follows:
 - .1 In accordance with TCM.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 35 29.06 – Health and Safety
- .2 Section 01 55 26 – Traffic Regulation
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
 - .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-O121-M1978(R2003), Douglas Fir Plywood.
- .3 Newfoundland and Labrador Department of Transportation and Works (NLDTW)
 - .1 Traffic Control Manual (TCM)

1.3 INSTALLATION AND REMOVAL

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

1.4 HOARDING

- .1 Erect temporary site enclosures when and where required using 38 x 89mm construction grade lumber framing at 600mm centres and 1200 x 2400 x 13mm exterior grade fir plywood to CSA O121.
- .2 Apply plywood panels vertically as indicated flush and butt jointed.
- .3 Provide one or two lockable truck entrance gates and at least one pedestrian door if directed by Departmental Representative and conforming to applicable traffic restrictions on adjacent roads. Equip gates with locks and keys.
- .4 Erect and maintain pedestrian walkways if directed by Departmental Representative including roof and side covers, complete with signs and electrical lighting as required by law.
- .5 Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB 1.189 and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition.
- .6 Erect temporary site enclosure where and when required using new 1.2m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m on centre. Provide one lockable truck gate. Maintain fence in good repair.
- .7 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.5 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. Provide as required by governing authorities and as indicated.

1.6 WEATHER ENCLOSURES

- .1 Provide weather tight closures where and when required to facilitate construction operations.
- .2 Design enclosures to withstand wind pressure and snow loading.

1.7 DUST TIGHT SCREENS

- .1 Provide dust tight screens to localize and control dust generating activities, and for protection of workers and the environment.
- .2 Maintain and relocate protection until such work is complete.

1.8 ACCESS TO SITE

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

1.9 PUBLIC TRAFFIC FLOW

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

1.10 FIRE ROUTES

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

1.11 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.

1.12 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

- .1 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .2 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.
- .3 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.
- .4 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date of issue is specifically noted.

1.3 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new unless otherwise noted, 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 a cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations.

1.1 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.

- 1.2 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.

1.3 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.4 TRANSPORTATION

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

1.5 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.

1.6 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.

1.7 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.8 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.

1.9 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Departmental Representative of conflicting installation. Install as directed.

1.10 PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of parts of new and existing bridges. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

1.11 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, 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.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 78 00 – Closeout Submittals.

1.2 REFERENCES

- .1 Owner's identification of existing survey control points and property limits.

1.3 QUALIFICATIONS OF SURVEYOR

- .1 Qualified registered land surveyor, licensed to practice in Newfoundland and Labrador, acceptable to Departmental Representative.

1.4 SURVEY REFERENCE POINTS

- .1 Existing horizontal and vertical working points are designated on drawings.
- .2 Locate, confirm and protect working points prior to starting site work. Preserve permanent reference points during construction.
- .3 Make no changes or relocations without prior written notice to Departmental Representative.
- .4 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require surveyor to replace control points in accordance with original survey control.

1.5 SURVEY REQUIREMENTS

- .1 Establish permanent bench marks on site, as required, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2 Establish lines and levels, locate and lay out, by instrumentation.
- .3 Stake for grading, fill and topsoil placement.
- .4 Stake slopes and berms.
- .5 Establish pipe invert elevations.
- .6 Establish foundation elevations.
- .7 Establish lines and levels for mechanical and electrical work.
- .8 Special care shall be taken when setting girder bearing elevations and deck screed elevations.

1.6 EXISTING SERVICES

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

1.7 RECORDS

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

1.8 ACTION AND INFORMATIONAL 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.
- .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform to Contract Documents.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to site, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7 Dispose of waste materials and debris off site.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.3 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .3 Remove waste products and debris including that caused by Owner or other Contractors, and leave Work clean and suitable for occupancy.
- .4 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6 Inspect finishes and ensure specified workmanship and operation.
- .7 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

- .8 Remove dirt and other disfiguration from exterior surfaces.
- .9 Sweep and wash clean finished paved areas within the work site.
- .10 Clean downspouts and drainage systems.
- .11 Remove debris and surplus materials from site.
- .12 Remove snow and ice from access to site.

1.4 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.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT GOALS

- .1 Prior to start of Work, conduct meeting with Departmental Representative to review and discuss PCA's Waste Management Plan and Goals.
- .2 Accomplish maximum control of solid construction waste.
- .3 Preserve environment and prevent pollution and environmental damage.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures

1.3 REFERENCES

- .1 Newfoundland and Labrador's Solid Waste Resource Strategy.
- .2 Newfoundland and Labrador Environmental Act, Regulation 82 (Latest Issue), Used Oil Regulations.

1.4 DEFINITIONS

- .1 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.
- .2 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .3 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .4 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .5 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .6 Salvage: removal of structural and non-structural structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .7 Separate Condition: refers to waste sorted into individual types.
- .8 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.

- .9 Waste Audit (WA): detailed inventory of estimated quantities of waste materials that will be generated during construction, demolition, deconstruction and/or renovation. Involves quantifying by volume/weight amounts of materials and wastes that will be reused, recycled or landfilled.
- .10 Waste Reduction Work Plan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials.

1.5 DOCUMENTS

- .1 Post and maintain in visible and accessible area at job site, one copy of following documents:
 - .1 Material Source Separation Plan
 - .2 Waste Reduction Workplan and any revisions to the document.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit following prior to project start-up:
 - .1 Submit 2 copies of completed Waste Reduction Work Plan (WRW).
 - .2 Submit 2 copies of Waste Source Separation Program (WSSP).

1.7 WASTE REDUCTION WORKPLAN (WRW)

- .1 Prepare and submit WRW prior to project start-up.
- .2 WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations.
- .3 Structure WRW to prioritize actions and follow as first priority Reuse, then followed by Recycle.
- .4 Describe management of waste.
- .5 Post WRW or summary where workers at site are able to review content.

1.8 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

- .1 Prepare MSSP and have ready for use prior to project start-up. The Demolition Waste Audit (DWA), with related weigh bills and /or receipt must be submitted on a monthly basis with the Contractor's monthly Progress claim.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.
- .3 Provide on-site facilities for collection, handling and storage of anticipated quantities of reusable and recyclable materials.
- .4 Locate containers in locations to facilitate deposit of materials without hindering daily operations.
- .5 Locate separated materials in areas that will minimize material damage.

- .6 Collect, handle, store on-site, and transport off-site salvaged materials in separated condition.
- .7 Transport to approved and authorized recycling facility.

1.9 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as specified in MSSP.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.
- .6 Separate and store materials produced during project in designated areas.
- .7 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
 - .1 On-site source separation is required.
 - .2 Remove co-mingled materials to off-site processing facility for separation.
 - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.

1.10 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner and the like into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Total tonnage generated.
 - .4 Tonnage reused or recycled.
 - .5 Reused or recycled waste destination.
- .4 Remove materials from deconstruction as deconstruction/disassembly work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.

1.11 USE OF SITE FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by PCA.

1.12 SCHEDULING

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

Part 2 Products

Not Used.

Part 3 Execution

3.1 APPLICATION

- .1 Do Work in compliance with WRW.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Clean up Work area as work progresses.
- .2 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .3 Source separate materials to be reused/ recycled into specified sort areas.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 78 00 - Closeout Submittals.

1.2 INSPECTION AND DECLARATION

- .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 will perform inspection of Work to identify obvious defects or deficiencies.
 - .2 Contractor to correct Work accordingly.
 - .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 Work: complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.
 - .2 When Work is deemed incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
 - .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
 - .6 Final Payment:
 - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
 - .7 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.3 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment. Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with applicable sections of these specifications.
- .2 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

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 01 71 00 – Examination and Preparation
- .4 Section 01 77 00 – Closeout Procedures

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide As-built documents and samples.
- .3 Provide final site survey certificate.

1.3 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
 - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide a full sized paper copy of plans marked up with red ink to show changes made during construction. Title block must indicate as-built drawings and bear contractors name, stamp and signature.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format on CD.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

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

- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.5 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain 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.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of opaque drawings.
- .2 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .3 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface features.
 - .2 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

- .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.
- .4 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .5 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.7 FINAL SURVEY

- .1 Submit final site as-built survey plan in both electronic and paper format. Electronic format to be CAD (Civil 3D) and PDF copy of paper format. Paper format to be stamped and signed by qualified registered land surveyor, licensed to practice in Newfoundland and Labrador. Survey information to include all features within the extents of the site and extend to existing ground prior to construction. Streambed within the site is also to be surveyed. Maximum spacing between survey points not to exceed 10 meters.

1.8 WARRANTIES AND BONDS

- .1 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .2 Except for items put into use with Department Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3 Section 03 20 00 – Concrete Reinforcing
- .4 Section 03 30 00 – Cast-in-Place Concrete

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .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 A23.4, Precast Concrete – Materials and Construction
 - .3 CSA-O86-14, Engineering Design in Wood.
 - .4 CSA O121-08(R2013), Douglas Fir Plywood.
 - .5 CSA O151-09 (R2014), Canadian Softwood Plywood.
 - .6 CSA O153-13, Poplar Plywood.
 - .7 CAN/CSA-O325-07(R2012), Construction Sheathing.
 - .8 CSA O437 Series-93(R2011), Standards for OSB and Waferboard.
 - .9 CAN/CSA-S269.1-1975 (R2003), Falsework for Construction Purposes
 - .10 CAN/CSA-S269.3-M92(R2013), Concrete Formwork, National Standard of Canada

1.3 ACTION AND INFORMATIONAL 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 professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada 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.
- .3 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.
- .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.

1.4 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 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.
 - .3 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 25 mm diameter in concrete surface. Holes to be filled with non-shrink grout.
 - .2 Dissimilar metals which are in contact must be separated by denso tape barrier.
- .3 Form release agent: non-toxic, biodegradable, low VOC. Form release agents must be compatible with waterproofing systems where applicable.
- .4 Falsework materials: to CSA-S269.1.

Part 3 Execution

3.1 FABRICATION AND ERECTION

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

- .2 Fabricate and erect falsework in accordance with CSA S269.1.
- .3 Refer to structural drawings and Item 2.1.2 for concrete members requiring architectural exposed finishes.
- .4 Do not place shores and mud sills on frozen ground.
- .5 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .6 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.
- .7 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .8 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .10 Construct forms for architectural concrete as indicated.
 - .1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .11 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 concrete texturing.
 - .2 Anchors and inserts cast into the concrete shall be non-metallic or galvanized metal and either be isolated from dissimilar metals by either a 30 mm clear spacing or denso tape barrier on the formwork anchors / inserts.
- .12 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 following minimum periods of time after placing concrete.
 - .1 Two (2) days for walls.
 - .2 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 days after the concrete placement.
- .6 Re-use 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 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/A143M-07 (2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .2 ASTM A780 / A780M 09 (2015), Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- .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 CSA-A23.4, Precast Concrete – Materials and Construction.
 - .4 CAN/CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement, A National Standard of Canada.
 - .5 CSA-G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .6 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada.
 - .7 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.
 - .8 CSA S6-14, Canadian Highway Bridge Design Code.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 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 Newfoundland and Labrador.
- .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-A23.3, unless otherwise indicated.
 - .1 Provide Class B tension lap splices unless otherwise indicated.

1.4 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 4 weeks prior to beginning reinforcing work.
 - .2 Submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

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 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M.
- .4 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .5 Mechanical splices:
 - .1 The use of mechanical rebar splices shall be subject to approval of Departmental Representative.

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 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 being placed in position. Bending shall be accurately done, in a bending machine and no welding or heating of 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, applying slow and steady pressure.
- .3 Replace bars which develop cracks or splits.

3.3 PLACING REINFORCEMENT

- .1 Place reinforcing 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 placement.
- .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 the Table 3.3.1, below.

Table 3.3.1

| Minimum Bend Diameter for Reinforcing Steel (400W) | |
|--|---------------------------|
| <u>Bar Size (mm)</u> | <u>Bend Diameter (mm)</u> |
| 10 | 70 |
| 15 | 90 |
| 20 | 150 |
| 25 | 200 |
| 30 | 250 |
| 35 | 300 |
| 45 | 450 |
| 55 | 600 |

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 35 29.06 – Health and Safety
- .3 Section 01 45 00 – Quality Control
- .4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .5 Section 03 10 00 – Concrete Forming and Accessories
- .6 Section 03 20 00 – Concrete Reinforcing

1.2 REFERENCES

- .1 ANSI/ACI 117-06, Specifications for Tolerances for Concrete Construction and Materials and Commentary.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C457-08, Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete.
 - .4 ASTM C494/C 494M-13, Standard Specification for Chemical Admixtures for Concrete.
 - .5 ASTM C1017/C 1017M-13, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .6 ASTM C1202-07, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.
- .3 Canadian Standards Association (CSA International)
 - .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 A23.5, Supplementary Cementing Materials
 - .3 CSA A283-00(R2003), Qualification Code for Concrete Testing Laboratories.
 - .4 CSA S269.3-M92(R2008), Concrete Formwork.
 - .5 CAN/CSA-A3000-13, Cementitious Materials Compendium.
 - .1 CSA-A3001-13, Cementitious Materials for Use in Concrete.
 - .6 CSA S6-14, Canadian Highway Bridge Design Code

1.3 DESIGN REQUIREMENTS

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

- .1 Concrete mixture designs shall be proportioned as normal density concrete in accordance with CSA-A23.1 latest edition, Alternative #1. Concrete shall be proportioned using Portland cement, Type SF silica fume, fly ash, fine and coarse aggregates, air entraining, water reducing, and superplasticizing and / or set retarding admixtures. Other supplementary cementing materials may include Class F fly ash. Set retarding admixtures may be used as ambient and site conditions warrant.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 At least fifteen days prior to the start of the concrete construction schedule, a pre-concrete conference must be held. The mix designs shall be reviewed and the required methods and procedures to achieve the required concrete shall be discussed. Develop and send a conference agenda to all attendees ten days prior to the scheduled date of the conference.
- .2 Arrange for representatives of all parties concerned with the concrete work to attend the conference, including but not limited to the following:
 - .1 The contractor's superintendent
 - .2 A representative from the laboratory responsible for the concrete mix design
 - .3 A representative from the laboratory responsible for the field quality control
 - .4 The concrete subcontractor
 - .5 The ready-mix concrete producer
 - .6 The admixture manufacturer supplier
 - .7 The hardener supplier
 - .8 The concrete pumping contractor
 - .9 The Engineer
 - .10 The Departmental Representative
- .3 Record minutes of the meeting and distribute to all parties concerned within five days of the meeting. Submit minutes to Departmental Representative.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit the following at least four (4) weeks prior to the commencing concrete work:
 - .1 Certification from the qualified independent inspection and testing company that plant, equipment and materials to be used in the concrete comply with requirements of CSA-A23.1/A23.2.
 - .2 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 Admixtures
 - .5 Water

- .6 Aggregates
- .3 Mix designs for concrete, mix proportions and aggregate sources, which 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 reactivity problems.
- .4 Certification for the concrete supplier from the Atlantic Provinces Ready Mixed Concrete Association – APRMCA Concrete Production Facilities Certification Program.
- .3 Include in the submission of the mix designs, test results for each mix containing the following information:
 - .1 Plastic Concrete Tests
 - .2 Slump (CSA A23.2-5C)
 - .3 Air Content of Plastic Concrete by Pressure Method (CSA A23.2-4C)
 - .4 Mass Density and Yield (CSA A23.2-6C)
 - .5 Compressive Strength Testing (CSA A23.2-9C)
 - .6 2 cylinders to be tested at 28 days
 - .7 Air Void Analysis on Hardened Concrete (ASTM C457) tested at 7 days
 - .8 Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration (ASTM C1202) tested at 56 days
 - .9 Alkali Reactivity Test Results
- .4 Submit four (4) weeks in advance of concrete placement, relevant test data for all aggregate materials indicating conformance to the requirements of CSA-A23.1 and this specification. The test results required, but not be limited to, shall include:
 - .1 Sieve Analysis of Fine and Coarse aggregate
 - .2 Amount of Material Finer than 80 µm in Aggregate
 - .3 Bulk Relative Density and Absorption of Fine and Coarse Aggregate (SSD basis)
 - .4 Fineness Modulus of Fine Aggregate
 - .5 Clay Lumps and Light Weight Pieces
 - .6 Test for Organic Impurities in Fine Aggregate
 - .7 Flat and Elongated Particles in Coarse Aggregates
 - .8 Petrographic Analysis of Coarse Aggregate (PN-NSTIR Test Method-2)
 - .9 Resistance to Degradation of Coarse Aggregate by Abrasion and Impact in the Los Angeles machine
 - .10 Micro-Deval test for Coarse and Fine Aggregate
 - .11 Soundness of Coarse and Fine Aggregate by Use of Magnesium Sulphate
 - .12 Test for Detection of Alkali-Aggregate Reactivity (AAR) on Coarse and Fine Aggregate
 - .13 Unconfined Freeze and Thaw test
- .5 Submit two (2) weeks prior to commencement of the project adequate details of all equipment to be used. Equipment shall include that required for transporting, handling, placement and curing of all concrete.

- .6 Concrete pours: submit accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 – FIELD QUALITY CONTROL.

1.6 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Submit to Departmental Representative, minimum of four (4) 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 four weeks prior to starting concrete work, submit proposed quality assurance procedures for review by the Departmental Representative on the following items:
 - .1 Falsework erection
 - .2 Hot weather concrete
 - .3 Cold weather concrete
 - .4 Placement method(s)
 - .5 Curing
 - .6 Finishes
 - .7 Formwork Removal
- .4 Quality Control Plan: submit written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 – PRODUCTS.
- .5 Health and Safety Requirements: undertake occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes 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 The concrete materials shall be mixed and transported in a manner which will not segregate or damage the mix in any fashion. Concrete shall be mixed using stationary or truck mixers. The mixer shall carry the Manufacturer's rating plate in a prominent position that indicates the following:
 - .1 The gross volume of the mixer
 - .2 The rated maximum mixing capacity
 - .3 The minimum and maximum speeds for mixing and agitating of the mixer
- .3 The mixer shall be capable of combining the concrete ingredients into a thoroughly mixed and uniform mass and shall not exceed the capabilities of the mixer.

- .4 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .5 Where ready mix trucks are used to transport the concrete, the Departmental Representative reserves the right to subject any truck suspected of poor mixing to a uniformity test as outlined in CSA A23. If the truck fails the test, then the concrete and the truck shall be rejected at the sole cost of the Contractor unless otherwise directed by the Departmental Representative.
- .6 Contractor to provide copy of all delivery slips for concrete delivered and accepted at the site. Delivery slips to include all pertinent information including; supplier, date and time of dispatch, mix proportions, name and quantity of admixtures, batch quantity, etc.
- .7 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 Use trigger operated spray nozzles for water hoses.
 - .3 Carefully coordinate the specified concrete work with weather conditions.
 - .4 Divert unused concrete materials from landfill to local facility approved by Departmental Representative.
 - .5 Designate an appropriate area on the job site where concrete trucks and tools can be safely washed to limit water use and runoff.
 - .6 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions collect liquid or solidify liquid with inert, non-combustible material and remove for disposal. Dispose of waste in accordance with applicable local, provincial and national regulations.
 - .7 Choose least harmful, appropriate cleaning method which will perform adequately.

Part 2 Products

2.1 MATERIALS

- .1 All cementing materials to CSA A3001.
- .2 Cementing material to be a blended Portland cement, fly ash, silica fume cement, Type GUb F/SF. The minimum proportion by mass of the total cementing materials for silica fume shall be 6% and a maximum of 8%. The maximum proportion by mass of the total cementing material for fly ash is 25%.
- .3 Water: to CSA A23.1 and to be free from injurious amounts of oil, acid, alkali soluble chloride, organic matter, sedimentation and other deleterious substances.
- .4 Aggregates: to CSA A23.1/A23.2. The maximum Petrographic Number of course aggregate shall not exceed 135. The maximum absorption of course aggregate shall not exceed 2%.
- .5 Coarse aggregates shall consist of washed crushed stone having a nominal size of 20 mm. The maximum combination of flat, elongated and flat and elongated particles, as defined in CSA A23.2, shall not exceed 10% of the total mass.

- .6 Fine aggregate shall be washed and classified for conform to the gradation limits specified in CSA A23.1.
- .7 The use of Alkali-Silica Reactive Aggregates shall not be permitted. When tested in accordance with CSA A23.2-14A, the expansion of the test samples incorporating the aggregate source shall not exceed 0.04 percent at one year.
- .8 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
 - .1 Compressive strength: 50 MPa at 28 days.
 - .2 Consistency:
 - .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30 seconds.
 - .2 Flowable: to ASTM C827. Flow tables, 5 drops in 35 (ASTM C109, applicable portion) as to 145%.
 - .3 Plastic: to ASTM C827. Flow table, 5 drops in 35 (ASTM C109, applicable portions) 100 to 125%.
- .9 Curing compound: to ASTM C309, Type 2.
- .10 Isolation Joint filler:
 - .1 Bituminous impregnated fibre board: to ASTM D1751.
- .11 Joint Sealant: acceptable products include:
 - .1 For horizontal joints: two component polyurethane self-leveling elastomeric sealant.
 - .2 For vertical joints: polyurethane non-sag elastomeric sealant.
 - .3 Primer to be compatible with sealant.
- .12 Dampproofing:
 - .1 Emulsified asphalt, mineral colloid type: to CAN/CGSB-37.2.

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, unless noted otherwise on the Contract Drawings. 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.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 – FIELD QUALITY CONTROL.
 - .2 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative #1. High Performance Concrete in bridge abutments, wingwalls, 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: 20 mm.
- .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 superplasticizer).
- .9 Maximum slump before superplasticizer: 60mm.
- .10 Slumps after superplasticizer: 180 ± 30mm.
- .11 Maximum spacing factor of hardened concrete not to exceed 230 µm.
- .12 Chloride ion permeability at 56 days: <1000 coulombs.
- .13 Maximum concrete temperature (from delivery equipment):
 - .1 Thickness >2 metres: 18°C.
 - .2 Thickness <2 metres: 25°C.
- .14 Maximum concrete temperature (in situ): 70°C.
- .15 Maximum temperature gradient: 20°C/metre.
- .16 Superplasticizer shall be used in all concrete.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete. Provide 24 hours minimum notice prior to placing concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after review of equipment and mix by Departmental Representative.
- .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.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

- .10 Remove all debris including sawdust, chips and any other deleterious materials from the interior of the forms.
- .11 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 CONSTRUCTION

- .1 Perform cast-in-place concrete work to CSA A23.1/A23.2.
- .2 High performance concrete shall not be placed when the air temperature exceeds 25°C or is likely predicted to rise above this temperature during placement. The temperature of the formwork, reinforcing steel or other material on which the concrete is placed shall not exceed 25°C.
- .3 Sleeves and inserts:
 - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through structural members, except where indicated or approved by Departmental Representative.
 - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
 - .3 Sleeves and openings greater than 100 x 100 mm not indicated must be reviewed by Departmental Representative.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
 - .5 Check locations and sizes of sleeves and openings shown on drawings.
 - .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .4 Anchor bolts:
 - .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
 - .2 Coordinate with modular bridge manufacturer (bearings anchor bolts at each abutment) prior to setting anchor bolts.
 - .3 When setting anchor bolts, care shall be taken to not only ensure that the anchor bolts are set in the correct position and orientation, but also that sufficient thread extension is provided to facilitate bolting the assembly to the concrete, complete with compatible nuts and washers (plate washers where specified), as per the details on the Contract Drawings and manufacture's recommendations.
- .5 Placing of concrete:
 - .1 Contractor is responsible for the placing method used.
 - .2 Concrete shall be delivered to the point of final deposit in a manner satisfactory to the Departmental Representative using means and equipment which will prevent segregation or loss of materials.
 - .3 The size of section to be placed in one continuous operation shall be as detailed on the drawings or as directed by the Departmental Representative.

- .4 Unless otherwise authorized by the Departmental Representative, forms shall be kept dry during the placing of the concrete until the concrete has reached initial set.
- .5 Concrete shall be deposited in the forms in maximum lifts of 500 mm and in layers that are approximately horizontal and as close as practicable to its final position.
- .6 Concrete shall not be moved horizontally with vibrators or by other methods which could cause segregation.
- .7 Under adverse weather conditions the Contractor shall be prepared to provide suitable protection in order to prevent damage to concrete.
- .8 Consolidation:
 - .1 All methods of consolidation shall be subject to the approval of the Departmental Representative.
 - .2 Concrete shall be consolidated thoroughly and uniformly by means of hand tamping, vibrators or finishing machines to obtain a dense, homogeneous structure, free from cold joints, voids and honeycomb.
 - .3 A sufficient number of vibrators shall be employed to adequately handle the anticipated rate of placement. The size and frequency of vibrators shall be as specified in CSA A23.1. A stand-by vibrator shall be available on the site at all times.
 - .4 Internal vibrators shall be used wherever practicable. External type vibrators may be used where surfaces cannot be properly consolidated with the internal type alone.
 - .5 Insertion of internal vibrators shall be made systematically at intervals such that the zones of influence of the vibrator overlap.
 - .6 Extreme care shall be taken to ensure that the internal type vibrators do not displace the reinforcing steel or the forms. Vibrators shall have rubber or non-metallic vibrating heads.
- .9 Curing concrete:
 - .1 Concrete shall be protected from freezing, premature drying, high temperature and moisture loss for a period of time necessary to develop the desired properties of the concrete.
 - .2 Curing shall be applied to concrete as soon as possible without damaging or marring the surface.
 - .3 Curing compounds shall conform to ASTM C309 Type 2.
 - .4 All fresh placed and consolidated concrete shall be suitably protected from the elements and from defacement due to construction activities, traffic and vandals. The effects of direct sunshine, drying winds, cold, excessive heat and running water are particularly harmful. The concrete shall be protected by the use of adequate tarpaulins or other suitable material to completely cover, or enclose, all freshly finished surfaces.
 - .5 The curing time shall be as indicated in CSA A23.1 or this specification. Curing shall be achieved by one or more of the following:
 - .1 Burlap: Two layers of pre-soaked burlap shall be carefully laid on the surface as soon as the concrete has set sufficiently to support the mass of the burlap without marking the surface.

Strips shall be overlapped 150 mm, secured to the surface and kept wet throughout the curing period. Burlap shall be free from holes or other substances that may have a deleterious effect on the concrete.

- .2 Moisture Vapour Barrier: The Contractor shall provide an effective vapour barrier and prevent any flow of air between it and the concrete surface. Where polyethylene sheet is used, it shall be white opaque pigmented with a minimum thickness of 100 µm. The vapour barrier shall be secured to the surface and overlapped 150 mm.
- .3 White Pigment Liquid Membrane: Curing compounds shall not be used on a surface where a bond is required for additional concrete. A curing compound may be approved by the Departmental Representative under certain circumstances where the application of moisture is impractical and where such compounds will not jeopardize the appearance of the concrete. Curing compounds shall be applied at the Manufacturer's recommended application rate. Curing compounds are not permitted on construction joints, surfaces requiring weatherproofing sealants or deck sections.
- .4 Water: Concrete exposed surfaces shall be kept continuously moist for a minimum of seven consecutive days after placing. The water for curing shall be clean and free from any material which could cause staining or discoloration of the concrete. All freshly placed and consolidated concrete shall be suitably protected from the elements.
- .6 Hot Weather Concreting (if approved by Departmental Representative):
 - .1 When the air temperature is at or above 25°C, or is likely to rise above 25°C within 24 hours, special measures, as detailed in CSA A23.1 shall be taken by the Contractor to protect the concrete from the effects of hot and /or drying weather conditions.
 - .2 The temperature of the formwork, reinforcing steel or the material on which the concrete is to be placed, shall not exceed 25°C. Concrete temperatures shall not exceed those specified in CSA A23.1, Table 16.
- .7 Cold Weather Concreting:
 - .1 When the mean air temperature is at or below 5°C or when the temperature is likely to fall below 5°C within 24 hours, the Contractor shall place, cure and protect concrete in accordance with CSA 23.1 and this specification.
 - .2 Concrete shall not be placed on or against any surface which is at a temperature less than 5°C. Snow and ice shall be removed before concrete is deposited on any surface.
 - .3 Calcium chloride or other de-icing chemicals shall not be used as a de-icing agent in the forms.

- .4 If heating of the mix water and/or aggregates is approved for use, the charging cycle shall be altered to prevent flash setting of the concrete.
 - .5 Aggregates and water shall not be heated above 80°C. Water and/or aggregates heated to a temperature in excess of 40°C, prior to the addition of the cementing materials shall be approved by the Departmental Representative.
 - .6 All frozen lumps of aggregate shall be excluded from the mix.
- .10 Protection Classes:
- .1 Protection and curing depends upon the outside temperature, the wind velocity, and the size of the concrete section.
 - .2 Under normal circumstances the following methods of protection may be required to maintain the protection necessary for the conditions described.
 - .3 Heating of the mixing water and/or aggregates shall be required for all classes of protection.
 - .4 When the outside temperature during placing or during the protection period may fall below 5°C, adequate covering of all surfaces with tarpaulins or polyethylene sheets shall be provided.
 - .5 When the outside temperature during placing or during the protection period may fall below 0°C, all surfaces shall be covered with an approved insulating material, over which tarpaulins or polyethylene sheets are placed.
 - .6 When the outside temperature during placing or during the protection period may fall below -5°C, a complete housing of the concrete, together with supplementary heat, shall be provided. The Contractor shall ensure that heat is supplied uniformly around the concrete.
 - .7 For mass concrete, defined as minimum section dimension in excess of 2 m, the temperature gradient shall not exceed 20°C/m from the interior of the element to the exterior face.
 - .8 In thin sections, less than 2 m, the temperature differential from the interior to the exterior shall not exceed 20°C.
- .6 Finishing of Concrete:
- .1 Basic Treatment:
 - .1 All cavities, honeycomb and other deficiencies shall be patched with sand cement mortar of the same composition as that used in the concrete.
 - .2 Mortar shall be composed of cement, fine aggregate and water, proportioned and mixed as specified.
 - .3 When the proportioning of cement and fine aggregate is not specified, the mortar shall consist of one (1) part by volume of cement and two (2) parts of fine aggregate.
 - .4 The quantity of water used in mixing the mortar shall be sufficient to make it capable of being freely spread with the trowel.

- .5 Mortar shall be mixed in quantities which can be utilized within 60 minutes.
 - .6 Mortar shall not be re-tempered or re-mixed with water after initial set.
 - .7 All bolts, ties, nails, or other metal not specifically required for construction purposes, shall be removed or cut back to a depth of 25 mm from the surface of the concrete unless otherwise directed by the Departmental Representative.
 - .8 The cavity shall be kept saturated for 60 minutes prior to the application of a latex bonding agent or neat cement paste.
 - .9 The mortar shall be pressed or packed into the depressions so as to completely fill the cavity and then finished to match the adjacent surface.
 - .10 Fins, unsightly ridges, or other imperfections shall be chipped or rubbed off flush with the surface.
 - .11 Mortar patches in excess of 25 mm shall be applied in layers not exceeding 25 mm with a 30 minute interval between the placing of layers.
 - .12 The surface of the patch shall be textured equivalent to the adjacent concrete.
 - .13 Honeycomb areas or cavities over 25 mm in diameter shall not be repaired until inspected by the Departmental Representative.
 - .14 Where honeycombing has occurred in non-structural elements, the affected area shall be removed and filled with mortar as previously described.
 - .15 Where honeycombing has occurred in structural elements, the corrective method of treatment shall be carried out as directed by the Departmental Representative.
 - .16 All concrete and mortar shall be cured and protected in accordance with CSA A23.1.
- .2 Smooth Form Finish (considered all exposed concrete surfaces as outlined in Section 03 10 00 - Concrete Forming and Accessories):
- .1 A Smooth Form Finish shall be a uniform, high quality concrete which has been homogeneously placed and thoroughly compacted.
 - .2 A Smooth Form Finish shall be uniform in colour, pattern and texture. All exposed bridge components and curbs shall have a Smooth Form Finish.
 - .3 If the concrete, after form stripping and the basic treatment, does not exhibit such finish, the Contractor shall perform any or all of the following operations, in order to obtain a Smooth Form Finish:
 - .1 Cut out all corrodible metal within 25 mm of the surface and repair the cavities as indicated in basic treatment.
 - .2 Remove fins and other projections to leave a smooth, plan surface.
 - .3 Remove stains, rust marks or other blemishes which detract from the specified uniformity of appearance.
- .3 Open Surfaces:

- .1 The finished surface of concrete shall conform to the lines, grades and elevations shown on the contract drawings.
 - .2 Concrete edges and expansion joints shall be formed in the concrete at the designated locations.
- .7 Damp-proof Membrane:
- .1 All damp-proofing material shall conform to CAN/CGSB-37.2-M and shall be applied in accordance with CGSB-37.3. Provide damp-proofing technical specifications to the Departmental Representative for review four weeks before application.
 - .2 The back face of abutments and soil face of wingwalls where concrete will be in contact with backfill shall be damp-proofed.
- .8 Concrete Sealer and Coatings:
- .1 Apply concrete sealers/coatings as described in Section 07 92 00 – Concrete Joint Sealant.
- .9 Concrete tolerance in accordance with CSA-A23.1/A23.2, except as noted below:
- .1 Cross-Sectional Dimensions: No more than 12 mm, no less than 6 mm.

3.3 CRACKS

- .1 All cracks 0.15 mm and greater shall be repaired within the warranty period, regardless of location, size or cause in accordance with the following methodology. Fine cracks are defined as less than 1 mm, medium cracks were 1 to 2 mm, and wide cracks were greater than 2 mm. Fine cracks identified for repair shall be filled with an approved low viscosity epoxy resin. The resin shall be applied by pressure injection or by gravity feed into the crack and allowing the sealant to be absorbed. A second application may be required, depending on the absorption and crack depth. The second application, if required by the Departmental Representative, shall be made as soon as possible after the first application has set. All use and placement of resin materials shall be in accordance with the manufacturer's written instructions. Wider cracks, as identified from the survey may require a higher viscosity resin for repair. The Contractor shall submit manufacturer's data for the proposed resin in this case for approval prior to use. Excess resin in the vicinity of the crack shall require removal by grinding and/or abrasive blast cleaning at the Departmental Representative's direction.

3.4 FIELD QUALITY CONTROL

- .1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and Section 1.6, Quality Assurance, of this Section and submit report as described in PART 1 - SUBMITTALS.
 - .1 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.
 - .2 Carry out tests for slump, air content, compressive strength and temperature in conformance with CAN/CSA A23.1 and CAN/CSA A23.2
 - .3 Frequency of Testing as follows:

- .1 Air, Slump and Temperature: one test for each load of concrete until satisfactory control is established daily and rate of placement $> 35 \text{ m}^3$ per hour; then one (1) test for each three (3) loads of concrete. Satisfactory control is considered to have been established when tests on five consecutive loads or batches of concrete are within specification requirements.
 - .2 Concrete shall be tested for slump, air content and temperature prior to and after the addition of superplasticizer (if added on site). Testing shall be carried out at the point of discharge from the truck and as close as possible to the final deposit into the forms. Sufficient superplasticizer shall be added to produce the desired consistency and if added on site, the superplasticizer shall be mixed into the load a minimum of five minutes prior to retesting.
 - .3 Concrete shall also be randomly tested for air content and rapid chloride permeability (RCP) in the hardened state (minimum one test every 150 m^3 of the same class of concrete cast). The hardened air voids shall be tested at 7 days and the RCP shall be tested at 28 and 56 days. A minimum of two hardened air void and two RCP tests shall be conducted during the project, one near the start of concrete casting and one near the end of concrete casting.
 - .4 A set of three regular compressive strength cylinders shall be made for every 50 m^3 of concrete placed, or fraction thereof, or as directed by the Departmental Representative. In addition, for every regular set of three cylinders, two additional cylinders will be cast to be tested only if requested by the Departmental Representative for appeal purposes.
 - .5 The responsibility for casting any additional cylinders required for interim testing lies with the Contractor.
 - .6 Ensure there is no accelerated curing of concrete cylinders
- .2 The Departmental Representative shall have the right to sample and test all materials used in the mixture design and given access to the production facilities of the ready mix supplier. Materials failing to meet requirements to be immediately rejected.
 - .3 Ensure test results are distributed to all parties.
 - .4 Departmental Representative will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.
 - .5 Departmental Representative may take additional test cylinders as required. Cure cylinders on job site under same conditions as concrete which they represent.
 - .6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
 - .7 Inspection or testing by Departmental Representative will not relieve Contractor of his contractual responsibility.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3 Section 03 30 00 – Cast-in-Place Concrete

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA-S16-14, Design of Steel Structures.
 - .4 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
 - .5 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel.
 - .6 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
 - .7 CSA S6-14, CSA S6 Canadian Highway Bridge Design Code (CHBDC)

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 specifications and data sheet in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada.
 - .3 Indicate materials, all necessary geometric details, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

- .4 Proposed welding procedures to be stamped and approved by Canadian Welding Bureau.
 - .1 Provide valid Canadian Welding Bureau certification of each welder and welding operator for the positions and processes intended.

1.4 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit 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, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials from damage.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations.
 - .2 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: as much as possible, remove for reuse by manufacturer any pallets, crates, padding and packaging materials.

1.6 Waste Management Disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 MATERIALS

- .1 Steel plates, and armour angles: to CSA G40.20/G40.21, Grade 350W.
- .2 Welding materials: to CSA W59.
- .3 Welding electrodes: to CSA W48 Series.
- .4 High strength Type 1 bolts, nuts and washers: to ASTM A325M. Bolts to ASTM A490M approved by Departmental Representative. Bolt assemblies to be galvanized.
- .5 Anchor bolts: to ASTM A307 or better.
- .6 Stud shear connectors: to CSA W59, Clause 5.5.6 and Appendix H.
- .7 Hot dip galvanizing: to CAN/CSA G164, minimum zinc coating of 763 g/m².

- .8 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours, 50 MPa at 28 days.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Where possible, fit and shop assemble work, ready for erection.
- .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
- .4 All items under this Section to be hot-dipped galvanized.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 763 g/m² to CAN/CSA-G164.

Part 3 Execution

3.1 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metal work square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA-S6, or weld.
- .7 Hand items over for casting into concrete to appropriate trades together with setting templates.
- .8 Touch-up damaged galvanized surfaces with zinc rich primer where burned by field welding.
- .9 Install items as per Contract Drawings / Approved Shop Drawings.

3.2 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt. Cleaning to meet approval of Departmental Representative.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.3 PROTECTION

- .1 Protect installed products and components from damage during construction.

- .2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 03 30 00 – Cast-in-Place Concrete

1.2 REFERENCES

- .1 CAN/CSA S6-14. Canadian Highway Bridge Design Code.
- .2 ASTM A123M-15. Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

- .1 Contractor responsible for the design, supply, installation, assembly and inspections for the following:
 - .1 Provide a modular panel bridge steel superstructure complete with decking and barriers to CAN/CSA S6-14. All live loads (CL 625 Design Vehicle) and dead loads to be considered per CAN/CSA S6-14. TL-1 Barrier system on bridge to be provided with bridge including all fastening, timber blocking and connections to bridge. A seamless and continuous transition from the approach guiderails to the bridge barrier shall be provided at each end and each side of the bridge.
 - .2 The bridge shall be designed for a 75 year design life (including fatigue) as per the requirements of CSA S6-14 with the roadway considered as a Class D highway for fatigue calculation purposes.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data: submit manufacturer's printed product literature and specifications for modular panel bridge components.
- .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Manufacturer's Field Services: submit reports within 3 days of receipt from manufacturer.
- .6 Instructions: submit manufacturer's installation instructions.
- .7 Bridge Supplier to Provide:
 - .1 Copies of the design and assembly drawings and instructions including required geometry of backwalls at each abutment for abutment design.

- .2 A package containing schematics of each part, limited to one part per page with dimensions.
- .3 One illustrated method to install the bridge (including installation loads).
- .4 A complete parts list with the mass of each part.
- .5 A proof of valid welding certification in accordance with CSA W47.1 for structural steel or CSA W47.2 for aluminum or approved equivalent(s).
- .6 Launching nose requirements, if required.
- .7 Proof of verification of methods and materials used in fabrication for compliance to the approved design drawings.
- .8 Mass of structure.
- .9 Design calculations indicating that the bridge conforms to the requirements of CAN/CSA S6-14.

1.5 QUALITY ASSURANCE

- .1 Quality Control:
 - .1 Meet quality requirements in Section 01 45 00 – Quality Control.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Handle components with care to avoid damage. All slings shall be non-metallic and to be designed and placed so as to not overstress any members or connections per manufacturer's recommendations.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 Modular Panel Bridge

- .1 Contractor to supply modular panel bridge with the following characteristics (design, supply, and installation by Contractor):
 - .1 Commercially available proprietary, modular type steel panel bridge complete with TL-1 barrier system and steel decking with epoxy anti-slip coating.
 - .1 Manufacturer to be “Mabey” or “Acrow” or approved equivalent.
 - .2 Design in accordance to CAN/CSA S6-14 with live loading CL625.
 - .3 Total Span: 15.24m (50 ft) centerline bearing to centerline bearing.
 - .4 Clear width between barriers: 4.3m minimum.
 - .5 Bridge height not to exceed one standard panel.
 - .6 Structure Depth Limit: The depth between the top of the roadway surface and the underside of the superstructure shall not exceed 1100mm.
 - .7 Rail System/Barriers: TL-1 to CAN/CSA S6-14. A seamless and continuous transition from the approach guiderails to the bridge barrier shall be provided at each end and each side of the bridge.

- .8 Deck Type: Steel deck modules
 - .9 Deck Coating: Sikaflex epoxy/trap rock anti-skid coating or approved equal.
 - .10 Deck Curbs: provide steel curbs to match deck system, two curbs (one each side) per panel bridge bay.
 - .11 Bearings: the panel bridge superstructure shall also be furnished with all necessary 'fixed' and 'free' bearing assemblies designed, detailed and fabricated to accommodate all loads and movements according to CAN/CSA-S6-14. The bearings shall be designed to provide longitudinal restraint at one abutment ('fixed') while allowing for longitudinal movement at the opposite abutment ('free'). Transverse restraint shall be provided at both abutments. If any additional supports are required for the end transom beams, then the Contractor shall also provide the design, details and fabricated assemblies with the panel bridge.
- .2 Materials:
- .1 All materials to be "like new" and comply with the details specified and shown on the designed drawings.
 - .1 Individual components shall have been manufactured within the past 10 years with no modification from original manufacture.
 - .2 All components shall be free of areas of rust, abrasion or damaged galvanizing.
 - .3 All fasteners including pins shall be new material.
 - .4 All materials shall be free of visible defects.
 - .5 The Departmental Representative reserves the right to reject any material which does not meet with these requirements.
 - .2 The supplier shall be certified according to CSA W47.1 for steel fabrication or W47.2M for aluminum fabrication. Alternatively, the Supplier shall be certified to an equivalent National Standard approved by the Departmental Representative.
 - .3 Miscellaneous hardware, deck plugs and other structural steel used in the erection and assembly of the modular bridge shall be according to the bridge Supplier.
 - .4 All components shall be supplied, fabricated in accordance with the Manufacturer's recommendations and approved by the Department Representative.
 - .5 Structural steel shall be Grade 350WT Category II or approve equivalent.
 - .6 All components shall be hot-dip galvanized and shall conform to the latest edition CAN/CSA-G164 or BS EN ISO1460 and have a minimum of 610 kg/m² of zinc on the surface of all galvanized sections.

Part 3 Execution

3.1 Modular Panel Bridge

- .1 Contractor to supply and install the modular panel bridge according to the requirements of the contract documents, the manufacturers recommendations and as directed by the Departmental Representative.
- .2 Superstructure:
 - .1 The panel bridge shall be designed in accordance with CAN/CSA S6-14, Canadian Highway Bridge Design Code for CL625 live load and all other applicable loadings and movements.
 - .2 The design shall include bearing reactions at SLS and ULS (dead, live, 1 in 50 year wind load and braking at minimum) with the abutments. The design shall also include all bearing component details and installation requirements. The anchor bolts and anchor bolt holes in the base plates shall be designed, detailed and fabricated to accommodate the loads and movements prescribed in CAN/CSA-S6-14. Modelling of the superstructure shall account for the appropriate stiffness of all supports rather than using absolute support tools available in modelling software. Absolute longitudinal supports shall not be used to model the 'fixed' bearings since this practice can lead to incorrect model behaviour, resulting in potentially under conservative load effects in parts of the superstructure and longitudinally 'free' abutment, and excessively conservative 'fixed' bearing and 'fixed' abutment designs.
 - .3 Construction and material specifications shall be in accordance with the Canadian Highway Bridge Design Code CAN/CSA-S6-14, or as otherwise agreed upon by the Departmental Representative.
 - .4 The Contractor shall provide design shop drawings and engineering calculations for review by the Departmental Representative in PDF format. Once reviewed and approved by the Departmental Representative, the Contractor shall submit one complete set of design drawings marked "Issued for Construction". The drawings shall be reviewed and stamped by a Professional Engineer licensed to practice in the Province of Newfoundland and Labrador, and they shall be provided in both electronic AutoCAD and PDF formats.
 - .5 Expansion joints, bridging plates or other approved means shall be provided at the abutments if the opening between the deck and the backwall is larger than the minimum specified in the CAN/CSA-S6-14 (including rotation and thermal movement effects).
 - .6 The Traffic Barrier shall be a TL-1 design and the anchorage shall be designed in accordance with CAN/CSA S6-14. Panel bridge superstructure shall come complete with galvanized traffic barriers along with all mounting hardware required to secure the barrier to the structure. The barrier shall be factory fabricated to fit the structure requiring no site modifications.
- .3 Manufacturer's Representative:
 - .1 A Manufacturer's representative shall be present during all phases of construction of the modular panel bridge. The Contractor shall be responsible to coordinate all site visits as required by the Departmental Representative
- .4 Certification:

- .1 Prior to opening the modular panel bridge to traffic and payment for the modular panel bridge item, the Contractor shall provide the Departmental Representative with a stamped letter from a Professional Engineer licensed to practice in Newfoundland and Labrador certifying the modular panel bridge has been properly constructed, in conformance with the stamped construction drawings / manufacturer's instructions, and is capable of carrying the required loadings.
- .5 Cleaning:
 - .1 The Contractor shall also be responsible for pressure washing all components of the newly installed structure prior to opening the bridge to traffic to the satisfaction of the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 35 29.06 – Health and Safety.
- .3 Section 01 35 43 – Environmental Procedures
- .4 Section 31 11 00 – Clearing and Grubbing
- .5 Section 32 11 16.01 – Granular Sub-base.
- .6 Section 32 11 23 – Aggregate Base Courses

1.2 SUMITTALS

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

Part 2 Products

Not Used

Part 3 Execution

- .1 Conduct, with Departmental Representative, condition survey of existing site.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovering.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
- .4 The existing road is closed at the bridge. Contractor is responsible for providing access to the site and maintaining the existing road throughout construction. This will include grading of the existing road to permit passage by work vehicles.
- .5 Access to the opposite side of the watercourse has been removed due to damage and removal of the previous bridge. Contractor is responsible to provide temporary crossing for access to the south side of McKenzies Brook in an environmental manner which is subject to review and approval of the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 61 00 – Common Product Requirements
- .2 Section 32 11 23 – Aggregate Base Courses
- .3 Section 31 24 14 – Fill Against Structure
- .4 Section 31 37 20 – Clear Stone

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D 4791-10, Standard Test Method for Flat Particles, Elongated Particles or Flat and Elongated Particles in Coarse Aggregate.
- .2 Newfoundland and Labrador Quarry Materials Act
 - .1 Consolidated Newfoundland and Labrador Regulation 804 – Quarry Materials Regulations (Revised 1996)

1.3 SOURCE APPROVAL

- .1 Provide copy of permit(s) for operation of pit/quarry.
- .2 Inform Departmental Representative of proposed source of aggregates, provide current testing reports (dated within the last year) for physical properties of the proposed source of aggregates prepared by certified third party inspection agency for inspection and testing and provide access for sampling.
- .3 If, in opinion of Departmental Representative, aggregate from the proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that aggregate from source in question can be processed to meet specified requirements.
- .4 Should a change of aggregate source be proposed during work, advise Departmental Representative 1 week in advance of proposed change to allow sampling and testing.
- .5 Acceptance of an aggregate at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

1.4 SAMPLING

- .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Allow continual sampling by Departmental Representative during production.
- .3 Provide Departmental Representative with access to source and processed material for sampling.
- .4 Install sampling facilities at discharge end of production conveyor, to allow Departmental Representative to obtain representative samples of items being produced. Stop conveyor

belt when requested by Departmental Representative to permit full cross section sampling.

- .5 Provide front end loader or other suitable equipment including trained operator for stockpile sampling as necessary. Move samples to storage place as directed by Departmental Representative.
- .6 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.
- .7 Provide water, electric power and propane to Departmental Representative laboratory trailer at production site.

Part 2 Products

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable aggregate free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in a deleterious manner for the use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
 - .1 Greatest dimension to exceed three times least dimension.
- .3 Fine aggregate satisfying requirements of applicable section to be one, or a blend of following:
 - .1 Natural sand.
 - .2 Manufactured sand.
 - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or a blend of the following:
 - .1 Crushed rock.
 - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
 - .3 Light weight aggregate, including slag and expanded shale.

Part 3 Execution

3.1 DEVELOPMENT OF AGGREGATE SOURCE

- .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as approved by authority having jurisdiction.
- .2 Where clearing is required, leave a screen of trees between cleared area and roadways in accordance with permit(s) and all land-use or zoning regulations which may apply.
- .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
- .4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.

- .5 Trim off and dress slopes of waste material piles and leave site in neat condition.

3.2 STRIPPING OF TOPSOIL

- .1 Commence topsoil stripping of areas to be processed.
- .2 Avoid mixing topsoil with subsoil.
- .3 Stockpile in conformity with permit(s) and all land-use or zoning regulations which may apply. Stockpile height not to exceed 2 m.

3.3 PROCESSING

- .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
- .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Departmental Representative.
- .3 Wash aggregates, if required to meet specifications. Use only equipment approved by Departmental Representative.
- .4 When operating in stratified deposits use excavation equipment and methods that will product uniform, homogeneous aggregate.

3.4 HANDLING

- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.

3.5 STOCKPILING

- .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet project schedules.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into work.
- .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
 - .1 Maximum 1.5 m for coarse aggregates and base coarse aggregate.
 - .2 Maximum 1.5 m for fine aggregate and sub-base aggregate.
 - .3 Maximum 1.5 m for other aggregate.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.6 SOURCE ABANDONMENT

- .1 For temporary or permanent abandonment of aggregate source, rehabilitate source to condition meeting conformity with permit(s) and all land-use or zoning regulations which may apply.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 35 43 - Environmental Procedures
- .3 Section 01 74 21 – Construction / Demolition Waste Management and Disposal

1.2 DEFINITIONS

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.
- .5 Grubbing consists of excavation and disposal of all stumps, roots, embedded logs, humus, root mat and topsoil from areas of excavations and embankments to not less than specified depth below existing ground surface.
- .6 Organic stripping consists of existing soil and organic material that has been grubbed from the site during grading operations. The intent for this project is to reuse the organic stripping as material for final landscaping treatments.

1.3 STORAGE AND PROTECTION

- .1 Prevent damage to fencing, trees, landscaping, natural features, utility lines, water courses, root systems of trees and existing site fixtures which are to remain.
 - .1 Repair damaged items to approval of Departmental Representative.
 - .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.

Part 2 Products

Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to Contractor's sediment and erosion control.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION

- .1 Inspect site and verify with Departmental Representative, items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
 - .1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.
 - .2 When utility lines which are to be removed are encountered within area of operations, notify utility in ample time to minimize interruption of service. The Departmental Representative is to be provided copies on all correspondence.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

3.3 CLEARING

- .1 Clearing is not permitted during nesting season which is anticipated to be between June 1 and July 15. Approval from the Departmental Representative must be given prior to commencement of clearing operation.
- .2 Clear areas as indicated and approved by the Departmental Representative. Generally, the areas to be cleared shall extend to a width of 3 m outside of excavation and embankment slope lines.
- .3 Clearing includes felling and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, rubbish and brush occurring within cleared areas.
- .4 Clear as indicated and as directed by Departmental Representative, by cutting at height of not more than 300 mm above ground.
- .5 Cut off branches and cut down trees overhanging area cleared as directed by Departmental Representative.

- .6 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.4 GRUBBING

- .1 Grub areas as indicated. Generally, the areas to be grubbed shall extend to a width of 1.5 m outside of excavation and embankment slope lines.
- .2 Remove and dispose of all rootmat, stumps, embedded logs, humus, root mat and topsoil from areas of excavations and embankments to not less than 300 mm below existing ground surface.
- .3 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.5 REMOVAL AND DISPOSAL

- .1 Remove cleared material off site as indicated by Departmental Representative.
- .2 Stockpile grubbed material on site as indicated by Departmental Representative for reuse in final surface treatment.
- .3 Protect stockpiled grubbed material with erosion and sedimentation controls.

3.6 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for immediate grading operations to approval of Departmental Representative.

3.7 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 35 29.06 – Health and Safety.
- .3 Section 01 35 43 – Environmental Procedures
- .4 Section 31 24 14 – Fill against Structure
- .5 Section 31 32 19.01 – Geotextiles.
- .6 Section 31 37 00 – Armour Rip Rap
- .7 Section 32 11 16.01 – Granular Sub-base.
- .8 Section 32 11 23 – Aggregate Base Courses

1.2 SUMITTALS

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of work.

Part 2 Products

Not Used

Part 3 Execution

3.1 Examination

- .1 Conduct, with Departmental Representative, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovering.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Install temporary barrier to separate and protect work zone from traffic and the public.

3.3 TEMPORARY DAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 – Health and Safety and Health and Safety Act for the Province of Newfoundland and Labrador, Canada.

3.4 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while work is in progress.
- .2 Provide for Departmental Representative review and approval details of proposed dewatering methods.
- .3 Protect open excavations against flooding and damage due to surface run-off.
- .4 Dispose of water by pumping into vegetated areas in approved collection runoff areas and in manner not detrimental to public, private property, watercourse, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
 - .2 Do not allow sediment laden water to reach adjacent watercourses.

3.5 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations.
- .2 Excavate to lines, grades, elevations and dimensions as indicated on the drawings or as directed by Departmental Representative.
- .3 Keep excavated and stockpiled materials safe distance away from edge of trench.
- .4 Restrict vehicle operations directly adjacent to open trenches.
- .5 Dispose of surplus and unsuitable excavated material off site (outside of Park boundaries) or in location(s) approved by the Departmental Representative.
- .6 Do not obstruct flow of surface drainage or natural watercourses.
- .7 Earth bottoms of excavations to be undistributed soil, level, free from loose, soft or organic matter.
- .8 Notify Departmental Representative when bottom of excavation is reached.
- .9 Obtain Departmental Representative approval of completed excavation.
- .10 Remove unsuitable material from excavation bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .11 Correct unauthorized over-excavation as follows:
 - .1 Fill with Fill Against Structure gravel compacted to not less than 98% of corrected Standard Proctor maximum dry density.
- .12 Install geotextiles in accordance with Section 31 32 19.02 - Geotextiles.
- .13 Protect environment from erosion and sediment, transport as per requirements of Environment Protection Plan.

- .14 Boulders removed shall be satisfactorily utilized or disposed of as directed by the Departmental Representative.
- .15 After removal of forms and the required concrete strength has been achieved as noted on the Contract Drawings, the excavations around the structure shall be backfilled up to the level shown on the Contract Drawings, utilizing the backfill materials noted in the Contract Documents. Materials obtained from the foundation excavation shall not be used as backfill unless written approval to do so is provided by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 11 00 – Clearing and Grubbing
- .2 Section 31 23 33.02 – Excavation for Bridge
- .3 Section 32 15 60 – Roadway Dust Control

1.2 REFERENCES

- .1 Definitions:
 - .1 Rock Excavation: excavation of:
 - .1 Material from solid masses of igneous, sedimentary or metamorphic rock which, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort with a Caterpillar D9 crawler bulldozer or equivalent to be considered integral with parent mass.
 - .2 Boulder or rock fragments measuring in volume 1cubic metre or more.
 - .2 Common Excavation: excavation of materials that are not Rock Excavation.
 - .3 Unclassified Excavation: excavation of materials regardless of type.
 - .4 Free Haul: distance that excavated material is hauled without compensation.
 - .5 Over Haul: authorized hauling in excess of free haul distance that excavated material is moved. Over Haul does not apply to this Contract.
 - .6 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.
 - .7 Waste Material: material unsuitable for embankment, embankment foundation or material surplus to requirements.
 - .8 Borrow Material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work.
 - .9 Organic stripping consists of existing soil and organic material that has been grubbed from the site during grading operations. The intent for this project is to reuse the organic stripping as material for final landscaping treatments.
- .2 Reference Standards:
 - .1 ASTM International
 - .1 ASTM D698-12e2, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements:

- .1 Adhere to regulations of authority having jurisdiction when blasting is required

Part 2 Products

2.1 MATERIALS

- .1 Embankment materials require approval by Departmental Representative.
- .2 Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps or other unsuitable material.
- .3 Borrow material:
 - .1 Obtain from sources such as quarry, or borrow pit as approved by Departmental Representative.
 - .1 Earth Embankment materials to consist of acceptable earth material and processed rock material free from objectionable quantities of organic matter, frozen soil, stumps, trees, moss, and other unsuitable materials.
 - .2 Rock Embankment material to consist of fragmented rock produced by drilling and blasting operations, and boulders which cannot be placed in layers as specified for Earth Embankments.
 - .1 Rock Embankment to conform to gradation as follows:

| Sieve Designation | Percent Passing by Weight |
|-------------------|---------------------------|
| 150 mm | 100 |
| 100 mm | 85 - 100 |
| 75 mm | 10 - 50 |
| No. 200 | 0 - 3 |

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that condition of substrate is acceptable for roadway embankment Work:
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 COMPACTION EQUIPMENT

- .1 Compaction equipment: vibratory rollers or vibrating plate compactors capable of achieving required density of project materials.

- .1 Demonstrate compaction equipment effectiveness on specified material and lift thickness by documented performance of test-strip before start of Work.
- .2 Replace or supplement equipment that does not achieve specified densities.

3.3 WATER DISTRIBUTORS

- .1 Apply water with equipment capable of uniform distribution.

3.4 STRIPPING

- .1 Commence topsoil stripping of areas as directed by Departmental Representative after brush have been removed from these areas.
- .2 Strip topsoil to depths as directed by Departmental Representative. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Departmental Representative.
 - .1 Stockpile height: not to exceed 2 m.
- .4 Remove clearing and grubbing debris from stripping.
- .5 Spread organic stripping, on completion of excavation and embankment construction, on slopes and trim or remove from site if quantity exceeds ability to grade on site.

3.5 EXCAVATING

- .1 General:
 - .1 Notify Departmental Representative when waste materials are encountered and remove to depth and extent directed.
 - .2 Sub-excavate rock 500 mm below subgrade in cut sections unless otherwise directed by Departmental Representative.
 - .1 Replace with approved embankment material or borrow material and compact to specified embankment density.
 - .3 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points as directed by Departmental Representative.
- .2 Drainage:
 - .1 Maintain profiles, crowns and cross slopes to provide good surface drainage.
 - .2 Construct ditches as work progresses to provide drainage.
 - .3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.
- .3 Rock excavation:
 - .1 Notify Departmental Representative, when material appearing to conform to classification for rock is encountered, to enable measurements to be made to determine volume of rock. Provide a minimum of 12 hours notification.
 - .2 Blasting of rock is not permitted.
 - .3 Reduce overbreak and increase stability of rock faces by using smooth blasting techniques.

- .4 Use smooth blast and excavate short sections in rock cuts to determine optimum spacing of holes when requested by Departmental Representative.
- .5 Stem holes as necessary to contain blast.
- .6 Do not use prilled type ammonium nitrate and fuel oil (ANFO) explosives within 4 m of final cut line.
- .7 Scale rock backslopes to achieve smooth, stable face, free of loose rock and overhangs to design backslope.
- .8 Control blasting to minimize flying particles.
- .9 No undrained pockets shall be left in the rock surface.
- .4 Borrow Excavation:
 - .1 Completely use in embankments, suitable materials removed from right-of-way excavations before taking material from borrow areas.
 - .2 Trim and leave borrow pits in condition to permit accurate measurement of material removed.

3.6 EMBANKMENTS

- .1 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces.
 - .1 Method used to be pre-approved in writing by Departmental Representative.
- .2 Break up or scarify existing road surface prior to placing embankment material.
- .3 Do not place material that is frozen nor place material on frozen surfaces except in areas authorized by Departmental Representative.
- .4 Maintain crowned surface during construction to ensure ready run-off of surface water.
- .5 Drain low areas before placing materials.
 - .1 Place and compact to full width in layers not exceeding 200 mm loose thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.
- .6 Where material consists of rock:
 - .1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 450 mm.
 - .2 Distribute rock material to fill voids with smaller fragments such that the interstices around rock are filled with fine material to form compact mass.
 - .3 Fill surface voids at subgrade level with rock spalls or selected material to form earth-tight surface.
 - .4 Do not place boulders and rock fragments with dimensions exceeding 150 mm within 500 mm of subgrade elevation.
- .7 Deductions from excavation will be made for overbuild of embankments.

3.7 **COMPACTION**

- .1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.
- .2 Deposit, spread, and blade smooth in successive uniform layers embankment material in layers 200 mm maximum thickness to the full width of the cross section.
 - .1 Ensure required compaction for each layer before placing any material for next layer.
- .3 Compact top 300 mm of subgrade in areas of excavation.
- .4 Use specialized compaction equipment supplemented by routing, hauling, and leveling equipment over each layer of fill.
- .5 Obtain written approval from Departmental Representative before using specialized compaction equipment such as tamping rollers, vibratory rollers, or other alternate compaction equipment that produces the required results.
- .6 Compact each layer to minimum 95% of the Standard Proctor maximum dry density or the acceptable Control Strip Density except top 300 mm of subgrade.
 - .1 Compact top 300 mm in 150 mm layers to a minimum 98% of the Standard Proctor maximum dry density or the acceptable Control Strip Density.
- .7 Add water or dry as required to bring water content of materials to level required to achieve specified compaction.
- .8 For material containing less than 30% oversize (retained on 20 mm sieve) the test method shall be Standard Proctor Test – ASTM D698.
- .9 For maximum dry density for material containing more than 30% oversized shall be determined using method prescribed herein as Control Strip.
- .10 Control Strip Method:
 - .1 A Control Strip is a lift of material constructed on a 30 m section, minimum 3 m wide, of prepared surface selected by the Departmental Representative.
 - .2 A maximum dry density “Control Density” shall be established on a lift of material using the equipment and method of compaction as prescribed herein for construction of a Control Strip.
 - .3 A Control Strip shall be constructed at the beginning of work. One or more Control Strips shall be constructed whenever a change is made in the type or source of material or any change in the compaction equipment used. Each Control Strip shall remain in place and become a portion of the completed base course.
 - .4 To determine the Control Density, a minimum of six water content and density tests shall be taken at random locations by the Departmental Representative, using nuclear equipment. Test results shall be averaged to determine the in-place maximum dry density.
 - .5 The maximum compacted thickness of each layer shall not exceed 200 mm except when it can be demonstrated, in construction of the Control Strip, that adequate compaction of thicker lifts is possible.

- .6 No additional lift shall be placed until the control density is determined and the compacted lift is approved by the Departmental Representative.
- .7 The Control Strip water content shall be adjusted to produce necessary compaction as directed by the Departmental Representative. If the Control Strip compaction is being adversely affected by the water content of the soil, being either excessive or deficient, the Control Strip construction shall not continue until the water content is reduced or increased, to produce necessary compaction.
- .8 The type and mass of the compaction equipment used shall be such that uniform density is obtained throughout the depth of the layer being compacted.
- .11 Minimum compaction equipment shall be a vibratory steel roller(s) weighing not less than 6 t, having a vibratory capacity of at least 1500 VPM with a minimum dynamic or centrifugal force of 8000 kg, operated in a vibratory mode, at a speed not exceeding 8 km/h.
- .12 Control Density Determination.
 - .1 A lift of material shall be spread over the entire Control Strip section. Once the Control Strip lift has been completely spread, the measurements of the Control Density shall commence and continue during repeated passes of the compaction equipment until a maximum dry density is achieved.
 - .2 A pass shall be one complete coverage of the Control Strip layer with the compaction equipment.
 - .3 Testing of the Control Strip shall be discontinued when the average dry density between each series of passes increases by less than 10 kg/m^3 , continually decreases, or remains constant.
- .13 The maximum dry density shall be the Control Density used to determine the percent compaction in other areas of the project for the same lift and thickness in other areas of the project for the same lift and thickness and same class of gravel as that used in the Control Section.

3.8 FINISHING

- .1 Shape entire roadbed to within 25 mm of design elevations with no depressions to hold water. Finish surface shall average design elevations and not uniformly high or low.
- .2 Finish slopes, ditch bottoms and borrow pits true to lines, grades and drawings where applicable. Scale slope by removing loose fragments, for cut slopes in bedrock steeper than 1:1.
- .3 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.
- .4 Hand finish slopes that cannot be finished satisfactorily by machine.
- .5 Round top of backslope 1.5 m both sides of top of slope.
- .6 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.
- .7 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.
- .8 Place organic stripping material to minimum depths:
 - .1 750 mm depth in areas of reinstated trees.

- .2 300 mm depth in areas of reinstated scrubs.
- .3 150 mm depth in areas of hydroseeding.
- .9 For details on finish grading refer to Section 32 91 21.
 - .1 In areas of reinstated trees and scrubs, prepare top 150 mm – 200 mm of placed organic stripping material to remove any waste wood in excess of 75 mm diameter.
 - .2 In areas of hydroseeding, prepare top 100 mm of placed organic stripping material to remove any waste wood in excess of 25 mm diameter.

3.9 CLEANING

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

3.10 PROTECTION

- .1 Maintain finished surfaces in condition conforming to this section until acceptance by Departmental Representative.
- .2 Provide silt fences and erosion protection as required to mitigate and prevent impacts to adjacent properties.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 32 11 16.01 – Aggregate Materials
- .3 Section 31 37 00 – Armour Rip-Rap

1.2 REFERENCES

- .1 ASTM C117, Test Method for Material Finer Than 75 m Sieve in Mineral Aggregate by Washing.
- .2 ASTM C131, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C136, Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D4318, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

Part 2 Products

2.1 MATERIALS

- .1 Crushed and screened gravel or rock approved by the Departmental Representative prior to placement.
- .2 Material shall be tested in accordance with ASTM C117 and ASTM C136 and shall conform to the following gradation:

| <u>Sieve Size mm</u> | <u>Percent Passing</u> |
|----------------------|------------------------|
| 112 | 100 |
| 40 | 60 – 85 |
| 5 | 25 – 50 |
| 0.315 | 5 – 15 |
| 0.080 | 2 – 7 |

- .3 Fill Against Structure shall conform to the physical properties requirements listed in the following:

| <u>Property</u> | <u>Test Method</u> | <u>FAS</u> |
|------------------------------------|--------------------|------------|
| LA Abrasion (Grading A) | ASTM C131 | 45 |
| Plasticity Index (Sand Portion) | ASTM D4318 | < 6 |

Part 3 Execution

3.1 PLACING

- .1 The embankment underlying the Fill Against Structure shall be compacted as indicated on the drawings or as directed by the Departmental Representative.
- .2 Prior to placing structural fill, inspect subgrade and concrete abutment structures to assure stability. Do not proceed with filling operations until these areas are approved by the Departmental Representative.
- .3 Fill material shall be placed in layers not exceeding 300 mm in thickness and each layer compacted as specified herein by means of a vibratory compactor. Refer to Contract Drawings for allowable compaction equipment adjacent to abutments. Compaction of fills behind each abutment shall not be undertaken until concrete has reached at least 35 MPa.
- .4 Fill Against Structure shall be compacted using special equipment, suitable for work in confined spaces and as outlined on the Contract Documents.
- .5 Compaction of Fill Against Structure shall be compacted as indicated on the Drawings.
- .6 Extents of Fill Against Structure adjacent and surrounding each abutment on both approaches shall be as indicated on the Drawings or as determined by the Departmental Representative.
- .7 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .8 Do not use Fill Against Structure material which is frozen or contains ice, snow or debris.

3.2 SITE TOLERANCES

- .1 The extent of Fill Against Structure shall be as indicated on the plans or as determined by the Departmental Representative.

3.3 PROTECTION

- .1 Upon completion of Work, remove waste materials and debris and correct defects as directed by Departmental Representative.
- .2 Maintain finished slopes and lines until subsequent material is placed covering the Fill Against Structure.
- .3 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .4 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 24 13 – Roadway Embankments

1.2 REFERENCES

- .1 All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:
 - .1 ASTM C 127, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .2 ASTM C 131, Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

Part 2 Products

2.1 MATERIALS

- .1 The stone may be field or quarry stone and of such sizes as may be approved or specified. All pieces of stone shall be sound and subject to approval.

2.2 GRADATION REQUIREMENTS

- .1 The rock fill shall be angular quarried or crushed, 450 mm minus stone, free of fines and having at least one crushed face. Material shall be well graded to fill voids and meet compaction.

2.3 PHYSICAL PROPERTIES

- .1 Rock fill shall conform to the physical properties listed in the table below:

| <u>Property</u> | <u>Test Method</u> | <u>Rock Fill</u> |
|--------------------|--------------------|------------------|
| Absorption % max. | ASTM C 127 | 2.00 |
| LA Abrasion % max. | ASTM C 131 | 40 |

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Rock Fill shall be placed and compacted in accordance with Section 31 24 13 or as directed by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedure
- .2 Section 31 24 14 – Fill Against Structure
- .3 Section 31 37 00 – Armour Rip-Rap
- .4 Section 31 37 20 – Clear Stone

1.2 REFERENCES

- .1 All current standards at the time of initial advertisement of tender apply
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D4491, Standard Test Methods for Water Permeability of Geotextiles by Permeability.
 - .2 ASTM D4595, Standard Test Method for Tensile Properties of Geotextile by Wide-Width Strip Method.
 - .3 ASTM D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 11.2-M89, Textile Test Methods – Bursting Strength – Ball Burst Test (Extension of September 1989)
 - .2 CAN/CGSB-142.1-2003, Methods of Testing Geotextiles and Complete Geomembranes – Complete Set.
 - .1 No. 2, Methods of Testing Geotextiles and Geomembranes – Mass per Unit Area.
 - .2 No. 3, Methods of Testing Geotextiles and Geomembranes – 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 Geotextiles and Geomembranes – Filtration Opening Size.

1.3 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 Test and Evaluation Reports:

- .1 Submit copies of mill test data and certificate at least 4 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 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

Part 2 Products

2.1 MATERIAL

- .1 Geotextile: woven synthetic fibre fabric, supplied in rolls.
 - .1 Width: 3.81 m minimum.
 - .2 Composed of: UV protected material.
- .2 Physical properties:
 - .1 Grab tensile strength and elongation: to CAN/CGSB-148.1, No. 7.3.
 - .1 Breaking force: minimum 1100 N, wet condition.
 - .2 Elongation at break: maximum 15%.
 - .2 Mullen burst strength: to CAN/CGSB-4.2, No. 11.2, minimum 3.0 MPa, wet condition.
 - .3 Bursting strength: use values specified in CAN/CGSB-148.1, No. 6.1, wet condition.
- .3 Hydraulic properties:
 - .1 Apparent opening size (AOS): to ASTM D4751, 50 µm (minimum) 150 µm (maximum).
 - .2 Hydraulic Conductivity, 0.01 cm/sec.
 - .3 Permeability: to CAN/CGSB-4.2 No. 11.1-9.

Part 3 Execution

3.1 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with security pins.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases. Stop geotextile 100 mm below finished surface.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.

- .5 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 Replace damaged or deteriorated geotextile to approval of Design Departmental Representative.

3.2 CLEANING

- .1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner. Recycle material if at all possible.

3.3 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

3.4 QUALITY CONTROL

- .1 The Contractor shall supply documentation from the manufacturer that the supplied material meets all specified as follows:

| <u>Test Type</u> | <u>Standard</u> |
|--------------------------------------|----------------------------|
| Opening | ASTM D4751 |
| Bursting Strength | CAN/CGSB-4.2, No. 11.2 |
| Mass/Unit Area | CAN/CGSB-148.1, No. 2 |
| Thickness | CAN/CGSB-148.1, No. 3 |
| Burst | CAN/CGSB-148.1, No. 6.1 |
| Tensile | CAN/CGSB-148.1, No. 7.3 |
| Filtration Opening | CAN/CGSB-148.1, No. 10 |
| Grab Tensile Strength and Elongation | CAN/CGSB-148.1, ASTM D4595 |
| Permeability and Water Flow Rate | ASTM D4491 |

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 24 14 - Fill Against Structure
- .2 Section 31 32 19.01 – Geotextiles

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C127-07, Test Method for Material Finer Than 75 µm 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.

1.3 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 ARMOUR STONE

- .1 Armour stone shall be hard, durable, field or quarry stone, free from splits, seams or defects likely to impair its soundness during handling or by the actions of water and ice. Shale, slate or rocks with thin foliations shall not be acceptable. The greatest dimension of each stone shall not exceed two times the least dimension. The minimum density of the stone shall be 2 650 kg/m³. Physical properties shall be as defined as:

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

Sizes of Armour Rip Rap shall be defined as:

| Approximate Maximum Dimension, mm | Percent Smaller Than |
|--|-----------------------------|
| 1050 | 100 |
| 650 | 0 – 50 |
| 300 | 0 - 15 |

2.2 GEOTEXTILE FILTER

- .1 Geotextile: in accordance with Section 31 32 19.01 - Geotextile.

Part 3 Execution

3.1 PLACING

- .1 Where armour rip rap is to be 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 geotextile on prepared surface in accordance with Section 31 32 19.01 - Geotextile and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.
- .4 Place armour rip rap to thickness and details as indicated.
- .5 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.
- .6 The Armour 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.
- .7 Final grading of slopes surrounding new abutments shall be completed within the allowable time for in water work as described in the specifications.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 05 16 – Aggregate Materials

1.2 REFERENCES

- .1 All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:
 - .1 ASTM C117-04, Standard Test Methods for Material Finer Than 75µm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C127-15, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D 4318 Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
 - .5 MTO LS-618, Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.

Part 2 Products

2.1 MATERIALS

- .1 Clear stone material: shall consist of hard, durable stone particles and free from elongated or objectionable pieces. Material shall be tested in accordance with ASTM C117 and ASTM C136 and shall conform to the following gradation table:

| <u>Sieve Size, mm</u> | <u>Percent Passing</u> | | | | |
|-----------------------|------------------------|--------|--------|--------|--------|
| | C1 | C2 | C3 | C4 | C5 |
| 250 | 100 | | | | |
| 200 | | 100 | 100 | | |
| 150 | 20-35 | 90-100 | 90-100 | | |
| 112 | | 0-10 | 20-35 | 100 | |
| 80 | | | 0-20 | 90-100 | |
| 56 | 0-10 | | | | |
| 28 | | | | 0-10 | 100 |
| 20 | | | 0-10 | | 90-100 |
| 10 | | | | | 0-40 |
| 5 | | | | | 0-10 |

- .2 Material shall conform to the physical properties listed in the table below:

| <u>Property</u> | <u>Test Method</u> | <u>Clear Stone</u> |
|--------------------|--------------------|--------------------|
| Absorption % max. | ASTM C 127 | 1.75 |
| Plasticity Index | ASTM D 4318 | 0 |
| Micro-Deval % max. | DOT&PW TM-1 | 25 |

Part 3 Execution

3.1 CONSTRUCTION METHODS

- .1 Where clear stone is to be placed on slopes, abutment drainage pipe ends, culvert ends, gutter ends, ditches or elsewhere directed by the Departmental Representative, excavate or prepare surface as directed.
- .2 Place geotextile on prepared surface in accordance with Section 31 32 19.01 - Geotextile and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.
- .3 Place clear stone to thickness and details as indicated or directed by Departmental Representative.
- .4 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass.
- .5 The clear stone shall be placed to the lines and grades shown on the drawings or as directed by the Departmental Representative. Placement and compaction 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 SECTIONS

- .1 Section 31 05 16 – Aggregate Materials

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-04, Standard Test Methods for Material Finer Than 75µm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C127-15, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .3 ASTM C131/C131M-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .4 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .5 ASTM C535-01, Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .6 ASTM D422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils.
 - .7 ASTM D5821-13, Standard Test for Determining the Percentage of Fractured Particles in Coarse Aggregate.
 - .8 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m³.
 - .9 ASTM D1883-07, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - .10 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 - .11 ASTM D1557-07, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 27,000 kN-m/m³.
- .2 Canadian Standards Association (CSA)
 - .1 CSA A23.2-23A, Method of Test for the Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.
- .3 Canadian General Standard Board (CGSB)
 - .1 CGSB 8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CGSB 8.2-M88, Sieves, Testing, Woven Wire, Metric Series.
- .4 Ministry of Transportation Ontario (MTO)
 - .1 MTO LS-618, Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.
 - .2

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 31 05 16 – Aggregate Material.
- .2 Store minimum 50% of total aggregate required prior to beginning operation. Maintain minimum of 1000 tonne in stockpile until last 1000 tonne is placed.

Part 2 Products

2.1 MATERIALS

- .1 Aggregate base material (Granular A): Crushed and screened quarried rock. Material to consist of hard and durable stone and sand particles. Material shall be tested in accordance with ASTM C117 and ASTM C136 and shall conform to the following gradation table:

Sieve Size mm Percent Pass

| | |
|-------|---------|
| 19 | 100 |
| 9.51 | 50 – 80 |
| 4.76 | 35 – 60 |
| 1.2 | 15 – 35 |
| 0.3 | 5 – 20 |
| 0.075 | 2 - 8 |

- .2 Granular material shall conform to the physical properties requirements listed in the following table:

| <u>Property</u> | <u>Test Method</u> | <u>Sub-base</u> |
|--|--------------------|-----------------|
| Absorption (% Maximum) | ASTM C127 | 1.75 |
| Los Angeles Abrasion* (loss % Maximum) | ASTM C131 | 35 |
| Fractures Particles, one face, (% Minimum)** | ASTM D5821 | 80 |
| Plasticity Index | ASTM D4318 | 0 |
| Petrographic Number (Maximum) | ASTM C295 | 150 |
| Micro-Deval Test for Fine Aggregate (% Max.) | CSA A23.2-23A | 30 |
| Micro-Deval Test for Coarse Aggregate (% Max.) | MTO LS-618 | 25 |

*The rates of loss after 100 revolutions to the loss after 500 revolutions shall not exceed 0.280.

**The fractured particle shall have at least one well defined fresh face resulting from fracture, with the face comprising no less than 20% of the particle surface area. Particles with smooth faces and rounded edges, or with only small chips removed will not be considered as fractured.

- .3 Materials shall be considered unsuitable even though particle sizes are within the specified gradation limits if particle shape or any other characteristic precludes satisfactory compaction.
- .4 Materials shall conform to the gradation requirements and to the physical requirements stated. The gradation shall not show marked fluctuations from opposite extremes of the limiting sizes, and the plotted curve shall flow in a manner free from acute changes in direction.

Part 3 Execution

3.1 PLACING

- .1 Place aggregate base after granular sub-base is inspected and approved by Departmental Representative.
- .2 Construct aggregate base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Begin spreading aggregate base material on crown line or high side of one-way slope.
- .6 Place aggregate base materials using methods which do not lead to segregation or degradation.
- .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
- .9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .10 Place and compact shouldering to match cross slope. Compacted shouldering to be flush with asphalt concrete surface.
- .11 Remove and replace portion of layer in which material has become segregated during spreading.

3.2 COMPACTION

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact to density of not less than 100% maximum dry density attained using the method prescribed herein as "Control Strip".

- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .4 Apply water as necessary during compaction to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 CONTROL STRIP METHOD

- .1 A Control Strip is a lift of aggregate base course constructed on a 30 m section, minimum 3 m wide, of prepared surface selected by the Departmental Representative.
- .2 A maximum dry density "Control Density" shall be established on a lift of aggregate base course using the equipment and method of compaction as prescribed herein for construction of a Control Strip.
- .3 A Control Strip shall be constructed at the beginning of work. One or more Control Strips shall be constructed whenever a change is made in the type or source of material or any change in the compaction equipment used. Each Control Strip shall remain in place and become a portion of the completed base course.
- .4 No additional lift shall be placed until the control density is determined and the compacted lift is approved by the Departmental Representative.
- .5 The Control Strip moisture content shall be adjusted to produce necessary compaction as directed by the Departmental Representative. The surface of the aggregate base course shall be kept moist until testing is complete.
- .6 To determine the Control Density, a minimum of six moisture and density tests shall be taken at random locations by the Departmental Representative, using nuclear equipment. Test results shall be averaged to determine the in-place maximum dry density.
- .7 The type and mass of the compaction equipment used shall be such that uniform density is obtained throughout the depth of the layer being compacted.
- .8 Minimum compaction equipment shall be a vibratory steel roller(s) weighing not less than 6 t, having a vibratory capacity of at least 1500 VPM with a minimum dynamic or centrifugal force of 8000 kg, operated in a vibratory mode, at a speed not exceeding 8 km/h.
- .9 Control Density Determination.
 - .1 A lift of aggregate base course shall be spread over the entire Control Strip section. Once the Control Strip lift has been completely spread, the measurements of the Control Density shall commence and continue during repeated passes of the compaction equipment until a maximum dry density is achieved.
 - .2 A pass shall be one complete coverage of the Control Strip layer with the compaction equipment.
 - .3 Testing of the Control Strip shall be discontinued when the average dry density between each series of passes increases by less than 10 kg/m^3 , continually decreases, or remains constant.

- .10 The maximum dry density shall be the Control Density used to determine the percent compaction in other areas of the project for the same lift and thickness in other areas of the project for the same lift and thickness and same class of gravel as that used in the Control Section.

3.4 SITE TOLERANCES

- .1 Finished aggregate base surface to be within a tolerance of +/-10 mm of dimensions as indicated but not uniformly high or low.

3.5 PROTECTION

- .1 Maintain finished aggregate base in condition conforming to this section until succeeding material is constructed, or until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures

1.2 SUBMITTALS

- .1 Product Data.
 - .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Submit statement which certifies that each bag of seed and each bag of fertilizer for use on this project is fully labeled in accordance with the Canada Seed Act and Fertilizer Act.
 - .3 Submit manufacturer's instructions, printed product literature and data sheets for seed, mulch, tackifier, fertilizer, liquid soil amendments and micronutrients.
 - .4 Submit in writing to Departmental Representative 10 days prior to commencing work:
 - .1 Volume capacity of hydraulic seeder in litres.
 - .2 Amount of material to be used per tank based on volume.
 - .3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.

1.3 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.

1.4 SCHEDULING

- .1 Schedule hydraulic seeding to coincide with preparation of soil surface.
- .2 Hydraulic seeding shall be carried out as soon as possible after completion of the surface preparation in order to prevent erosion by wind and water. Hydraulic seeding shall take place no more than two (2) weeks after excavation and embankment construction is complete.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:

- .1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.
- .2 Inoculant containers to be tagged with expiry date.
- .3 Storage and Handling Requirements:
 - .1 Store fertilizer in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.
- .3 Do not dispose of unused fertilizer into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MATERIAL

- .1 Seed: “Canada pedigreed grade” in accordance with Government of Canada Seeds Act and Seeds Regulations.
 - .1 Grass mixture: “Certified”, “Canada No. 1 Lawn Grass Mixture” in accordance with Government of Canada “Seeds Act” and “Seeds Regulations”.
 - .2 Mixture composition: 60% Annual Rye and 40% Creeping Red Fescue.
- .2 Mulch: Specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, with an environmentally acceptable dye, free of germination and growth inhibiting factors with following properties:
 - .1 Type I mulch.
 - .1 Made from wood cellulose fibre.
 - .2 Organic matter content: 95% plus or minus 0.5%.
 - .3 Value of PH: 6.0.
 - .4 Potential water absorption: 900%.
 - .2 Tackifier: Water dilutable, liquid dispersion water soluble vegetable carbohydrate powder.
- .3 Water: Free of impurities that would inhibit germination and growth.
- .4 Fertilizer:
 - .1 To Canada “Fertilizers Act” and “Fertilizers Regulations”.
 - .2 The fertilizer is to have a plant food ratio of 10 nitrogen, 10 phosphorus and 20 potash plus 2% Fritted Tract Elements.
 - .3 The fertilizer to be spread the following spring during the maintenance period shall have a plant food ratio of 5 nitrogen, 10 phosphorus and 30 potash.

- .5 Inoculants: Inoculant containers to be tagged with expiry date.

2.2 EQUIPMENT

- .1 Truck (hydraulic):
 - .1 Slurry tank: approved commercial hydraulic equipment.
 - .1 Capable of continually agitating the mixture during hydraulic seeding operation to ensure homogeneous slurry is produced.
 - .2 Pumps capable of maintaining continuous non-fluctuating flow of solution.

Part 3 Execution

3.1 WORKMANSHIP

- .1 Do not spray onto structures, signs, guide rails, fences, plant material, utilities and other than surfaces intended.
- .2 Clean-up immediately, any material sprayed where not intended, to satisfaction of Departmental Representative.
- .3 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.
- .4 Protect seeded areas from trespass until plants are established.

3.2 PREPARATION OF SURFACES

- .1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.
- .2 Fine grade areas to be seeded free of humps and hollows.
- .3 Remove deleterious materials such as sticks, roots, or large rocks and loosen top 50 mm of soil to remove hardened or crusted soil.
- .4 Surface to be scarified parallel to the contour of the slope with a minimum indentation of 25 mm and at a maximum spacing of 150 mm.
- .5 Cultivated areas identified as requiring cultivation to depth of 25 mm.
- .6 Ensure areas to be seeded are moist to depth of 150 mm before seeding.
- .7 Obtain Departmental Representative's approval of grade before starting to seed.

3.3 PREPARATION OF SLURRY

- .1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to Departmental Representative. Supply equipment required for this work.
- .2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.
- .3 After all materials are in the seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.4 HYDRAULIC SEEDING

- .1 Seed during local growing season when natural moisture is available and temperature is suitable to ensure germination and growth.
- .2 Measure all quantities of material by weight or by weight-calibrated volume measurement.
- .3 Charge seeder with water, and while agitating, slowly add mulch, seed, fertilizer and lime until all components are thoroughly mixed.
- .4 When required, add erosion control agent to seed and mix thoroughly to complete seeding slurry.
- .5 Slurry application per hectare:
 - .1 Seed: Grass mixture 125 kg.
 - .2 Fertilizer: 375 kg.
 - .3 Mulch: Type I 1350 kg.
 - .4 Tackifier: 300 kg.
 - .5 Water: Minimum 30,000 litres.
- .6 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.
 - .1 Use correct nozzle for application.
 - .2 Using hoses for surfaces difficult to reach and to control application.
 - .3 Blend application 300 mm into adjacent grass areas or sided areas and previous applications to form uniform surfaces.
 - .4 Slurry shall be thick enough to prevent grass seed from drying and blowing but not to impact germination and growth.
 - .5 Reshoot areas where application is not uniform.
 - .6 Remove slurry from items and areas not designated to be sprayed.
 - .7 Protect seeded areas from trespass satisfactory to Departmental Representative.
 - .8 Remove protection devices as directed by Departmental Representative.

3.5 MAINTENANCE DURING ESTABLISHED PERIOD

- .1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
- .2 The contractor shall be responsible for maintaining hydraulic seeded areas to ensure proper and adequate growth of the vegetation during the warranty period. The contractor shall also be responsible for an additional application of fertilizer the following spring after initial application. This application shall be by a method approved by the Departmental Representative. The fertilizer shall be 5-10-30 and shall be at a rate of 300 kg/ha. No additional payment will be made for maintenance on the extra application of fertilizer.

3.6 ACCEPTANCE OF HYDROSEED APPLICATION FOR PARTIAL PAYMENT

- .1 Hydroseeded areas will be accepted for payment provided:

1. Seeded areas are uniformly established and turf is free of rutted, eroded, bare or dead spots.
2. Seeded areas have established to 50% coverage, i.e. 50% of soil surface soil is visible when grass has been cut to 75 mm height.
3. Areas seeded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.7 WARRENTY PERIOD

- .1 All areas hydraulic seeded under this contract shall have a warranty period of one (1) year starting from the date of initial acceptance. This warranty shall cover any defects in materials and workmanship, and damages caused by the elements of weather. During this period, any defect brought to the attention of the Contractor by the Departmental Representative shall be fixed, repaired or made good to the satisfaction of the Departmental Representative and at no additional cost.

3.8 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 74 21 – Construction / Demolition Waste Management and Disposal
- .2 Section 32 11 16.01 – Granular Sub-base.

1.2 REFERENCES

- .1 American Association of State Highway and Transportation Officials (AASHTO)
 - .1 AASHTO M180-2011, Corrugated Sheet Steel Beams for Highway Guardrails.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A307-12, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating
- .4 Canadian Standards Association (CSA)
 - .1 CAN/CSA-080 Series-08 (R2012), Wood Preservation
 - .2 CAN/CSA-S136, Cold Formed Steel Structure Members
 - .3 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles
- .5 Newfoundland and Labrador Department of Transportation and Works (NLDTW)
 - .1 NLDTW Specification Book

1.3 DEFINITIONS

- .1 Steel W-Beam Guide Rail shall consist of single W-beam guide rail with posts spaced at 3.81 m intervals and off-set blocks at each post.
- .2 Steel W-Beam Guide Rail – Bridge Approach shall consist of single W-beam guide rail and single Channel rail between posts spaced at 1.905 m intervals except for the first length of rail extending from the end of the bridge which shall have posts spaced at 0.953 m intervals. All posts to have off-set blocks at each post.

1.4 SAMPLES

- .1 At least 4 weeks prior to commencing work, inform Departmental Representative of proposed sources of guide rail and components, and provide access for sampling.

Part 2 Products

2.1 MATERIALS

- .1 Steel W-beam guide rail:

- .1 Steel rail and terminal sections: to AASHTO M180, Class A, Type 1 zinc coated.
- .2 Bolts, nuts and washers: to ASTM A307, hot dip galvanized to CSA G164.
- .2 Timber post and offset block:
 - .1 Well seasoned, straight and sound, free from loose knots or other defects, dressed four sides.
 - .2 Sizes: posts to be 200 mm x 200 mm x 2.1 m in length; blocks to be 200 mm x 200 mm x 440 mm in length.
 - .3 Acceptable species of wood: Jack Pine or Eastern Hemlock.
 - .4 Treat posts and blocks to CSA 080 commodity standard 080.14-M, pressure preserved wood for highway construction Table 1 and its references. Standard minimum retention of CCA preservative 6.4 kg/m³.
 - .5 Reflector strips shall be 70 mm x 75 mm on metal backing.

Part 3 Execution

3.1 ERECTION

- .1 Install posts and rails in accordance to contract drawings or directed by the Departmental Representative.
 - .1 Bury end treatment in accordance to contract drawings.
- .2 Install posts plumb at locations and with minimum embedment of 1320 mm in road embankment or directed by Departmental Representative.
- .3 Bottom of each post hole to be compacted to provide firm foundation. Set post plumb and square in hole, backfill in 150 mm layers and compact each layer before placing succeeding layer.
- .4 Cutting of posts is not permitted without approval of the Departmental Representative.
- .5 Treat cut with two coats of same type of wood preservative used to pressure treat posts.
- .6 Erect steel W-beam components to details indicated. Lap joints in direction of traffic. Tighten nuts to 100 N.m. torque. Maximum protrusion of bolt 6 mm beyond nut.
- .7 Once the W-beam rail is properly installed, new reflective strips shall be placed immediately on every second post and on each end post.
 - .1 White reflector shall be placed facing the approaching traffic in the immediately adjacent driving lane and yellow reflector on the opposite side of the same post facing traffic in the other direction.

3.2 TOUCH-UP

- .1 Clean damaged surfaces with brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas in accordance with manufacturer's instructions.

3.3 REMOVAL

- .1 Wooden posts and steel guide rail systems shall be removed where and as directed by the Departmental Representative.
- .2 Components which are considered salvageable by the Departmental Representative shall be removed with care, delivered and stacked in neat piles at a location to be designated by the Departmental Representative;
 - .1 Every effort shall be made to avoid damage to reusable guide rail system components during the removal operation.
 - .2 The use of heat to remove bolts and the cutting of rail sections and bolts shall be not permitted unless approved by the Departmental Representative.
 - .3 For Parks Canada depot locations, Contractor must provide 48 hour notice to Parks Canada staff to arrange drop off.
- .3 Remaining non-salvageable components shall be removed and disposed of in accordance with Section 01 74 21 – Construction / Demolition Waste Management and Disposal.
- .4 Post holes to be backfilled and compacted with Sub-Base Granular material.
- .5 Area to be graded to match surrounding shoulder elevation.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Measurement procedures.
- .2 Waste management and disposal.
- .3 Materials.
- .4 Installation.
- .5 Removal and salvage.
- .6 Cleaning.

1.2 RELATED SECTIONS

- .1 Section 01 35 43 – Environmental Procedures
- .2 Section 01 55 26 – Traffic Regulation

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A276-91a, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
 - .2 ASTM B209M-92a, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - .3 ASTM B210M-92a, Specification for Aluminum-Alloy Drawn Seamless Tubes.
 - .4 ASTM B211M-92a, Specification for Aluminum and Aluminum-Alloy Bar, Rods and Wire.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB1-GP-12c-65, Standard Paint Colours:
 - .2 CAN/CGSB-1.28-M89, Alkyd, Exterior House Paint.
 - .3 CAN/CGSB-1.59-M89, Alkyd, Exterior Gloss Enamel.
 - .4 CAN/CGSB-1.94-M89, Xylene Thinner (Xylol)
 - .5 CAN/CGSB-1.99-92, Exterior and Marine Phenolic Resin Varnish.
 - .6 CAN/CGSB-1.104-M91, Semigloss Alkyd Air Drying and Baking Enamel.
 - .7 CAN/CGSB-1.132-M90, Zinc Chromate Primer, Low Moisture Sensitivity.
 - .8 CGSB 1-GP-189M-78, Primer, Alkyd, Wood, Exterior.
 - .9 CGSB 31-GP-3M-88, Corrosion Preventative Compound, Cold Application, Soft Film.
 - .10 CGSB 62-GP-9M-80, Prefabricated Markings, Positioning, Exterior, for Aircraft Ground Equipment and Facilities.
 - .11 CGSB 62-GP-11M-78, Marking Materials, Retroreflective, Enclosed Lens, Adhesive Backing.
- .3 Canadian Standards Association (CSA)

- .1 CAN/CSA-G40.21-M92, Structural Quality Steels.
 - .2 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-080 Series-M89, Wood Preservation.
 - .4 CSA 0121-M1978, Douglas Fir Plywood.
 - .5 CSA W47.2-M1987, Certification of Companies for Fusion Welding of Aluminum.CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped
- .4 Newfoundland and Labrador Department of Transportation and Works (NLDTW)
 - .1 NLDTW Specification Book
 - .5 Manual of Uniform Traffic Control Devices (MUTCD) for Streets and Highways.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 – Environmental Procedures.
- .2 Divert unused metal and/or plastic materials to recycling facility approved by Departmental Representative.
- .3 Damaged signs and posts from any removals to be transported to recycling facility approved by the Departmental Representative.

Part 2 Products

2.1 SIGNS

- .1 Signs as indicated on the drawings.

2.2 MATERIALS

- .1 All materials shall be in accordance with NLDTW Specification Book and Parks Canada Specifications.

Part 3 Execution

3.1 INSTALLATION

- .1 The Contractor shall load, haul and install posts and existing signs (see detail sheet for typical sign) and bases in the following manner:
 - .1 The Contractor is responsible for locating power/telephone/gas lines/services/ utilities at all proposed sign locations.
 - .2 The Contractor is responsible for layout and measurements to ensure signs are installed as per drawings and as directed by the Departmental Representative.
 - .3 Sign bases: Excavate hole for the post at the location and depth provided by the Departmental Representative. Using some of the excavated materials, level and compact bottom of hole. Place post with one side parallel to the edge of asphalt and level.

- .4 Adjust the post height by using a cut off saw. All post cuts will be determined in the field by the Departmental Representative. The Departmental Representative will measure existing elevations at each site and calculate the cuts needed. The Contractor is required to provide the Departmental Representative with a minimum of 48 hours notice in order to perform the calculations.
- .5 Assemble the signs on the forks on the ground. Slide forks onto posts and place the cap.
- .6 Drill 1 hole in the base sleeves and posts for ½” bolts, as shown in the detail sheet and as verified by the Departmental Representative, and shim to plumb if necessary.
- .7 Bases must be perfectly plumbed. Vertical and horizontal tolerances for the base are 0.075m. Tolerance for the plumb of the posts is 0.01 m per 1.0 m or ¼” on a two foot carpenters level. Tolerances for the signs are 0.075 m for distance from asphalt and 0.075 m for height above white line.
- .8 The Contractor is responsible for hauling all materials to and from each work site.
- .9 Landscape so the top of the base is flush or 25 mm above finished grade.
- .10 Remove all excess material on site including, boulders larger than 100 mm.
- .11 All signs are to be covered until the Departmental Representative advises to uncover.
- .12 Payment for this item shall be based on the number of signs installed and shall include all material, labour and equipment required to satisfactorily complete this item of work.

3.2 CLEANING

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

END OF SECTION

APPENDIX A
Environmental Documents



Parks Canada Basic Impact Analysis Template

1. PROJECT TITLE & LOCATION

McKenzies Forest Access Road Bridge Replacement, Gros Morne National Park

Location: Horseback Brook Bridge, Gros Morne National Park (49.433646° N; 57.867593° W)

2. PROPONENT INFORMATION

Parks Canada – Gros Morne National Park

Project managers:

Ashley Gillis

Highway Engineering Services (East)

Parks Canada

Cell / Portable: (902) 452-3341

Email: ashley.gillis@pc.gc.ca

Darren Fitzgerald

Physical Engineer

Parks Canada

Box 130, Rocky Harbour, NL, AOK4N0

Tel. 709-458-3403; Cell 709-458-8672

Email : Darren.Fitzgerald@pc.gc.ca

3. PROPOSED PROJECT DATES

Planned commencement: 09/07/2018

Planned completion: 15/08/2018

4. INTERNAL PROJECT FILE

PCA 1955

GMNP-2018-009

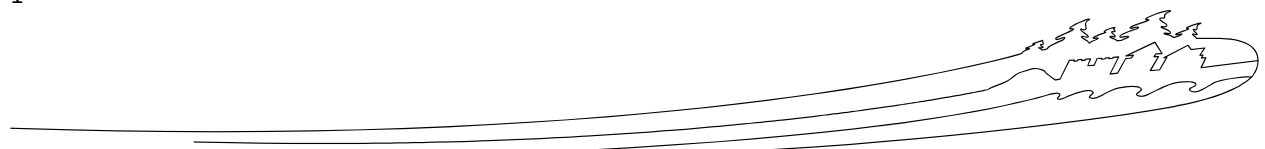
5. PROJECT DESCRIPTION

In January 2018, western Newfoundland experienced a severe storm that included heavy rainfall, unseasonably mild temperatures (>10° C), and high winds (>100 km/h). In addition to the rainfall, this weather event melted virtually all of the snowpack (>60 cm) in a period of ~24 h, leading to extreme surface runoff that caused substantial damage to roads, bridges, and other infrastructure in Gros Morne National Park. Included in the damage was the wash out of the bridge, which consisted of two 1800 mm diameter pipe culverts, that crossed Horseback Brook on McKenzies road (see Figure 1).

There is a need to replace the bridge with a new crossing structure, as Parks Canada has a commitment with the province to provide access through McKenzies forest access road to areas used for forestry south of the park (Parks Canada 1984). The new structure will consist of a single lane 4.3 m wide and 15.24 m long panel bridge sitting on cast-in-place abutments with sloped embankments leading up to the footings. The bridge will be fit to the existing road alignment.

First, the existing wood abutments will be removed, as well as a 12.8-meter section of the existing gabion wall (drawing S1). If work below the high water mark is needed to complete this work, isolation of the work area and water control will be required.

As the new bridge span is longer, the new abutments will be placed to accommodate the new span. The north abutment will be 5.5 meters back from the current north embankment, and the south abutment will be 6 meters back from the current south embankment. In order to install those new abutments, approximately 9.5 meters of embankment will be excavated on either side of the brook. The underside of footings and area behind the back





walls will be backfilled with Fill Against Structure. To mitigate risk with the slightly perched footings, the abutments will be reinforced with R1 armour stone (drawings S1 to S4).

The excavation of the north and south embankments below the stream bed and the high water mark will require isolating the work area and water control as well as measures to avoid harm to fish.

Components of bridge construction that will be addressed in this BIA include:

- staging of equipment and materials;
- crossing Horseback Brook (equipment and personnel) to access the southern approach;
- excavation, grading of embankments, and placement and compaction of fill to prepare approaches for footings;
- installation of footings and concrete abutments;
- repair and grading of embankments and ditches on road approaches on either end of the bridge;
- assembly and installation of the panel bridge and fixed bearings;
- installation of armour stone / rip-rap along stream banks to prevent erosion;
- placing roadway aggregate and granular material on approaches;
- removal of excavated materials;
- installation of guard rails;
- hydro-seeding of approach slopes in disturbed areas;
- work below the high water mark.

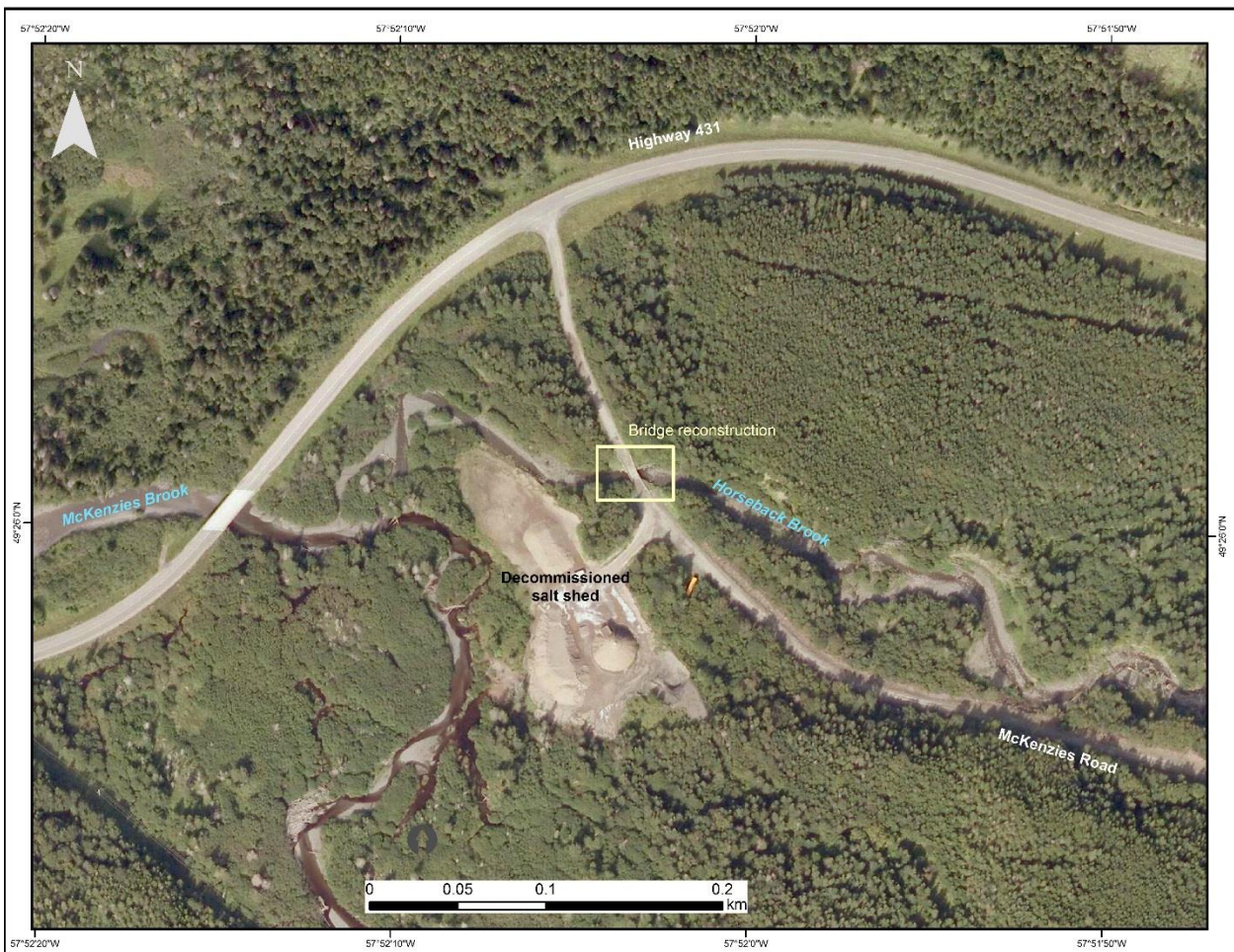
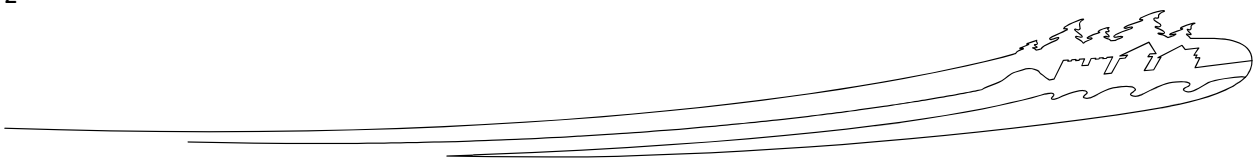


Figure 1. Location of bridge installation in Horseback Brook on the McKenzies forest access road in Gros Morne National Park.





6. VALUED COMPONENTS LIKELY TO BE AFFECTED

Natural Resources

- Air quality and noise: In addition to ambient air quality and natural noise levels (e.g. from wind and stream flow), the project area will be subject to emissions and noise from equipment.
- Soil and Landforms: The project area for road approaches and bridge work should remain within the existing road footprint, where soils and landform have been previously disturbed and altered by road construction. The stream channel was disturbed by the January 2018 flood so stream banks are heavily eroded and unstable in many locations.
- Surface water (fresh and marine waters). The road crossing spans a ~2-4 m wide stream that flows into McKenzies Brook ~300 m downstream, which then flows into the South Arm of Bonne Bay ~500 m further downstream. These lower reaches of Horseback Brook and McKenzies Brook follow a relatively gentle gradient, and includes riffle, run and some pool habitat with a stream bed characterised by rock, cobble and gravel. However ustream sections are very steep and so these watersheds are prone to regular “flash floods” and high energy runoff, such as caused the loss of the original crossing structure. Water quality is likely good, though suspended sediment levels may be somewhat elevated, particularly during runoff events, due to erosion and bed movement that resulted from the January 2018 flood.
- Flora: The area is typified by upland and riparian boreal forest vegetation, with balsam fir, black spruce, white spruce, trembling aspen, red maple, yellow birch, and paper birch comprising most of the forest canopy. Existing road embankments support grasses and alders. Riparian vegetation is characterised by alders and other woody shrubs as well as the aforementioned tree species, and was disturbed by the January 2018 flood.
- Fauna: Fish surveys have not been conducted in Horseback Brook, but have been conducted in McKenzies Brook in 1970 and 1983 (Anions 1994). Similar species are likely occurring in Horseback Brook. Species present include Brook Trout [*Salvelinus fontinalis*], American Eel [*Anguilla rostrata*] and Threespine Stickleback [*Gasterosteus aculeatus*]. In addition, there is the possibility of downstream effects in the South Arm estuary, which supports various fish species adapted to brackish water. Aquatic Invertebrates, including various taxa such as mollusks and arthropods are likely found in the stream. Various terrestrial fauna typical of Newfoundland’s boreal forests may be in the area, including landbirds (e.g. Red-breasted Nuthatch, Black-capped Chickadee, various woodpeckers, and Belted Kingfisher), and such mammals as moose, mink, and various small mammals.
- Species at risk: None known in area and no critical habitat in area. Note however that American Eel, which has been assessed as Threatened by COSEWIC but which is not listed under the SARA, may occur in Horseback Brook though there are no survey data to confirm this.

Visitor Experience

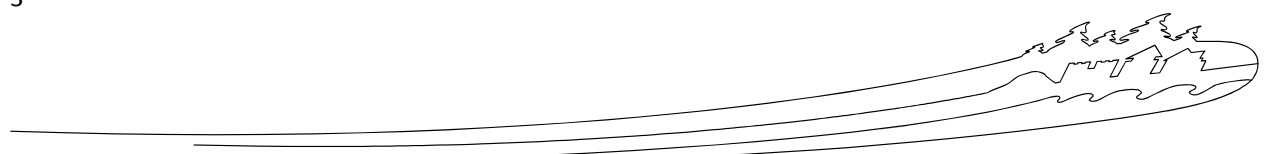
- McKenzies road provides access to areas open to forestry. Gros Morne National Park has an agreement with the province of Newfoundland and Labrador to maintain access to those areas (Parks Canada 1984).
- McKenzies road is regularly used by locals and provides access to cabins outside the park boundary.

Cultural Resources

- A separate Cultural Resource Impact Assessment (CRIA) is being performed and a Statement of CRIA will be provided with further mitigations.

7. EFFECTS ANALYSIS

Effects analysis considers possible interactions between the project infrastructure components and activities and the Valued Components, within the project area. Interactions may be direct or indirect and may cause a positive or negative effect. Potential effects of on the key indicators are identified by comparing the existing conditions to those which are expected to result from the introduction of the project. Note that these effects do not consider the adoption of planned mitigation measures identified in the next section, which will be intended to prevent/minimize the potential effects identified here.





Natural Resources

Air quality and noise:

- Construction activities could lead to an increase in noise, dust and vehicle emissions above baseline (i.e., daily highway traffic volume), and a decrease in ambient air quality.
- Dust may come from disturbance of exposed soils by vehicles and wind, as well as construction activities such as excavation and mixing of cement.

Soil and Landforms:

- The current stream channel and bank are heavily eroded and unstable. Reshaping and armouring of embankments should greatly reduce the risk of further erosion.
- Bridge and road work will remain within the existing road footprint, so will have a limited effect on undisturbed soils and landforms.
- Embankments will be shaped, armouring with rip rap and re-vegetated with hydro-seed.
- Removal of upland and riparian vegetation and excavation of existing embankments and gabion wall could destabilise soils and shorelines, increasing the risk of erosion.
- Construction activities can lead to unnatural ground surfaces contours (e.g. rutting).
- Accidental spills and leaks from equipment and construction materials can impact soils.

Surface Water:

- The current stream channel and banks are unstable and may be realigned during bridge installation. Reshaping at a 2:1 slope grade and armouring of embankments should greatly reduce the risk of further erosion and consequent runoff of silt and sediment into the stream.
- Disturbance of the stream bed could lead to siltation and increased turbidity in Horseback Brook, McKenzies Brook and possibly also the estuary.
- The period of work (July-August) coincides with somewhat dry weather, meaning that flow rates in Horseback Brook are likely to be relatively low, reducing the risk of erosion and surface runoff. However, high precipitation events may increase siltation and turbidity in Horseback Brook, McKenzies Brook and possibly also the estuary, and also increase the risk of construction materials (e.g. temporary crossing structures, sand bags and unsecured materials) being washed downstream.
- Riparian and upland vegetation may be removed and soils and aggregate may be disturbed, exposed, and stockpiled due to construction activities. This could create the risk of sediment runoff that could impact water quality in Horseback Brook, McKenzies Brook and the estuary.
- Toxic spills or leaks from machinery, equipment and construction materials (e.g. concrete) could significantly impact water quality in Horseback Brook, McKenzies Brook and the estuary.
- Fuels and materials stored at temporary staging areas have the potential to leak and leach into ground and surface water.
- Work below the high water mark has the potential to increase siltation and impact water quality in Horseback Brook, McKenzies Brook and the estuary.

Flora:

- Some riparian and upland vegetation may be removed in order to accommodate the longer bridge and the temporary crossing.
- Improper cleaning of machinery may transfer and spread invasive plant species.
- Accidental fuel or oil spills from construction equipment could contaminate soils and groundwater, with adverse consequences for vegetation.
- Soil disturbance in construction and staging areas may create habitat conducive to the establishment of invasive plant species that would displace or compete with native vegetation.

Fauna:

- Based on DFO self-assessment criteria (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) it was determined that this project does not require a DFO review because:





- Any debris removal will be necessary to protect the bridge abutments
- It is a clear span bridge
- There will be no obstruction of fish passage during critical timing windows or otherwise
- There will be no impacts to SARA listed species
- Work below the high water mark will be isolated from flowing water
- Regardless of any requirement for DFO review, recommended measures to avoid causing harm to fish and fish habitat (see: <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html>) are to be followed, as detailed in the mitigations below.
- Disturbance of the stream bed and stream banks, as well as erosion from upland areas where soils are disturbed by construction activities, could lead to siltation and increased turbidity in Horseback Brook, and possibly also McKenzies Brook and the estuary. This could adversely affect water quality for aquatic fauna.
- Contamination of Horseback Brook from toxic spills or leaks from machinery, equipment and construction materials (e.g. concrete, runoff sediment) could impact the health and survival of freshwater and marine fauna at or downstream from the construction site.
- The removal of part of the gabion wall could alter freshwater habitat characteristics. However replacement of the previously used culverts with a longer, clear span bridge will result in a more natural stream environment and allow more natural stream channel processes to occur.
- Removal of riparian and upland vegetation could lead to loss of food sources and habitat for terrestrial fauna such as songbirds during nesting season. However, no or very limited clearing should be needed in this project.
- Construction noise and activities may cause temporary avoidance behaviours, and also disrupt feeding and breeding activity of wildlife in the area.
- Improperly stored construction materials, garbage, and food may act as wildlife attractants, increasing risk of human-wildlife conflict and roadway mortality.
- Accidental fuel or oil spills from construction equipment may negatively affect wildlife and habitat quality through contamination of vegetation or water sources used by wildlife.

Visitor Experience

- McKenzies road has been inaccessible since January 2018 and will remain closed to public access during construction activities. Regardless, construction activities could represent a hazard to any unauthorized people in the area.

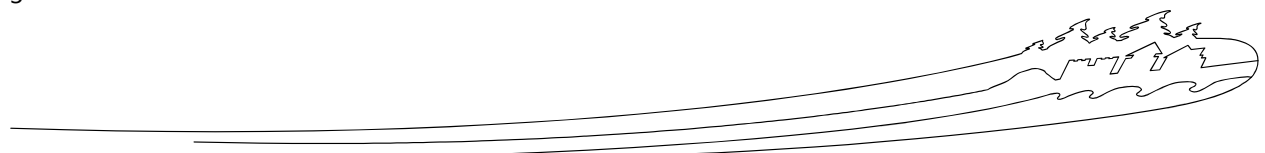
Cultural Resources

- A separate Cultural Resource Impact Assessment (CRIA) is being performed and a Statement of CRIA will be provided with further mitigations.

8. MITIGATION MEASURES

General Mitigations

1. The contractor will prepare an Environmental Protection Plan (EPP) in accordance with Parks Canada Environmental Procedures, a minimum of 5 business days before construction. This EPP should address all mitigations listed here, and prior to work beginning the EPP must be approved by the Parks Canada. The EPP will include, but not be limited to:
 - A Work Area Plan showing proposed activity in each portion of area and including details on how the work limits will be marked and procedures to keep operations within the clearing boundaries to minimize damage to peripheral vegetation and soil.
 - An overall site Erosion and Sedimentation Control (ESC) Plan which outlines areas where erosion and sedimentation are likely to occur and the means by which the Contractor proposes to control these issues. In addition, a localised ESC plan which directs specific mitigation for in-water work is required



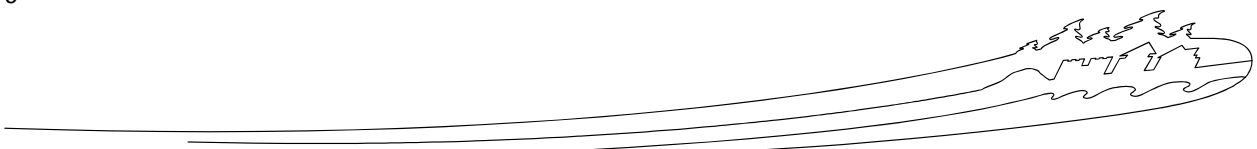


(e.g. removal of existing gabion wall, excavation of embankments for new abutments). Erosion and sediment control measures should be maintained until all disturbed ground has been permanently stabilized or suspended sediment has resettled to the bed of the waterbody. The plan should include (DFO 2016):

- Installation of effective erosion and sediment control measures before starting work to prevent sediment from entering the water body.
 - Work areas should be isolated using temporary cofferdams, sand bags or other methods and instream work done in the dry.
 - Measures for containing and stabilizing material (e.g. stockpiled topsoil, stockpiled riprap) above the high water mark of nearby waterbody to prevent re-entry.
 - Regular inspection and maintenance of erosion and sediment control measures and structures during the course of construction.
 - Repairs to erosion and sediment control measures and structures if damage occurs.
 - Removal of non-biodegradable erosion and sediment control materials once site is stabilized.
- A Hazardous Materials and Spill Contingency Plan (HMSCP) that details the containment and storage, handling, use and disposal of empty containers, surplus fuels, or other hydrocarbon products to the satisfaction of the Parks Canada and in accordance with all applicable federal and provincial legislation. The HMSCP will include a list of products and materials to be used or brought on site that are considered or defined as hazardous or toxic to the environment. Such products may include, but are not limited to, fuels and lubricants. The Safety Data Sheets (SDS) for all chemicals used will be made available onsite. Appropriately sized and stocked spill kits will be on site capable of handling 125% of the largest potential spill. All contractor's staff will be made aware of their location(s) on site and will be trained on spill response procedures.
 - A waste management plan (including industrial waste, domestic waste, and human waste), which among other things identifies methods and locations for solid waste disposal.
 - Waste Water Management Plan identifying methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
 - Note that though this Basic Impact Analysis (BIA) specifies that the contractor must prepare an Environmental Protection Plan, if these two documents are not consistent the most rigorous with regard to environmental stewardship shall be followed.
2. All relevant mitigation measures outlined in the Parks Canada National Best Management Practices for Roadway, Highway, Parkway and Related Infrastructure (BMPs; PCA, 2015) will be followed. These allow an identified suite of well-understood project activities to proceed such that there will not be resulting significant adverse environmental effects. The BMPs are applicable when the project activities are routine and repetitive with well-understood and predictable effects. If the mitigations listed in this BIA or the Contractor's EPP conflict with the PCA Highways BMPs, the most rigorous with regard to environmental stewardship shall be followed.
 3. Prior to starting work on site all contractor personnel working on site will be required to attend an on-site environmental briefing conducted by Parks Canada's Environmental Officer (EO) and project manager to review the mitigation measures required in this BIA. EO and general contacts for Parks Canada include:

Gabrielle Robineau-Charette, Resource Manager Officer and Environmental Officer, Parks Canada, Rocky Harbour.

Email: gabrielle.robineau-charette@pc.gc.ca Office: 709-458-3581





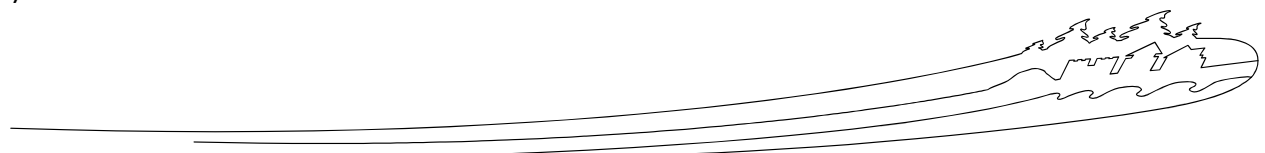
Darroch Whitaker, Ecologist, Parks Canada, Rocky Harbour.
Email: darroch.whitaker@pc.gc.ca Office: 709-458-3464

Equipment

4. Prior to arrival on site equipment must be properly tuned, cleaned and free of contaminants, in good operating order, free of leaks (e.g., fuel, hydraulic fluid, coolant, oil or grease), and fitted with standard air emission control devices, spill pans, and spark arrestors. It should also be maintained free of invasive species, noxious weeds, and soils.
5. Equipment will be inspected daily for fuel, hydraulic fluid, and other leaks, and for structural integrity, and inspections will be recorded. Detected leaks will be addressed immediately.
6. Equipment maintenance is not permitted within the Park boundaries.
7. Equipment operators must be fully trained and experienced.
8. Fueling heavy equipment is prohibited within 100 m of the stream or open water, and must be carried out in a level area on either an impermeable roadside or at a staging area with spill catchment countermeasures in place. Fueling sites should not drain towards water bodies or wetlands.
9. Fueling of small engines (e.g. generators, chainsaws), if needed, will not be permitted within 30 m of open water and portable containment pads must be used to prevent ground contact by accidental fuel spills.
10. Storage and movements of heavy equipment and workers' private vehicles shall be restricted to the 'footprint' of the construction and staging area only. Further, machinery (e.g., excavators, bobcats, chainsaws, and generators) must be stored and maintained on a flat surface at least 100 meters from the shoreline.
11. To prevent materials (e.g. soil, rock, construction material, etc.) from escaping from trucks, all loads must be covered or tarped during transport through the park.
12. It is recognized that machinery, building materials, and personnel will have to cross Horseback Brook to gain access to the south side to undertake work on this project. Any stream crossings will be made using an environmentally friendly, safe approach that is pre-approved by Parks Canada. Further, any crossing structures must be structurally sound and also must be able to be removed quickly if at risk due to high runoff (floods).

Hazardous materials and contaminants

13. As part of the Environmental Protection Plan, the Contractor must submit and then comply with a Hazardous Materials Management and Spill Contingency Plan.
14. Handle and store hazardous materials as per applicable federal legislation/regulations. The contractor must have all relevant and current Material Safety Data Sheets available onsite.
15. Hazardous or toxic products (fuels, lubricants, paint, sealants, etc.) must be (i) securely stored, (ii) shall not be stored within 200 m from any stream, wetland, or water body, and (iii) shall not be disposed of in the national park.
16. Storage of large amounts of fuel (more than 900 L) in the Park is not permitted.
17. Fuels, gases, or other deleterious substances will be contained within the appropriate and approved containers, and tanks, hoses and connections will be inspected prior to use.
18. Secondary containment and spill kits must be available on site during all periods of work. These must be able to handle 125% of the largest potential spill, and workers must be trained in their use and aware of their location.
19. Spills (e.g. hydraulic fluids) will be responded to immediately according to the Contractor's Spill Response Plan. In the event of any fluid spills or leaks, the Spill Response Plan will be followed, including immediate containment, cleanup/mitigation, and immediate reporting to Parks Canada. Any absorbent materials used in the clean-up or soils contaminated by the spill will be disposed of in the appropriate facilities and transported





in accordance with the federal Transportation of Dangerous Goods Regulations. All spills will be reported to Parks Canada's EO.

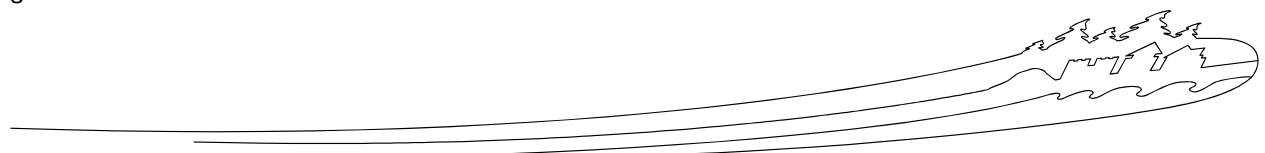
20. Following the cleanup of any spill larger than 5 L the spill site will be inspected to ensure there is complete containment and disposal to the satisfaction of Parks Canada.

Waste

21. Burning of any vegetation or worksite materials is prohibited in the park.
22. Excess mixed cement should be disposed of at an approved landfill or equivalent facility outside the park. Straw bales, wood stakes, and sandbag materials can be used to construct temporary containment walls or "barriers", and these must be sufficient in size to contain all liquid and concrete waste with a minimum of 10 cm (4 inches) freeboard. Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material. Collected wastewater must then be removed from the site and hardened concrete shall be broken up, removed, and disposed of outside the park at an approved landfill or equivalent facility.
23. Sanitary facilities, such as a portable container toilet, shall be provided at the work site, maintained in good working order, and emptied outside the park at an approved waste treatment facility.
24. To prevent habituation of wildlife, human wildlife conflict, and risk of wildlife being struck by vehicles, garbage that includes food waste or other wildlife attractants must be securely stored so that it is not accessible to wildlife, and should be disposed of daily.
25. Disposal of treated wood wastes including saw-dust must be outside of the Park, and in accordance with all applicable Provincial and Municipal regulations. Similar attention must be given to disposal of the replaced guiderail posts which have been treated with creosote.
26. All construction waste shall be disposed outside of the park at the appropriate waste management facility.

Erosion and sediment control

27. As indicated above, as part of the EPP the contractor must prepare an Erosion and Sedimentation Control (ESC) Management Plan and submit this to Parks Canada's EO for approval prior to the start of earthworks activities.
28. Excavated material and debris must be stored in a stable area, above the high water mark or active floodplain and 15m from drainage features and/or the top of steep slopes. Protect excavated material from re-entering the water body (e.g., cover with erosion blankets, seed or plant with native vegetation).
29. All surplus excavated material must be removed from the Park as soon as possible and disposed of at an approved location and in an approved manner.
30. Erosion and sedimentation controls must be installed prior to earthworks activities commencing. Regularly inspect and maintain erosion and sediment control structures during all phases of the project and modify or enhance measures as necessary. Particular attention must be paid to activities in areas draining into Horseback Brook or other wetlands or water bodies; erosion and runoff silts from exposed soils must be prevented from entering the stream.
31. Whenever possible use erosion and sediment control products made of 100% biodegradable materials (e.g., jute, sisal or coir fiber). Ensure backing materials are also biodegradable.
32. Stockpiled aggregates and construction materials must be stored at an approved site far enough away from open water to prevent runoff of sediment or potential contaminants from entering the stream and nearby wetlands.
33. To reduce erosion and sediment runoff, grubbing and stripping of topsoil should be carried out under dry conditions (i.e. no surface runoff) whenever possible.





34. Construction and equipment travel will be minimized during periods of heavy precipitation and excavation activities halted during heavy rainfall events (50 mm or more in 1 hour).
35. Erosion- and sediment-control materials will be readily available on-site. Materials may include but are not limited to rock, gravel, mulch, straw, straw bales, grass seed (seed mixture of 60% annual rye and 40% creeping red fescue), bio-degradable erosion control blankets, sediment fencing, staking, and polyethylene sheeting.
36. Prior to removal of sediment and erosion control measures, all disturbed surfaces and shorelines shall be stabilized and/or re-vegetated as soon as possible. Remove accumulated sediments prior to removing erosion control products.

Additional environmental mitigations

Note that the mitigations listed above will address many potential impacts on valued components of the environment, visitor experiences, and cultural resources. The following additional mitigations are required to further protect specific elements of these resources.

Air quality and noise

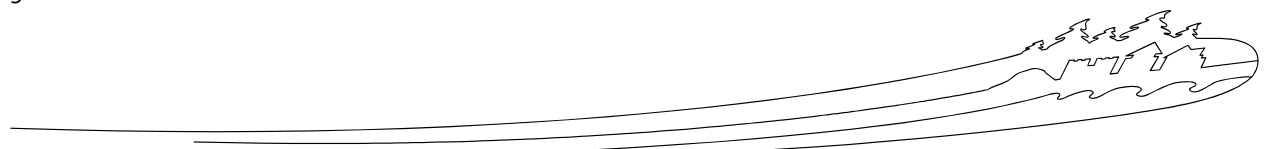
37. Should dust control be required on the construction site or roadbed, only fresh water will be permitted.
38. All equipment, vehicles and stationary emission sources will be well maintained and used at optimal loads for minimal noise and air emissions.
39. Minimize idling of engines, contingent on operating instructions and temperature considerations.

Soils and Landforms (Note that many mitigations listed elsewhere will also mitigate impacts on soils and landforms, especially those for erosion and sediment control and also for vegetation impacts)

40. Borrow areas are not permitted in the project area.
41. Any topsoil that is being removed should be salvaged and stockpiled to be used for site landscaping and restoration throughout the course of the project.
42. When earthworks activities are complete in any area that will not form part of the finished bridge, armoured embankments, or road approaches, loosened soils should be shaped to match the local terrain and ensure noticeable construction impacts (e.g., ruts, holes, depressions, compacted areas) are appropriately re-graded, back-filled with topsoil, re-contoured and capped. Salvaged topsoil should be spread in areas lacking sufficient soil for plant growth; topsoil should be spread evenly and should not be compacted. Hydro-seeding or bio-degradable erosion control blankets may be required to stabilize exposed soils along some back slopes. If restoration occurs during the growing season a seed mixture of 60% annual rye and 40% creeping red fescue should be applied.

Surface water (fresh and marine waters) (Note that many mitigations listed elsewhere will also mitigate impacts on surface water, especially those for erosion and sediment control and hazardous materials and contaminants)

43. Construction equipment is not permitted to operate in water.
44. Any work in de-watered sections of the stream channel, including mitigations, must be discussed with and pre-approved by Parks Canada's EO.
45. Where in-water activity is necessary, in this case the removal of the existing gabion wall and the excavation of the existing embankments below the stream bed, functioning site isolation measures to contain suspended sediment (e.g., sandbags, coffer dams, silt curtains, or silt booms) must be in place for the duration of the work, and then removed once the work is complete. Further, in-water work must be timed to avoid periods of high flow, and must cease if heavy precipitation occurs or is forecast.
46. Turbidity curtains must be used when constructing or removing cofferdams, and these should be placed at the shoreline and moved into the desired location to prevent fish from being trapped inside; ensure the edges are tight to the shoreline to reduce the risk of sediment getting out or fish getting in. Where rock is used to build a





coffer dam it must be clean an installation of a water tight membrane should be prioritized. Silt or debris accumulated around a temporary cofferdam must be removed prior to withdrawal of cofferdam.

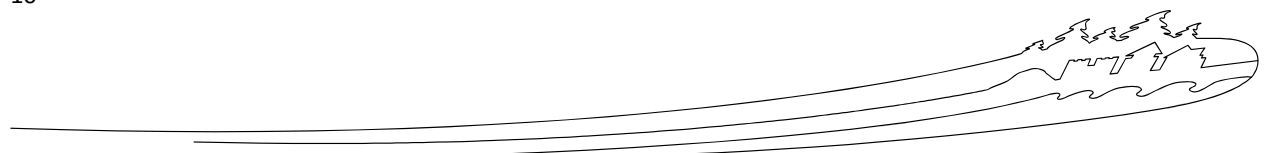
47. Measures must be in place to prevent wastewater pumped from the worksite from directly or indirectly entering the stream. Excess water must be discharged well away from the stream and filtered either naturally over the forest floor or pumped onto filter fabric or straw spread on the forest floor.
48. Withdrawing water from the brook requires a Restricted Activity Permit from Gros Morne National Park. This can be obtained in communication with Park's Canada's Environmental Officer.
49. All construction materials and forming residue materials (e.g. packaging, concrete form parting oils, solvents or curing compounds) must be securely contained at the work site and kept from entering the stream.
50. Excavated material and debris must be stored in a stable area, above the high water mark or active floodplain and at least 15 m from drainage features and/or the top of steep slopes, and removed from the Park prior to project completion.
51. Concrete mixing must take place at least 30 m from streams, wetlands or water bodies. Fresh, wet, uncured concrete, concrete dust, and wastewater is toxic to the aquatic environment and must not come into contact with any water body.
52. To protect stream water quality when cutting riparian vegetation (i.e. within 30 m of a watercourse), regular chainsaw bar lubricant oils must be replaced with BioLube or a similar non-toxic, vegetable-based chain oil.
53. Do not clean or drain equipment in waterways.

Vegetation (Note that many mitigations listed elsewhere will also mitigate impacts on vegetation, especially those for erosion and sediment control)

54. Clearing of vegetation requires a Restricted Activity Permit from Gros Morne National Park. This can be obtained in communication with Park's Canada's EO.
55. Vegetation clearing and soil grubbing and removal should be limited to the minimum necessary for the completion of the project. Wherever possible vegetation cover should be maintained to prevent erosion. The area to be cleared must be clearly delineated with highly visible materials such as flagging tape to inform cutters and equipment operators of the area they are to work in to avoid unnecessary vegetation removal.
56. Design and construct approaches to the waterbody such that they are perpendicular to the watercourse to minimize loss or disturbance to riparian vegetation.
57. Cut vegetation must be either removed from the worksite to a location outside the park boundaries, mechanically chipped onsite, or dragged out of sight into forest edges. Any mechanically chipped woody vegetation must be dispersed evenly on site to a surface depth not greater than 5 cm.

Fauna: Fish and fish habitat (Note that many mitigations listed elsewhere will also mitigate impacts on fish and fish habitat, especially those for erosion and sediment control and also for surface water)

58. Shorelines and banks that might be disturbed by the work will be stabilized immediately and if the original gradient of channel banks cannot be restored, a stable gradient will be restored.
59. If replacement rock reinforcement/armouring or rip-rap is required to stabilize eroding or exposed areas, appropriately-sized, clean rock will be used. Such rock will be installed at a similar slope to maintain a uniform bank/shoreline and natural shoreline alignment.
60. Waterway beds are not to be used for borrow material.
61. Undertake all in-stream activities in isolation of open or flowing water to maintain the natural flow of water downstream and avoid introducing sediment into the watercourse.
62. Ensure that all in-water activities, or associated in-water structures, do not interfere with fish passage, constrict the channel width, or reduce flows, or result in the stranding or death of fish.





Fauna: Terrestrial fauna

- 63. Construction vehicles travelling on public roads must respect posted speed limits and yield to wildlife.
- 64. To prevent incidental destruction of bird nests and nestlings, no vegetation cutting or grubbing will be permitted between June 1 and July 20, the primary songbird nesting season.
- 65. The contractor(s) must immediately report to Parks Canada any wildlife discovered nesting, roosting, or denning on or near the worksite. If an active wildlife nest, roost, or den is found, the vegetated area will be left intact and a suitable sized buffer of shrubs/trees around it will be clearly marked until the nest, roost, or den is no longer in use. The appropriate size of buffer is species dependent, and will be determined in consultation with Parks Canada’s Environmental Officer.
- 66. To prevent habituation of wildlife, human wildlife conflict, and risk of wildlife being struck by vehicles, feeding of wildlife is strictly prohibited and all potential wildlife attractants, including gasoline, garbage, and food, must be securely stored so that they are not accessible to wildlife. Particular vigilance is required when workers are leaving at the end of the work day so that attractants are not accessible during the night.
- 67. The contractor(s) must immediately report to Parks Canada any instances of potential problem wildlife (e.g., foxes, coyotes, bears) becoming habituated to people in the vicinity of the worksite. A written record of any problem wildlife encounter must be submitted to the Parks Canada EO within 24 hours of the incident.
- 68. If wildlife is observed during work, give animals the opportunity to escape the work area to the surrounding forest or elsewhere to seek new shelter.

Visitor Experience / Public Safety

- 69. Onsite stockpiling areas for construction materials must be barricaded from public access.
- 70. Maintain the project area in as tidy a condition as is practical for the duration of work.
- 71. During bridge construction, McKenzies road will be closed at the junction with Route 431. Appropriate signage warning the public that the road is closed and that construction is underway should be in place at the junction with Route 431 and along the road. This would include a “trucks turning” sign at the junction with Route 431. Further, all such signage and associated materials (e.g. sandbags used to ballast signs) must be removed from the park after the completion of work.

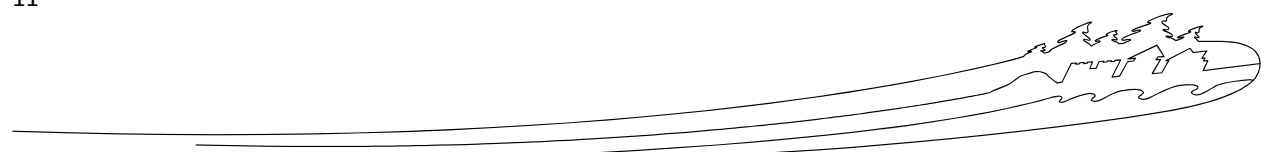
Cultural Resources

- 72. A separate Cultural Resource Impact Assessment (CRIA) is being performed and a Statement of CRIA will be provided with further mitigations.
- 73. If cultural resources, features, or artifacts (e.g., stone tools, historic artifacts such as pipes, ceramics, iron stove parts, etc.) are encountered within the project area, work should cease and the Parks Canada project manager should be contacted immediately. The Parks Canada project manager will then pass information concerning the find to a Parks Canada archaeologist for advice and assessment of significance. This will in turn determine what will be required to mitigate the chance find.

9. OTHER Considerations

Check all that apply

- Public/stakeholder engagement
- Aboriginal engagement or consultation
- Surveillance





- Follow-up monitoring, required to evaluate effectiveness of mitigation measures and/or assess restoration success
- Follow-up monitoring, required by legislation or policy (indicate basis of requirement e.g. required by the *Species at Risk Act*)
- SARA Notification

For any of the boxes checked above, briefly describe what was done, how the results were incorporated into the BIA and/or outline plans for what is needed.

10. 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.

Natural Resources: Given the magnitude of effects and application of mitigation measures, the project is unlikely to result in significant residual adverse effects to natural resources.

Visitor Experience: Given the magnitude of effects and application of mitigation measures, the project is unlikely to result in significant residual adverse effects to visitor experience.

Cultural Resources: A separate Cultural Resource Impact Assessment (CRIA) is being performed and a Statement of CRIA will be provided with further mitigations.

NOTE: If the project is identified as likely to cause significant adverse effects, CEAA 2012 prohibits approval of the project unless the Governor in Council (Cabinet) determines that the effects are justified in the circumstances. A finding of significant effects therefore means the project CANNOT go ahead as proposed.

FOR SARA REQUIREMENTS:

- There are no residual adverse effects to species at risk and therefore the SARA-Compliant Authorization Decision Tool was not required

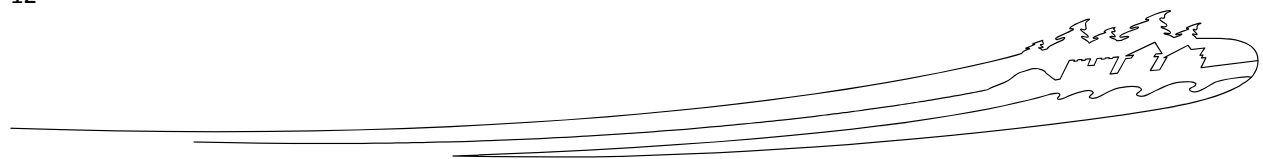
OR, the SARA-Compliant Authorization Decision Tool ([Appendix 2](#)) was used and determined:

- 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

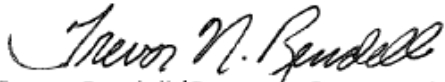
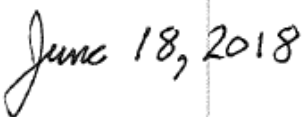

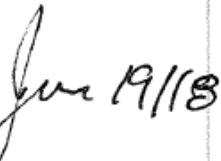
11. RECOMMENDATION AND APPROVAL

(Add additional blocks as required)

| | |
|--|----------------------------|
| <p>Prepared by:</p>  <p>Gabrielle Robineau-Charette (<i>Resource Management Officer, Gros Morne National Park</i>)</p> | <p>Date: June 13, 2018</p> |
|--|----------------------------|





| | |
|---|---|
| <p>Recommended by:  Trevor Rendell (Resource Conservation Manager, WNLFU)</p> | <p>Date: </p> |
| <p>Approval signature:  Geoff Hancock (Superintendent, WNLFU)</p> | <p>Date: </p> |

12. REFERENCE LIST

Anions, M.F.E. 1994. The Freshwater Fish of Gros Morne National Park: Resource Description and analysis. Gros Morne National Park of Canada, Rocky Harbour, Newfoundland. Contract GMR 93-021.

Parks Canada 1984. Gros Morne National Park: Management Plan. Parks Canada, Department of the Environment, Rocky Harbour, NL.

13. ATTACHMENTS

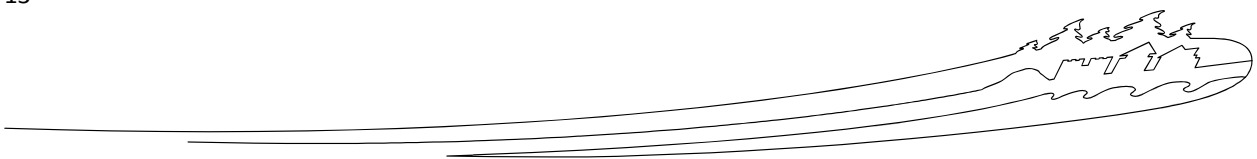
13.1. BMPS

Parks Canada 2015. Parks Canada National Best Management Practices, Roadway, Highway, Parkway and Related Infrastructures.

14. 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).

*****Ensure that all required mitigation measures and conditions (e.g. follow-up monitoring requirements) are included in project permits and authorizations*****

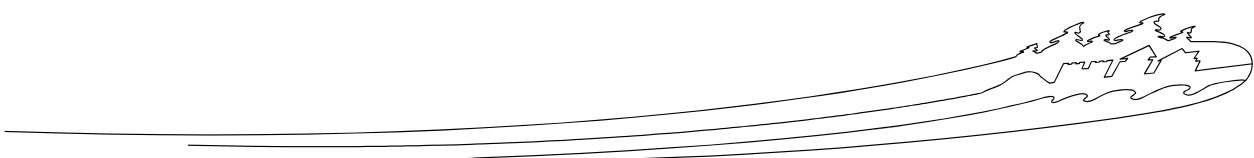




Appendix 1 : Effects Identification Matrix (optional)

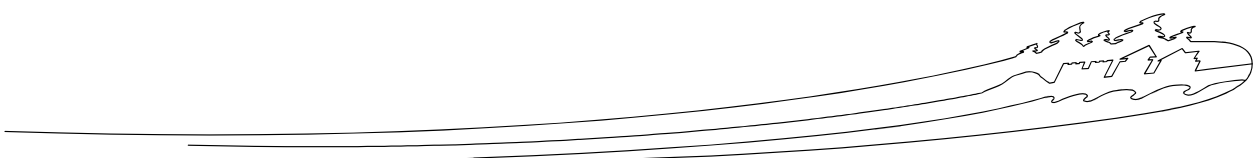
Section A focuses on direct effects of the project and **Section B** on indirect effects that are caused by changes to the environment.

| A. Direct Effects | | | | | | | | | |
|--------------------|--|---|-------------------------------------|--|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| | | Valued components potentially directly affected by the proposed project | | | | | | | |
| | | Natural Resources | | | | | Visitor Experience | Cultural Resources | |
| | | Air | Soil & landforms | Water (surface, ground, crossings, etc.) | Flora (specify, including SAR) | Fauna (specify, including SAR) | Visitor Safety | | |
| Phase | Examples of Associated Activities | | | | | | | | |
| Project Components | Preparation / Construction / Operation / Decommissioning | Supply and storage of materials | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| | | Burning | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Clearing | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Demolition | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Disposal of waste | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| | | Site remediation/ restoration | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| | | Blasting/ Drilling | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Dredging | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Drainage | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Excavation | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Grading | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Backfilling | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Use of machinery | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| | | Transport of materials/ equipment | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| | | Use/Removal of temporary facilities | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Use of Concrete | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Visitor Access | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Vehicle Traffic | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | | |





| B. Indirect Effects (all phases) | | | | | | | |
|--|--|---|-------------------------------------|---|------------------------------------|---------------------------------------|--------------------------|
| | | 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... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | Could impacts to <u>soils and landforms</u> lead to adverse effects on... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | Could impacts to <u>water</u> (e.g. surface, ground water and water crossings) lead to adverse effects on... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | Could impacts to <u>flora</u> (including SAR) lead to adverse effects on... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | Could impacts to <u>fauna</u> (including SAR) lead to adverse effects on... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |





Attachments



Parks
Canada

Parcs
Canada

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

Canada

February 2018



Parks Canada National Best Management Practices for Roadway, Highway, Parkway and Related Infrastructure

Approved by

Original signed by Mike Wong

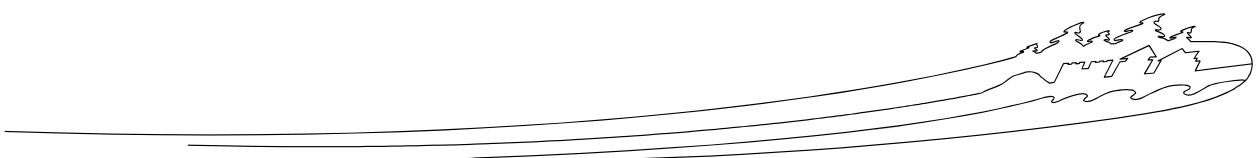
Mike Wong, Executive Director Natural Resource Conservation Branch

Original signed by Calvin Mercer

Kalvin Mercer, Associate Vice-President Asset Management and Project Delivery

July 23, 2015

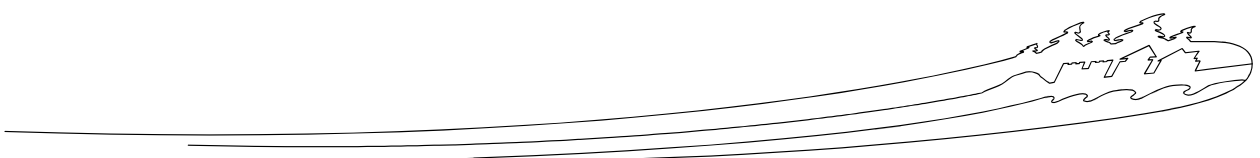
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16. Introduction

The Parks Canada National Best Management Practices for Roadway, Highway, Parkway and Related Infrastructure will allow an identified suite of project activities to be undertaken in such a manner that there will not be resulting significant adverse environmental effects.

The Best Management Practice (BMP) pathway is applied when there is a suite of routine, repetitive projects (e.g. paving) or activities (e.g. de-watering), with well understood and predictable effects. This fulfills Park's Canada's obligations under the *Canadian Environmental Assessment Act 2012* as a manager of federal land, see the [Guide to the Parks Canada EIA Process](#). The BMP maximizes efficiency through creation of a pre-approved impact assessment for the defined suite of projects, to which standard mitigation and environmental management measures can be applied.

The impact assessment officer (IAO) will review a proposed project and advise the functional manager of the project if and how this BMP should be applied. The IAO's advice will be based on whether the project falls within the scope of the BMP, and whether application of the mitigation measures in the BMP will adequately address potential adverse effects of the project.

Project Managers are responsible to ensure all mitigation measures applicable to the project are added to the terms and conditions of any permits or contracts issued for the project.

The Impact Assessment Officers must ensure the project, EIA pathway applied and determination are recorded in the Parks Canada National Impact Environmental Assessment [Tracking System](#).

17. Scope of Application

This BMP outlines the impact assessment of repetitive and routine projects on roadways, highways and parkways. If a project involves some or all of below activities, and the initial assessment of site and project indicate "the project is unlikely to result in significant adverse environmental effects" the BMP can be applied. Projects that this BMP would likely be applied to include:

- The proposed maintenance or repair of an **existing** sidewalk, or parking lot.
- The proposed maintenance or repair of an **existing** road, including pull-off areas, that would be carried out on the existing right of way¹.

Activities included in the scope of this BMP are:

1. Project Design

2. General Activities

- Worksite Conditions/Staging/Laydown
- Equipment operations
- Fuel storage and refueling
- Site Clean Up/Waste Disposal

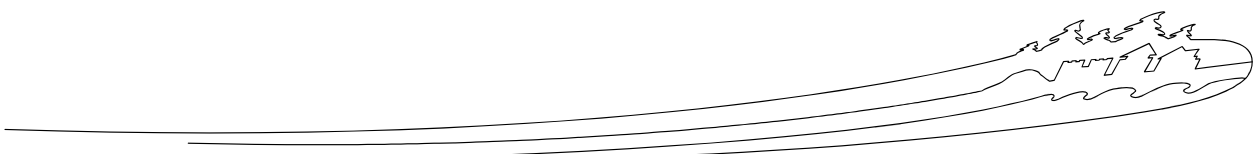
3. Asphalt Production and Handling

- Asphalt Plant Operation
- Gravel Crushing and Washing
- Oiling of Truck Boxes
- Clean Up and Disposal of Waste Products

4. Concrete Handling

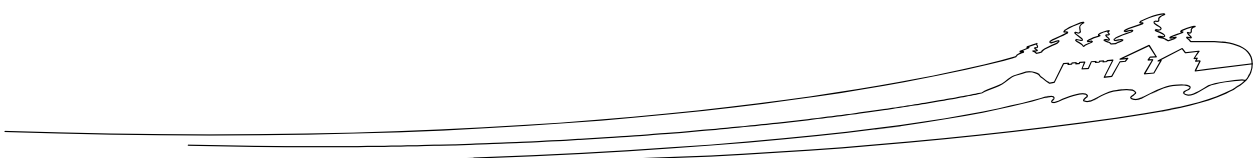
- Operation, maintenance and inspection of Onsite Temporary Concrete Washout Facility
- Removal of Temporary Concrete Washout Facilities
- Onsite concrete management

¹ Highway Footprint or Right of Way (ROW): The permanent physical intrusion of a highway or freeway, including the road surface, shoulders, side slopes, drainage ditches and/or storm drainage ponds (Transport Canada, 2008).





5. Paving, Resurfacing and Grading
 - Grading
 - Paving and Resurfacing
 - Pavement Marking and Barrier and Guardrail Reinstatement
6. Barriers and Guardrails
 - Repair, replacement and upgrades of barriers and guardrails
7. Vegetation Removal
 - Vegetation Removal
 - Grubbing
 - Brushing
 - Disposal of Vegetation Debris
 - Integrated Pest Management
8. Excavation, Soil Stripping and Overburden Removal
 - Excavation
 - Soil Stripping
 - Topsoil Salvage
 - Excavated Material Storage
 - Excess Material and Waste (overburden removal)
9. Slope Stabilization, Drilling and Blasting
 - Slope stabilization-scaling, hydraulic hammers
 - Drilling and blasting for Slope Stabilization and Geotechnical Investigations
10. Soil and Vegetation Restoration
 - Topsoil Replacement
 - Soil Amendments
 - Seedbed Preparation
 - Species Selection
 - Seed Lot Selection
 - Seed Mixture Composition
 - Seeding
 - Alternatives to Seeding
 - Reclamation Standards
 - Reclamation Plot Evaluation
 - Time Limits
10. Drainage Structures
 - Drainage structures
 - Culverts
11. Bridge Maintenance
 - Bridge Cleaning
 - Bridge Repairs Using Treated Wood Products
 - Bridge and Structure Painting
12. Water Withdrawal and Dewatering
 - Water Withdrawal





- Pump Screens
- Dewatering

18. Exceptions

This BMP is not suitable for the following project activities as they would require supplemental assessment and/or mitigations:

- Work that may impact aquatic or terrestrial wildlife habitat connectivity, such as fences or culverts;
- Elongation of culverts; realigning water courses; dredging; or work below the high water mark of a fish bearing water body;
- Bridge projects needing work to occur below the High-Water Mark², with permanent alteration to the water course, such as replacement of piers/abutments or permanent installation of structures on the bed of a water body;
- Greater than 10% increase in land use footprint (e.g. gravel pit expansion); and,
- Work which might adversely impact any potential or established Aboriginal and Treaty rights or traditional use³.

If the project has the potential to have an adverse effect on the critical habitat of a species at risk (with endangered, threatened, or extirpated status) this BMP does NOT apply. The project will require a separate environmental impact analysis.

If the project has the potential for residual adverse effects on a listed species at risk (including effects to individuals and residence of the individuals) this BMP does NOT apply, the project will require a separate environmental impact analysis.

Note: If there is any uncertainty regarding potential adverse effects to species at risk, consult a member of the National Office Species Conservation team.

19. Approved geographic area of application

This BMP is intended for use in all Parks Canada administered protected heritage places with roadways, highways and parkways.

20. Components of the environment that may be affected

Potential effects from projects of this type are well understood and predictable. They include:

Water Resources:

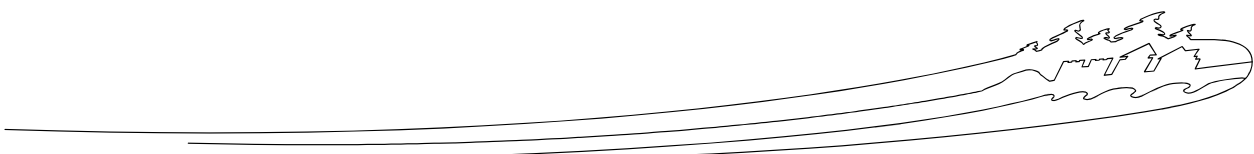
- Adverse modifications to surface drainage patterns
- Reduced water quality due to increased erosion, sedimentation, transportation of debris and contamination (i.e. from leaks and accidental spills, etc.)

Soil/Land Resources:

- Change in slopes, landforms, and landscape
- Soil compaction and rutting
- Slope instability, due to increased soil exposure and improper excavation and storage

² High-water Mark is the usual or average level to which a body of water rises at its highest point and remains for a sufficient time so as to leave a mark on the land. (Fisheries and Oceans, 2015). Upper Controlled Water Elevation (UCWE) is used as definition of High-water Mark in managed waterways.

³ Parks Canada must engage in additional and separate consultations with Aboriginal groups if there is a possibility of a project adversely affecting established or potential Aboriginal or Treaty rights. This is required to fulfill federal government responsibilities in upholding the honour of the crown. If there is uncertainty regarding the need for Aboriginal consultation with respect to a project, refer the matter to Parks Canada Legal Services for advice. Guidance on consultation may be sought from the [Aboriginal Affairs Secretariat](#) and from the guidance document "[A Handbook for Parks Canada Employees on Consultation with Aboriginal Peoples](#)".





- Soil contamination

Air quality:

- Decreased ambient air quality (i.e. from dust, equipment emissions, etc.)
- Increased ambient noise levels
- Temporary increased levels of CO2 and other pollutants
- Temporary increased localized temperatures from paving and equipment operation.

Flora and Fauna:

- Damage to and/or removal of vegetation in immediate or adjacent areas
- Introduction of non-native species populations, or expansion of existing populations
- Wildlife sensory disturbance causing displacement/preferred habitat avoidance
- Wildlife habituation/attraction to artificial food sources
- Impeded/altered wildlife movement
- Damage to nests/disruption of nesting animals
- Mortality from project activities

Cultural Resources:

- Adverse effects on the heritage value or character-defining elements of a cultural resource
- Impacts to archaeological resources (known or potential)

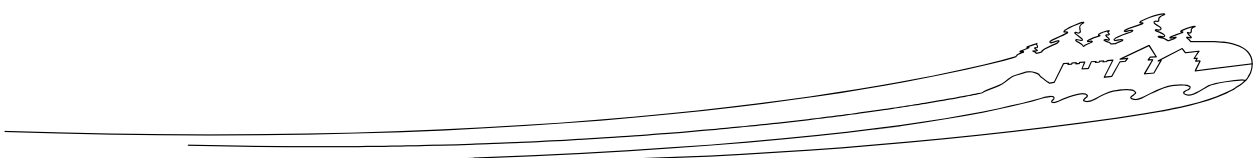
21. Mitigation Measures

To use the document efficiently, keep the activity mitigation lists that apply to the project expanded and collapse the other activities by clicking on the section titles, print this as a pdf or paper document and include with the EIA determination record. This will reduce the overall size and scope of the mitigations to present to contractors and project managers.

Choose all that apply to project. Each title is hyperlinked to the related section.

Module

| | |
|-----|--|
| 1. | Project Design |
| 2. | General Activities |
| 3. | Asphalt Production and Handling |
| 4. | Concrete Handling |
| 5. | Paving, Resurfacing, Grading |
| 6. | Barriers and Guardrails |
| 7. | Vegetation Removal |
| 8. | Excavations, Soil Stripping and Overburden Removal |
| 9. | Slope Stabilization, Drilling and Blasting |
| 10. | Soil and Vegetation Restoration |
| 11. | Drainage Structures |
| 12. | Bridge Maintenance |
| 13. | Water Withdrawal and Dewatering |





1. Project Design

When upgrades to infrastructure are planned opportunities to decrease the environmental impacts of long term operation should be considered in the engineering design. Some examples are: directing runoff into vegetated areas rather than directly into surface waters to decrease pollution in surface waters, increasing the span length of bridges during replacements to allow for terrestrial wildlife passage underneath and converting smaller culverts to larger culverts or clear span bridges to allow for better fish passage and less restricted flows.

2. General Activities Mitigations Module

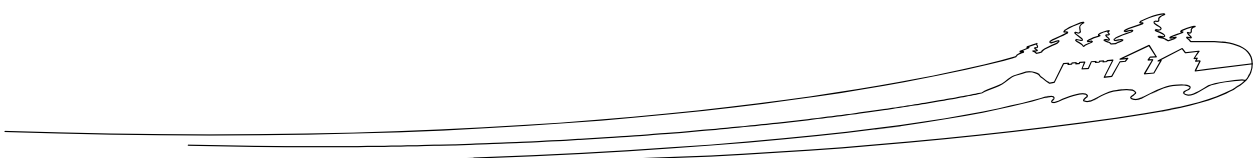
Construction activities involve the use of laydown/staging areas, equipment operations, storage and handling of hazardous materials. Potential adverse effects include: destruction of vegetation, erosion and sedimentation, constriction for wildlife movements and introduction/spread of non-native vegetation.

Work Site Conditions/Staging/Laydown

- 2.1. All employees must attend a briefing with an Impact Assessment Officer (IAO) or Surveillance Officer (SO) before beginning work at the site review and explain the mitigations that are conditions of the project approvals.
- 2.2. Minimize vegetation-clearing activities and ground disturbance by staging on existing hardened areas wherever possible.
- 2.3. Avoid or terminate activities on site that attract or disturb wildlife. Vacate the area and stay away from the immediate location if wildlife display aggressive behaviour or persistent intrusion.
- 2.4. Control materials that might attract wildlife (e.g. petroleum products, human food and garbage).
- 2.5. Notify the SO immediately about dens, litters, nests, carcasses (road kills), wildlife activity or encounters on or around the site or crew accommodation. Other wildlife-related encounters are to be reported to SO within 24 hours.
- 2.6. Delineate the work zone; clearly mark the limits to active construction and the access and egress locations.
- 2.7. When work involves the disturbance of soils or the use of erodible materials (e.g. sands, topsoil), prevent the transport of sediment by the installing of appropriate erosion and sediment control.
- 2.8. An Erosion and Sedimentation Management Plan shall be prepared for the components of the work undertaken in proximity to watercourses, wetlands or riparian environments. If sediment ponds are required, they shall be designed to settle all sediment particles 0.02 mm or larger. The ponds shall also be designed to handle 1:5 year storm events, with overflow spill capacity for 1:10 year storm events and emergency spillway capacity for 1:100 year storm events. All components require regular maintenance to ensure effectiveness.

Equipment Operations

- 2.9. Equipment movements and workers' private vehicles shall be restricted to the 'footprint' of the construction area.
- 2.10. Ensure machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species, noxious weeds and soils from off-site.
- 2.11. Operate machinery on land above the high water mark, on ice, or in another manner that minimizes disturbance to the banks and bed of any water body.





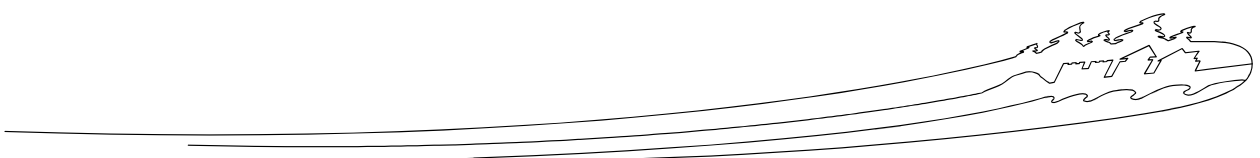
- 2.12. Limit machinery crossing (fording) a stream or watercourse to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, construct a temporary crossing structure in compliance with the *Fisheries Act*.
- 2.13. For fording equipment without a temporary crossing structure, use stream bank and bed protection methods (e.g., swamp mats, pads) if minor rutting is likely to occur during fording.
- 2.14. Use temporary crossing structures or other practices to cross streams or water bodies with steep and highly erodible (e.g., dominated by organic materials and silts) banks and beds.

Fuel Storage and Refueling/Emergency Plans

- 2.15. A Spill Response Plan will be prepared and detail the containment and storage, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products in accordance with all applicable federal and provincial legislation. The Plan shall include a list of products and materials to be used or brought to the construction site that are considered or defined as hazardous or toxic to the environment. Such products include, but are not limited to, waterproofing agents, grout, cement, concrete finishing agents, hot poured rubber membrane materials, asphalt cement and sand blasting agents.
- 2.16. Spill kits shall be provided at re-fuelling, lubrication, and repair locations that are capable of dealing with 110% of the largest potential spill and shall be maintained in good working order. Site staff shall be informed of the location of the spill response kit(s) and be trained in its use.
- 2.17. If potentially hazardous materials (e.g. cement-based products, sealants or paints) are used on site ensure raw material, mixed compounds and wash water are not released to any watercourse or soils. Measures such as collection/drip trays and berms lined with occlusive material such as plastic and a layer of sand, and double-lined fuel tanks can prevent spills into the environment.
- 2.18. Hazardous or toxic products shall be stored no closer than 100 metres from streams, wetlands, water bodies or waterways.
- 2.19. Timely and effective action shall be taken to stop, contain and clean-up all spills as long as the site is safe to enter. The SO shall be notified immediately of any spill. In the event of a major spill, all other work shall be stopped and all personnel devoted to spill containment and clean-up.
- 2.20. The costs involved in a spill incident (the control, clean up, disposal of contaminants and site remediation to pre-spill conditions), shall be the responsibility of the proponent. The site will be inspected to ensure completion to the expected standard and to the satisfaction of Parks Canada.

Site Clean Up/Waste Disposal

- 2.21. Clean tools and equipment off-site to prevent the release of wash water that may contain deleterious substances.
- 2.22. Where possible, sweep up loose material or debris. Any material thought to pose a risk of contamination to soils, surface water or groundwater should be disposed of appropriately off-site.





- 2.23. Construction, trade, hazardous waste and domestic waste materials shall not be burned, buried or discarded at the construction site or elsewhere in Parks Canada protected heritage places. These wastes shall be contained and removed in a timely and approved manner and disposed at an appropriate waste landfill site located outside the Parks Canada protected heritage place. Construction waste storage containers, shall be emptied when 90% full. Waste containers will have lids, be wildlife proof if there attractants and waste loads shall be covered while being transported.
- 2.24. Sanitary facilities, such as a portable container toilet, shall be provided and maintained in a clean condition.

3. Asphalt Production and Handling Mitigations Module

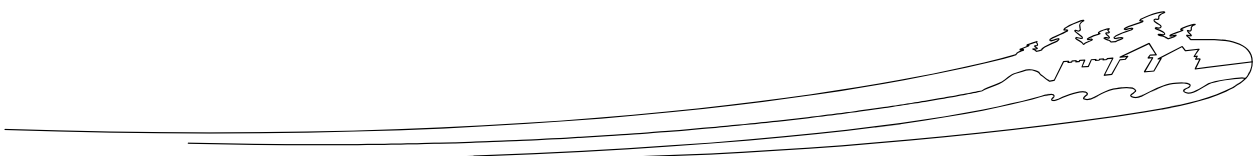
Asphalt is a common building material for transportation infrastructure. Its production requires the use of gravel, water, and petroleum products, and associated project activities include transportation, storage and handling of these materials. Installation of asphalt plants is common within the larger parks where gravel extraction is undertaken.

Timing of Works

- 3.1. Asphalt works are preferably undertaken during periods of dry weather as this allows easier control of contaminated runoff and sediment.
- 3.2. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters, particularly for surface repair works requiring the application of patching and sealing compounds, tar, asphalt, and chemical surface sealants.

Operation of Asphalt Plants

- 3.3. Asphalt plant operation must comply with all environmental pollution control regulations, including provincial regulations, and the plant operational plan.
- 3.4. Spoil piles and stock piles will be at least 30 meters from the edge of any water body.
- 3.5. There must be enough room between the stockpiles and the asphalt plant for a loader in the event of a spill at the asphalt plant.
- 3.6. A containment berm with an associated liner made of occlusive material (e.g. plastic of a thickness approved by the SO) and covered with absorbent sand or clay shall be installed under the asphalt storage tank to ensure containment of 110% of the tank's capacity.
- 3.7. The proponent shall be responsible for the purchase and safe delivery/storage/handling of asphalt cement and emulsions to the asphalt plant site.
- 3.8. Excess hot mix or reject new asphalt shall be temporarily in stored in the containment area sufficient to prevent runoff of petroleum into soils or surface waters as directed by the SO, and removed from the Parks Canada protected heritage place, prior to project completion.
- 3.9. Every effort will be made to recycle waste asphalt, either as a base course, or by recycling waste asphalt through the asphalt plant according to engineering specifications. Old cured ground asphalt material shall be removed, recycled, or stored for future recycling at an approved operational gravel pit or asphalt plant site. Stockpiles must be further than 30 metres from any surface waters.
- 3.10. Remaining stockpiles will be removed or incorporated into reclamation plans for the gravel pits or asphalt plant sites.





- 3.11. Asphalt to be removed must be sampled and analyzed to determine possible lead contamination. Contaminated asphalt will be transported to an approved waste disposal facility. A receipt of delivery is to be provided to the SO.
- 3.12. Proponent should protect containment/catchment areas and drip trays at the asphalt plant from rainfall since, if contaminated, all of the collected water will require disposal of at an approved disposal facility at the expense of the Proponent.
- 3.13. Dyking and ponding will be required to control the rate and quality of runoff from the plant site.
- 3.14. Ensure that the water in the settling ponds remains clean of petroleum products. Any contaminated water will require disposal at an approved disposal facility at the expense of the Proponent.

Gravel Crushing and Washing

- 3.15. Where possible within engineering constraints, asphalt materials should be recycled to reduce the need for new gravel.
- 3.16. Gravel will be obtained from an approved operational borrow pit only. For gravel obtained from a borrow pit within a protected heritage place or borrow pit, gravel extraction within the footprint of the disturbed area of the approved operational borrow pit is permitted.
- 3.17. Gravel will not be crushed within 30 meters of any water body.
- 3.18. If water for cleaning is extracted from a watercourse, refer to water withdrawal section of this BMP.
- 3.19. If gravel requires washing, the water used will not be returned directly to any watercourse.
- 3.20. Water free from chemical contaminants will be discharged into ground where further erosion and runoff into surface water is prevented. Discharging into well vegetated ground surface, at a rate which prevents erosion can often provide increased absorption and reduction of sediment load.
- 3.21. Contaminated water must be treated to meet CCME guidelines or transported outside of the Parks Canada protected heritage place for disposal at an approved facility.
- 3.22. For waste removed from the park a detailed receipt of delivery to an approved facility will be provided to the SO.

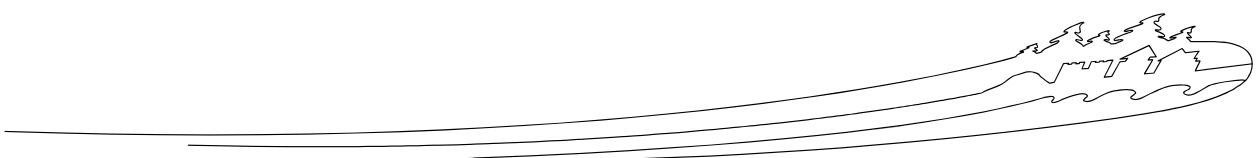
Oiling of Truck Boxes

Trucks for hauling asphalt mixture shall have tight, clean, smooth metal beds that have been sprayed with a minimum amount of thin fuel oil to prevent the mixture from adhering and causing waste asphalt.

- 3.23. Truck boxes may be oiled only when absolutely necessary.
- 3.24. Oiling will take place in a bermed area, consisting of a plastic underlay with 15 centimetres overlay of clean gravel. Oil contaminated gravel will be hand collected (so as to prevent tearing of the plastic) from the bermed area daily, and put through the asphalt plant.
- 3.25. Vehicle covers shall be securely fastened.

Air Quality Mitigations

- 3.26. Asphalt plants should be 500 meters from buildings with human habitation.
- 3.27. Emissions from the asphalt plant and paving project equipment will comply with End Product Specifications (EPS) emission control standards and other provincial emissions regulations. Stack test results provided to the ESO by the operator or surveillance contractor may be





required when the asphalt plant is at full capacity to ensure the plant is operating within the required standards. If the plant is not operating within the appropriate levels, production will cease until the requirements are met.

- 3.28. Sludge removed from the clarifier that is free of chemical contamination will be contained to prevent fine dust particles from becoming airborne during windy periods.
- 3.29. Unannounced stack tests will be conducted throughout the project. If the plant does not meet requirements, operation will cease until the requirements can be met.

Disposal and Clean Up of Other Waste Products

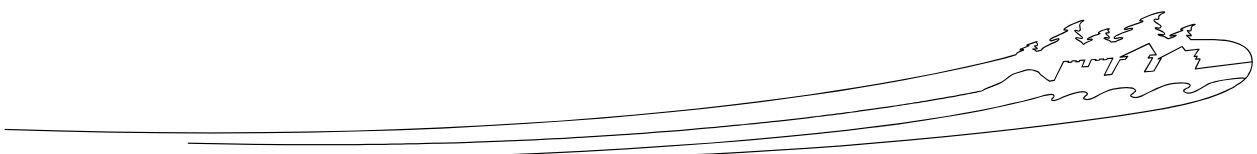
- 3.30. To ensure regular clean-up of waste asphalt and petroleum spills, a defined clean up schedule will be established during the preconstruction meeting.
- 3.31. Leaks will be collected in drip-trays, the collected material will either be removed from the park, or recycled back through the Asphalt Plant. For any material removed outside the park to an approved facility, a detailed receipt will be provided to the ESO.
- 3.32. Used oil, filters, grease cartridges, oil cans and other waste products of plant servicing will be collected and disposed of at the nearest industrial waste facility.

4. Concrete Handling Mitigations Module

Concrete is a common construction material used in transportation infrastructure. Its use ensures longevity of the infrastructure and safety for public use. One litre of concrete wash water or leachate in 1000L of water will kill fish. Cement-based products including grouts and concrete are lethal to fish and many other aquatic organisms. Raw product or leachate entering a watercourse will alter water chemistry, making it more basic or alkaline.

Onsite Temporary Concrete Washout Facility

- 4.1. Temporary concrete washout facilities shall be located a minimum of 30m from storm drain inlets, open drainage facilities, and watercourses.
- 4.2. Temporary concrete washout facilities shall be temporary pit or bermed areas constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- 4.3. Straw bales, wood stakes, and sandbag materials can be used to construct temporary containment walls or “barriers”.
- 4.4. Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material.
- 4.5. The soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.
- 4.6. Perform washout of concrete mixer trucks in designated areas only.
- 4.7. Wash concrete from mixer truck chutes into approved concrete washout facility or collect in an impermeable bag for disposal.
- 4.8. Pump excess concrete in concrete pump bin back into concrete mixer truck.
- 4.9. Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed offsite.
- 4.10. Once concrete wastes are washed into the designated area and allowed to harden, the concrete shall be broken up, removed, and disposed of per federal and provincial regulations.





Maintenance and Inspection of Temporary Concrete Washout Facilities

- 4.11. Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100 mm (4 inches) for above grade facilities and 300 mm (12 inches) for below grade facilities.
- 4.12. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition.
- 4.13. Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
- 4.14. Temporary concrete washout facilities shall be inspected for damage (i.e. tears in PVC liner, missing sand bags, etc.).
- 4.15. Onsite concrete waste storage and disposal procedures should be monitored at least weekly or as directed by the ESO.

Removal of Temporary Concrete Washout Facilities

- 4.16. Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and restored.

Onsite Concrete Management

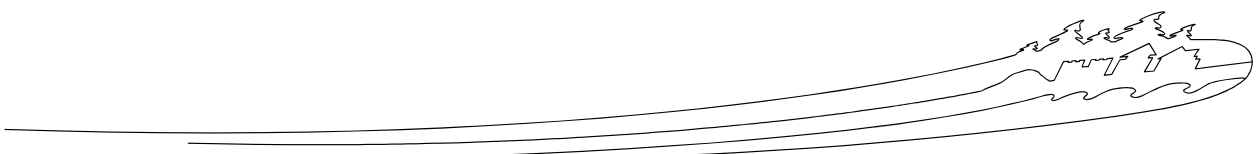
- 4.17. Rolling concrete mixers with surplus concrete in amounts less than one cubic metre of wet concrete may waste this concrete in the grade right-of-way as directed by the Parks Canada Representative in areas that drain well away from watercourses. Surplus amounts in excess of one cubic metre are to be returned to the batching yard.
- 4.18. Water contaminated in the placing of cement and curing of concrete shall be contained and removed from the site to an approved disposal facility.
- 4.19. The concrete batching plant must be operated pursuant to applicable dust, air emission, and water quality control regulations.
- 4.20. Waste, solidified concrete from rolling concrete mixers in amounts less than 1 cubic meter and waste solidified concrete from construction pour shall be buried in the grade within 48 hours of the pour, subject to approval and direction from the Departmental Representative

5. Paving, Resurfacing, Grading Mitigations Module

Highway surface management activities are undertaken to ensure public safety on Parks Canada Agency highways by maintaining clean, level, and unbroken road surface conditions through activities such as pavement cleaning, patching, application of surface treatments, and pavement crack sealing. Grading is used to address drainage issues, vegetation encroachment, potholes and rough surfaces.

Timing of Works

- 5.1. Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of contaminated runoff and sediment.
- 5.2. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters, particularly for surface repair works requiring the application of patching and sealing compounds, tar, asphalt, and chemical surface sealants.





Grading

- 5.3. During grade construction conducted close to any watercourse, water body or wetland ensure materials are not pushed, fall or are eroded into the water or wetlands.
- 5.4. No grade building shall occur outside of the delineated work area or within 1 metre of the drip line of existing forest. Any material inadvertently falling outside the work limits will be removed promptly in a manner that does not damage trees or vegetation.
- 5.5. Materials shall be placed at storage sites or on the grade without spillage outside the work limits. Any material inadvertently falling outside the work limits will be removed promptly in a manner that does not damage trees or vegetation.
- 5.6. Retain a 30 metre vegetated buffer around water bodies or install runoff management structures.
- 5.7. If possible grade roads early in the spring before vegetation develops seed heads or late in season after vegetation has set seed and is dormant to minimize non-native vegetation propagation.
- 5.8. Ensure gravel or road bed material is free of weeds and comes from an approved operational gravel source free of other contaminants.

Paving and Resurfacing

- 5.9. Minimize changes to the surface that could affect infiltration and runoff characteristics and maintain effective surface drainage to limit direct runoff into surface waters.
- 5.10. Minimize application of seal coats in wet conditions. Attempt to apply only to dry surfaces and not prior to (within 24 hrs.) or during rainfall. If unforeseen rain arrives ensure runoff from recently seal coated surfaces are prevented from entering surface waters.
- 5.11. For asphalt handling and management see the [Asphalt Mitigation Module](#) of the BMP.

Pavement Marking and Barrier and Guardrail Reinstatement

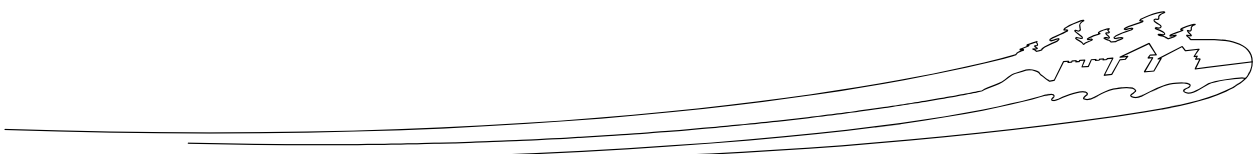
- 5.12. Minimize changes to the surface that could affect infiltration and runoff characteristics and maintain effective surface drainage to limit direct runoff into surface water. Pavement marking shall be undertaken pursuant to standard methods applied in National Parks for control of paint products, both in transport and handling. The Contractor shall present a description of methods to be employed for transporting and controlling paint and hazardous products, application of paint, cleaning of equipment, containment and disposal of waste paint and cleaning products, etc. the satisfaction of the Parks Canada Representative.
- 5.13. Where concrete barriers or guard rails are temporarily removed, for highway improvements, temporary glow posts shall be installed, at 20.0 m intervals on straight sections and at 10.0 m intervals on curves and shall remain in place until permanent barrier system has been installed.

6. Barriers and Guardrails Mitigations Module

Repair, installation and upgrade of barriers and guardrails involves laydown/staging areas, equipment operations, minor excavation (e.g., for barrier post holes) and use of concrete. Potential adverse effects include destruction of vegetation and erosion and sedimentation.

Timing of Works

- 6.1. Where excavation is required, schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.





- 6.2. If the work schedule requires working in the rain, appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

Repairs, Replacement and Upgrades

- 6.3. An Erosion and Sedimentation Management Plan shall be prepared for the components of the work undertaken within 100m of watercourses, wetlands or riparian environments. If sediment ponds are required, they shall be designed to settle all sediment particles 0.02 mm or larger.
- 6.4. Where use of concrete is required for guardrail post holes, Concrete Handling Mitigations apply.
- 6.5. If vegetation removal is required for barrier or guardrail works, Vegetation Removal Mitigations apply.
- 6.6. Where concrete barriers or guardrails are temporarily removed, temporary glow posts shall be installed, at 20.0 m intervals on straight sections and at 10.0 m intervals on curves and shall remain in place until permanent barrier system has been installed.

7. Vegetation Removal Mitigations Module

Roadside vegetation management activities include mowing, brushing, and landscape maintenance activities undertaken to maintain clear sight lines for highway users, control noxious weeds, facilitate effective drainage, and reduce possible fire hazards. Mature timber may need to be removed for improving road alignments, improving sight lines or replacing or repairing associated infrastructure. Grubbing (stump and root removal) may be required to prepare the ground surface for other activities.

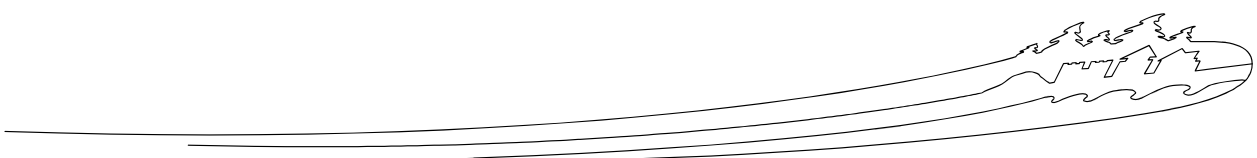
Timing Windows

- 7.1. Vegetation clearing can negatively impact nesting birds and/or bats in spring and summer. Avoid all vegetation removal during this time. If vegetation removal is scheduled to occur within these times a qualified professional biologist/ecologist should further clarify the species presence and timing particular to the work site and any occupied bird nests, eggs, or nests of species protected under the Migratory Bird Convention Act (MBCA). See [appendix on regulatory guidance](#) for further detail on the MBCA and SARA.
- 7.2. If a nest is found during the pre-work surveys, the vegetated area will be left intact with a suitable sized buffer of shrubs/trees around it until the young have fledged and left the nest. Size of buffer species dependent, to be determined in consultation with professional biologist or park ecologist.
- 7.3. Grass mowing and trimming should not occur during peak spring or fall reptile/amphibian migrations and hatching. Consult a local biologist/ecologist for site and species specific timing windows.

Vegetation Removal Mitigations

- 7.4. Vegetation removal should be limited to the minimum Clear Zone Distance⁴ dependent on type and size of road and maximum height needed to meet the road safety objectives.
- 7.5. Minimize full removal and retain vegetation when possible to reduce erosion.

⁴ A clear zone is an unobstructed, traversable roadside area designed to enable a driver to stop safely or regain control of a vehicle that has accidentally left the roadway. The selection and design of appropriate clear zone dimensions is project-specific and should be the responsibility of professionals trained in roadside design.

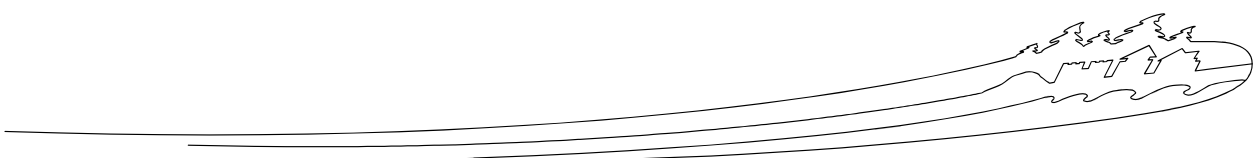




- 7.6. Prior to the commencement of any vegetation removal, the worksite must be surveyed for species at risk. If species at risk are found, work must be stopped until site-specific mitigations to address potential adverse effects are developed.
- 7.7. Survey vegetation for non-native species, clear vegetation areas with non-native vegetation in spring and early summer to avoid further spread and development of the non-native seed bank.
- 7.8. Clearing activities shall be avoided during nesting seasons for birds, reptiles and amphibian species in the project area.
- 7.9. If wildlife is observed during work, if possible, give animals the opportunity to escape the work area to the surrounding forest or elsewhere to seek new shelter.
- 7.10. Avoid ground vegetation removal during dry, windy periods to prevent erosion of topsoil and reduction of air quality with dirt/dust.
- 7.11. Retain 30 metre vegetated buffer around water bodies, where disturbance is necessary and unavoidable restoration is required.
- 7.12. Debris will not be deposited in water bodies.
- 7.13. Ensure tree limbs/stumps are flush cut as close to the ground or stem as possible.
- 7.14. Logs and other salvage materials are to be conveyed to and placed at a storage site without spread of debris or damage to other standing trees or landscape resources outside the marked clearing or storage limits. They shall not be skidded through wetlands, waterways or water bodies.
- 7.15. During the grubbing component, stumps, roots, imbedded logs and other non-soil debris shall be pulled and shaken free of loose soil and rocks before transport to a designated pit.
- 7.16. Where possible preserve identified wildlife trees by limbing or topping if they are not assessed as hazard trees.

Disposal of Vegetation Debris

- 7.17. All vegetation debris must be removed as soon as possible from the right-of-way, either by transporting off-site for disposal or piling and burning on-site.
- 7.18. All vegetation containing non-native species will be piled and burnt or bagged and removed off site to disposal facility.
- 7.19. Piles will be made where trees are felled, piles will be 1.2-1.8 (4 to 6 feet) in diameter and no more than 1.2 m (4 feet) high (approximately 1 to 3 trees per pile) or as instructed by local fire and vegetation specialists.
- 7.20. Piles are to be located so that they do not scorch surrounding live trees and measures must be in place to ensure that fires do not spread (i.e., conduct burning on snow or on mineral soil).
- 7.21. Piles will be left until fall for burning to allow for curing of green fuels.
- 7.22. Provincial regulations for air quality must be met.
- 7.23. Where fire fuel loading is not a concern vegetation debris of limited amounts will be dragged in the forest to mimic natural tree fall.
- 7.24. If removal or burning are not feasible a chipper may be used for less than 50 boles per hectare. Chip depth is to be a maximum of 5 cm (2 inches), spread over area no greater of 5m x 5m per hectare so as to not cover underlying vegetation, prevent new native seedlings from





sprouting, and cause soil/seed bank sterilization. Spreading of chips may extend beyond these parameters with permission from Parks Canada.

- 7.25. To facilitate chipping of woody debris, all trees/shrubs/vines can be left temporarily along the road shoulders and laid facing the same direction.
- 7.26. In some cases, logs from newly cut trees may be set aside for use elsewhere as directed by local park site managers and the ESO.
- 7.27. Store removed vegetation on already disturbed areas to minimize disturbance area.
- 7.28. In appropriate areas re-establish native vegetation where it has been completely removed/damaged.

Integrated Pest Management

- 7.29. A Field Unit Integrated Pest Management Plan (IPMP) must be completed and approved prior to the use of herbicides to ensure the most effective and least harmful substances are properly used.

8. Excavations, Soil Stripping and Overburden Removal Mitigations Module

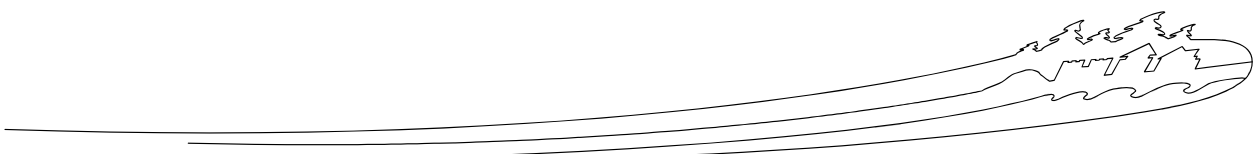
Construction projects often involve excavations. To successfully complete reclamation of disturbed areas, and protect areas from erosion proper soil handling and backfilling procedures must be followed. Post excavation and stripping soil and vegetation restoration mitigations should be applied. See section of this BMP for [Soil and Vegetation Restoration](#).

Timing of Works

- 8.1. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
- 8.2. If the work schedule requires working in the rain, appropriate sediment controls must be installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

Excavation

- 8.3. Materials shall be placed at storage sites or on the grade without spillage outside the working limits. Any material inadvertently falling outside the work limits is to be removed promptly in a manner that does not damage trees or vegetation.
- 8.4. All sediment control measures must be in place before starting work in the vicinity of rivers, water bodies, watercourses, and wetlands.
- 8.5. Special precautions may have to be taken during excavation in the vicinity of intermittent or active drainage channels.
- 8.6. Excavation plans must be compared to local archaeological resource inventories, if available. If no archaeological information is available for the work area, an Archaeological Overview Assessment (AOA) may be required to determine the archaeological potential of the work area. Based on the results from the AOA, an Archaeological Impact Assessment might be required. It would be time and cost efficient to refer the plan to Parks Canada's Terrestrial Archaeology section before conducting any excavation to determine the appropriate course of action.
- 8.7. If cultural resources (eg. archaeological resources) are discovered, immediately cease work, and alert SO.





- 8.8. Minimize changes to the ground surface that affects its infiltration and runoff characteristics and maintain/re-establish effective surface drainage on completion of the project
- 8.9. Backfill and compact excavations as soon as possible. Optimize degree of compaction to minimize erosion and allow for re-vegetation.
- 8.10. All trenches or ditches left unattended overnight must be fenced or covered to prevent wildlife entrapment.

Soil Stripping

- 8.11. Strip topsoil under dry conditions, whenever possible.
- 8.12. No stripping shall occur outside of the delineated work area or within 1 metre of the drip line of existing forest.
- 8.13. In the event of a work program shutdown during inclement weather (e.g. winter conditions unfavourable for construction, heavy rain events, construction delays, etc.) erosion control of bared soils or excavated material stockpiles is required.
- 8.14. Stripping close to any watercourse, water body or wetland shall employ methods to ensure materials are not pushed, do not fall or erode into the water or wetlands.
- 8.15. Work within a 100 metre buffer from the high water mark of waterways or wetlands will require a site specific sediment and erosion control plan.
- 8.16. An erosion control plan is also needed to control dust generated from the construction site.

Topsoil Salvage

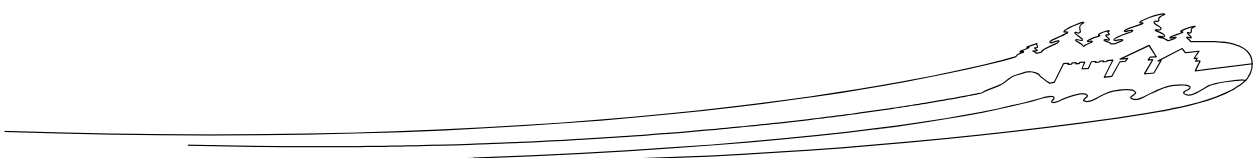
- 8.17. Salvage topsoil at all excavation sites for reclamation purposes.
- 8.18. Usually the upper 15 cm of soil, below the sod layer if present, is considered topsoil, where depths exceed 15cm salvage the entire depth of topsoil.
- 8.19. Remove stumps and woody debris from topsoil, wherever possible.

Excavated Material Storage

- 8.20. Allow space for separate storage of topsoil and spoil; where space is available separate stored topsoil from spoil by at least 1 m. Use appropriate material (e.g., geo-textile) to separate soil components where space is limited.
- 8.21. Topsoil may be stored on hardened surfaces, geo-textile material or directly on undisturbed vegetation. If storage occurs on vegetation, material recovery by hand may be required.
- 8.22. Cover all stockpiled material with heavy-duty plastic or filter cloth to prevent erosion during precipitation events.
- 8.23. Topsoil should be stockpiled on the uphill side of the disturbance on sloped terrain.
- 8.24. Construct barricades to prevent losses on steep terrain (>18°, 3:1) and within 100m of watercourses.

Excess Materials and Waste (Overburden Removal)

- 8.25. Remove excess excavated material from site where it cannot be used for the final grading of the area. Site specific arrangements must be made for disposal locations and procedures of overburden.
- 8.26. Surplus excavated material may be used to fill depressions around the project site providing topsoil is stripped before filling, with approval from SO.





9. Slope Stabilization, Drilling and Blasting Mitigations Module

Where standard excavation is not sufficient, scaling, hydraulic hammers, drilling units or trim blasting are used to break up rock or soil for removal. Accumulations of debris in ditches reduce their effectiveness at trapping rock fall and reduce public safety. Ditches will be cleaned using a loader and back hoe. Guardrails and rock fences may be temporarily removed to permit this activity.

Timing of Works

- 9.1. Time any vegetation removal work should adhere to the Migratory Bird windows for the area.
- 9.2. Time work to reduce impact to mammals, amphibians and reptiles using rock faces during sensitive life stages such as birthing and rearing of young. This often occurs during the spring. Confirm timing windows with local wildlife ecologists.
- 9.3. Avoid ditch clearing during wet periods and wait until ditches are dry to reduce impacts to amphibians and reptiles and limit sedimentation.

Slope Stabilization-Scaling, Hydraulic Hammers

The use of hydraulic hammers attached to excavators is considered the ideal solution for rock disintegration. It avoids rock blasting where the parent rock is no longer rippable by the excavator's bucket but still has enough planes of weakness for economical operation and effective use of the hydraulic hammer. Scaling is the manual removal of loose material on rock slopes using pry bars, hydraulic press, brooms, shovels and power equipment operated by personnel using roped access to a rock face.

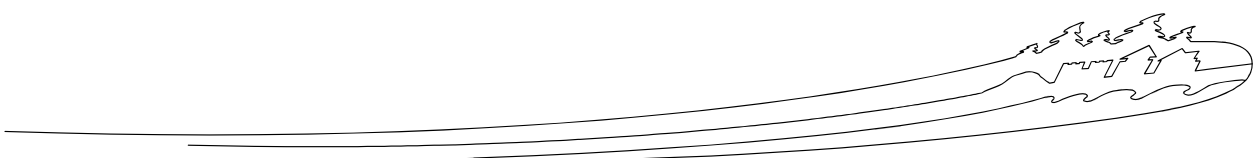
- 9.4. For vegetation clearing refer to the [vegetation removal mitigation module](#) of this BMP.
- 9.5. For slope-stabilization in soils, please refer to the Excavation section.
- 9.6. Survey the work site for cultural resources such as rock art (ex. pictographs, petroglyphs, etc. prior to the work commencing, establish site specific mitigations for their protection.
- 9.7. Measures shall be taken to control dust as much as possible during the removal and falling of rock materials down slope.
- 9.8. Placement of rip rap and backfill on shorelines shall be undertaken without contacting the watercourse, wetted margins and must not be below the High Water Mark.
- 9.9. If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, then ensure that appropriately- sized, clean rock is used, and rock is installed at a similar slope to maintain a uniform bank.
- 9.10. Direct concentrated surface water (runoff) away from cut and fill slopes.
- 9.11. Immediately stabilize banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through vegetation restoration with native species suitable for the site-refer to [soil and vegetation restoration section of BMP](#).

Drilling and Blasting for Slope Stabilization and Geotechnical Investigations

Trim blasting is used for controlled blasts in which explosive charges are placed in predetermined pattern of holes drilled into the rock face and then detonated. Potentially unstable masses of rock can sometimes be stabilized using rock bolts and long steel rods drilled into the rock to bind it together. Drilling is a common method of investigation to obtain geotechnical reports required for engineering design.

Drilling

- 9.12. Debris from drilling will be contained (screened or settle out) so it will not cover the surrounding area or enter any water course. All debris will be removed, [see section on overburden removal](#) for further mitigations.

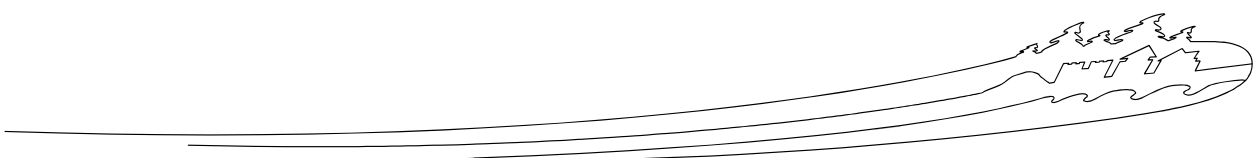




- 9.13. The cuttings from all drilling will be contained so they can be removed entirely from the site. If contaminated, the cuttings are to be disposed at an approved waste disposal facility.
- 9.14. Control of spoil and sediment loaded water is required on the drill site. Dyking will be required to retain the deposit on non-vegetated surfaces. If contaminated, the spoil pile must be disposed at an approved waste disposal facility.
- 9.15. During aquifer tests, the water must be piped so it does not erode any soil or any part of the ground. If the water from the tests is piped to a creek, stream, or river, the pipe is to be situated so that there is no erosion of the stream bank or bed. If any sand or similar material is discharged during the aquifer test, care must be taken that the sand does not cover any vegetation.
- 9.16. All test wells will be filled in after the testing is completed. The proponent will be responsible for rectifying any future problems associated with any of the wells or test wells.

Blasting

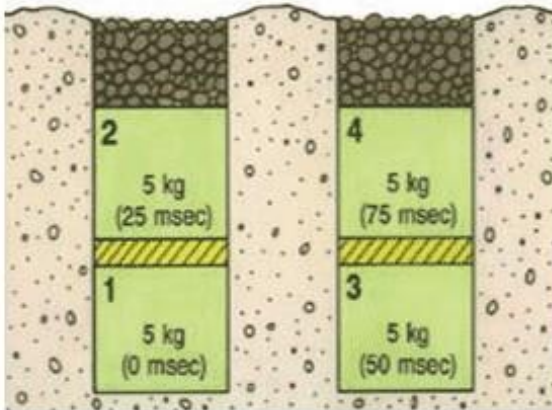
- 9.17. The Parks Canada Representative will identify a magazine location for explosives should a factory site or "ready-to-use" explosives storage site be required
- 9.18. The blasting supervisor will ensure no damage to infrastructure, people, surrounding vegetation or wildlife by mitigating risk of fly rock.
- 9.19. Avoid using explosives in or near water. Use of explosives in or near water produces shock waves that can damage a fish swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.
- 9.20. If explosives are required as part of a project (e.g., removal of structures such as piers, pilings, footings; removal of obstructions such as beaver dams; or preparation of a river or lake bottom for installation of a structure such as a bridge or culvert), the potential for impacts to fish and fish habitat will be minimized by implementing the following measures:
 - Time in water work requiring the use of explosives to prevent disruption of vulnerable fish life stages, including eggs and larvae, by adhering to appropriate fisheries [timing windows](#).
 - Isolate the work site to exclude fish from within the blast area by using bubble/air curtains (i.e., a column of bubbled water extending from the substrate to the water surface as generated by forcing large volumes of air through a perforated pipe/hose), cofferdams or aquadams.
 - Remove any fish trapped within the isolated area and release unharmed beyond the blast area prior to initiating blasting.
 - Minimize blast charge weights used and subdivide each charge into a series of smaller charges in blast holes (i.e. Decking) with a minimum 25 millisecond (1/1000 seconds) delay between charge detonations (see Figure 1).
 - Back-fill blast holes (stemmed) with sand or gravel to grade or to streambed/water interface to confine the blast.
 - Place blasting mats over top of holes to minimize scattering of blast debris around the area.





- Do not use ammonium nitrate based explosives in or near water due to the production of toxic by-products. Remove all blasting debris and other associated equipment/products from the blast area.

Figure 1: Sample Blasting Arrangement



Per Fig. 1: 20 kg total weight of charge; 25 msecs delay between charges and blast holes and decking of charges within holes. (Fisheries and Oceans Canada, 2015)

10. Soil and Vegetation Restoration Mitigations Module

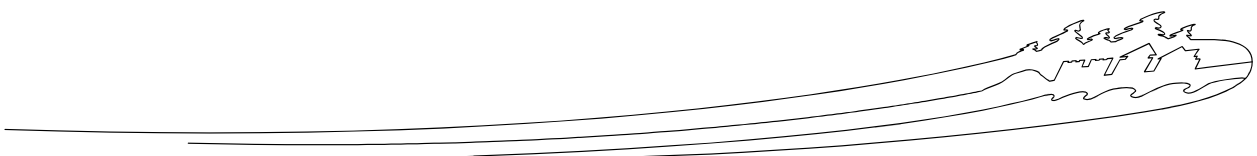
Almost all projects activities included in this BMP will require some ecological restoration- *the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed*. The restoration plan can be a simple application of the following mitigations and can be at the site or both at the site and in concert with another site designated to offset the permanent impact of a project. For disturbance areas greater than a hectare a restoration plan is required. The restoration works can be often be considered projects in and of themselves. Soil and vegetation restoration must apply the principles of effective, efficient and engaging solutions.

Timing Windows

- 10.1. Develop restoration plan as part of the project scoping and specifications prior to project approvals.
- 10.2. Vegetation restoration is most effective if seeded in the fall, this allows for full scarification of the seed over the winter and adequate moisture available. Spring and early summer will also work, consider using seed that requires shorter scarification times for these applications. Transplants will do best in the spring and summer and will require adequate watering.

Topsoil Replacement

- 10.3. Implement restoration plan for the disturbed area immediately following completion of construction.
- 10.4. Replace topsoil to all areas immediately following fine grading.
- 10.5. Do not compact topsoil.





- 10.6. Where insufficient topsoil is available imported soil may be used as a last resort. Imported topsoil must be certified completely free of non-native seeds and compost developed from sewage treatment plants. Methods of improving vegetation succession using locally sourced, weed and contaminant free materials are preferred.
- 10.7. Slopes to be seeded should be no steeper than 2 horizontal to 1 vertical (2:1) and covered with a minimum of 5 cm (2 inch) of topsoil. Finish grading should always follow top soil placement.
- 10.8. Where remaining soils are unstable due to steepness or soil characteristics, immediate installation of sod or erosion control blanket is required.
- 10.9. Methods of bioengineering such as terracing, willow staking, live pole drain systems should be assessed as solutions where soils are steeper or remain unstable.

Soil Amendments

Fertilizer Application

- 10.10. Avoid use of fertilizer to limit non-native vegetation growth and allow for local species to use available nutrients.
- 10.11. If needed use locally sourced mycorrhizae compost teas to improve vegetative success.

Topsoil substitute

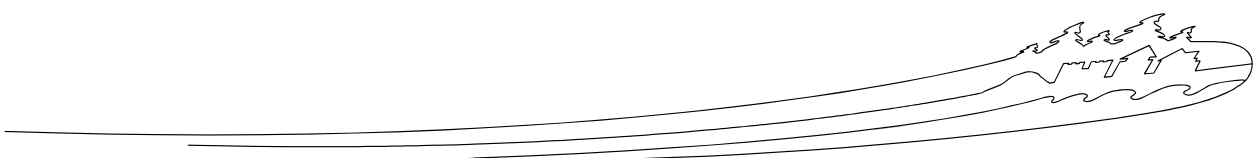
- 10.12. Apply an organic cellulose only amendment as a soil substitute if reclamation standards are not being met within the defined time frame.
- 10.13. Determine the type of organic amendment based on the site-specific requirements (e.g., peat moss, compost).

Seedbed Preparation

- 10.14. The seedbed will be scarified by hand or, with the approval of the SO, by machine on large areas (i.e., roadbeds) where it is accessible and appropriate.
- 10.15. The seedbed will be scarified if seeding takes place more than 7 days after final grading or if there has been a rainfall between final grading and the seeding date.
- 10.16. The cleats of a tracked vehicle or a harrow device will be used, where possible, to prepare an adequate seedbed with seedling safe-sites (microsites) substantially free of soil crusts.
- 10.17. Align cleat marks at right angles on slopes to trap seed and sediment and reduce erosion.

Species Selection

- 10.18. When selecting species and varieties:
 - Use species of local native plant communities.
 - Species viability in proposed environment and climatic conditions.
 - Capability to effectively control erosion, where required.
 - Adaptation to the variable site conditions of undulating topography.
 - Consider palatability of some species to herbivores and avoid growing attractants in areas of increased risk to wildlife and visitors.
 - Variable life expectancy to produce variable, delayed die-out of seeded species and replacement with indigenous native plants.





Seed Lot Selection

- 10.19. Select seed lots based on indigenous species variety and quality (guaranteed weed seed free content and highest purity and germination), consult with vegetation restoration specialist or fire/vegetation ecologist.
- 10.20. Reject any seed lots containing any seed of undesirable crop or weed species.

Seed Mixture Composition

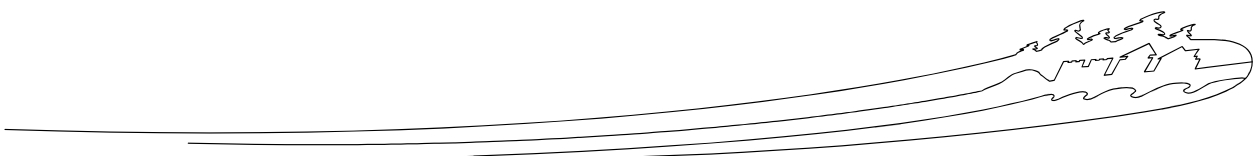
- 10.21. The proportion of each species should be calculated to provide an adequate quantity of pure live seed (PLS) per unit area of each key component.
- 10.22. Aim for density of about 140 seedlings/m² at the end of the first growing season to provide adequate ground cover and allow native species to re-colonize the site over time.
- 10.23. Consider that parameters such as seed lot purity, seed germination, seedling establishment, seed size and seeding method affect the final stand composition.

Seeding

- 10.24. Use approved native seed mixes developed for site-specific conditions for various elevations.
- 10.25. Seed and stabilize (e.g. mulch/tackifier) bare areas as soon as possible after disturbance, preferably as soon as a significant area is graded and finished and before the next rain event. If there is a risk of seedling mortality as a result of fall frost stabilize until appropriate growing conditions exist.
- 10.26. Use sod in high traffic areas or places that need extra erosion control. Source sod grown from native species (often called fescue sod) and ensure adequate anchoring and watering is in place.
- 10.27. Use temporary seeding when outside the seeding dates for permanent vegetation
- 10.28. Apply a seed mixture which is appropriate for the climate, soil, and drainage conditions of the site.
- 10.29. Apply seed at a rate appropriate to the seed mixture, seeding method and existing vegetation conditions.
- 10.30. Conduct broadcast seeding under calm wind conditions. Hydro-seeding is acceptable where access is available.
- 10.31. Do not exceed 30 kg/ha for the broadcast method, ensure seed is integrated with the soil by light rake or harrow. Broadcast method seeding rate is 25 kg/ha (2.5g/m²) (e.g., 1x25 kg bag will cover 10,000m² or 1 hectare).
- 10.32. For hydro-seeding do not exceed 75 kg/ha with light mulch rates (500 kg/ha- of mulch with hydro-seeding) and 150 kg/ha with heavy mulch rates (1500 kg/ha of mulch with hydro-seeding).
- 10.33. Do not increase the seeding rate to compensate for poor seedbed conditions.
- 10.34. Monitor temporary erosion control measures to prevent seed loss.
- 10.35. Some seeding procedures may have to be completed or repeated in subsequent years.

Alternatives to Seeding

- 10.36. Use topsoil seed bank in small areas when there is no risk of erosion or competition from invasive species (i.e., natural regeneration).





- 10.37. Use native transplants in areas where conventional seeding applications are not applicable or where slope stability is an issue.
- 10.38. Use conventional forestry planting methods for container grown transplants, see website for guidance.

Reclamation Standards

- 10.39. Minimum standard for plant density is 25 plants/m², with 90% frequency.
- 10.40. Minimum standard for plant cover is 80% ground cover, with 90% frequency.
- 10.41. Minimum standard for plant community composition standard is 50% cover and 90% frequency of native species.
- 10.42. Exclude species designated as weeds in the work sites from the plant density standard consult local vegetation ecologist for current site specific non-native vegetation management program.
- 10.43. Rock, plant litter and non-vascular species are included in the cover standard.
- 10.44. Remaining plant cover of seeded native species is acceptable.

Reclamation Plot Evaluation

- 10.45. Select any site within reclamation area measuring 10 x 10 m, providing 100 plots of 1 square meter.
- 10.46. Measure the plant density, cover and composition in each of the 100 square meter plots.
- 10.47. The reclamation standard will have been met if 90 of the 100 plots match or exceed the criteria.
- 10.48. No fertilizer will be applied one year before the reclamation standard is evaluated.

Time Limits

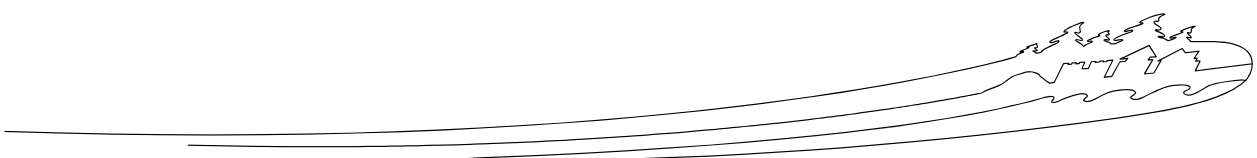
- 10.49. Inspect site annually during the growing season.
- 10.50. Minimum reclamation standard, as above, to be met within one season post planting.
- 10.51. Apply amendments annually, depending on reclamation progress.
- 10.52. Re-seed site if the plant density standard is not expected to be achievable within 5 years.
 - A new restoration plan will be prepared and implemented when reclamation standards have not been met after 5 years.

11. Drainage Structures Mitigations Module

Drainage structures on roadway, highway and parkways are structures such as culverts, ditches and drains. Drainage structure management activities are undertaken to ensure that surfaces are safe and efficiently drained, water is efficiently channeled to ditches and watercourses, and erosion of highways and adjacent properties is prevented. These mitigations include the cleaning and maintenance of drainage structures and related hardware, as well as the repair or replacement of existing and installation of new drainage structures.

Timing of Works

- 11.1. Time work in water to respect [timing windows](#) to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. Contact your local aquatics specialists and DFO offices for further information on [timing windows](#) in your region.





- 11.2. Conduct in-stream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.
- 11.3. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
- 11.4. If the work schedule requires working in the rain, the area of work must be isolated and appropriate sediment controls installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

Drainage Structures

- 11.5. Isolate your work area from any flowing water that may be present. Ensure any flows are temporarily diverted around the portion of the ditch or watercourse where you are working.
- 11.6. Select appropriate equipment and work access routes to reduce damage to riparian vegetation and watercourse banks when using earth-moving equipment.
- 11.7. For smaller scale debris and sediment removal activities, remove materials by hand.
- 11.8. To assist with bank stability and invasive plant prevention, leave topsoil and root systems intact on channel banks surrounding your work area.
- 11.9. Ensure any works to repair damaged structures retain the pre-repair channel conditions (e.g., streambed profile, substrate, channel cross section) and do not constrict the stream width.
- 11.10. Maintain effective sediment and erosion control measures until complete re-vegetation of disturbed areas is achieved.

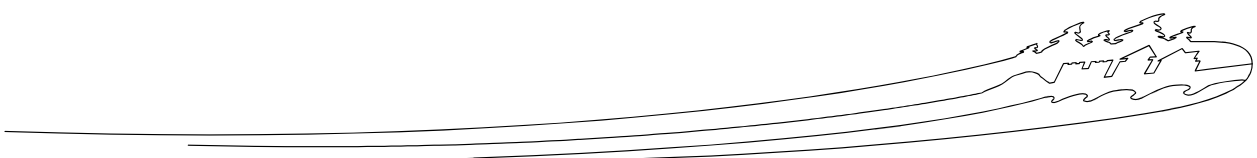
Culverts

If a proposed culvert crosses a stream where fish are present, the crossing should be designed or upgraded to provide fish passage and avoid interference with fish habitat. To mitigate the impact of culverts on fish movement technical assessment of the water flows and fish species is required to establish a culvert design that will allow for passage of fish. Often there are regional or provincial best practices available online and qualified professionals can assist with designs. Some best management practices for installation or replacement of culverts follows.

Culvert Design and Alternatives

Utilize alternative crossing structures (e.g. clear span bridges, lock blocks and concrete decks) as a replacement for culverts, where possible.

- 11.11. Ideally, crossings should have natural streambed material through them to allow continuous substrate that matches the streambed below and above the crossing. Open bottom crossings are ideal for maintaining natural substrate.
- 11.12. Utilize a single large culvert design over a multiple culverts design (i.e. several smaller culverts) to reduce debris blockage and increased fish and wildlife passage, where hydrologically feasible
- 11.13. Design culvert bottoms to be placed at least 30cm below the stream bed elevation to ensure culverts remain passable by fish and wildlife by preventing culverts from becoming perched.
- 11.14. A minimum water depth of 200 mm should be provided throughout the culvert length. To maintain this water depth at low flow periods an entrance/downstream pool can be constructed. In some cases, an upstream pool may also be necessary.
- 11.15. The culvert slope should follow the existing streambed slope where possible.





- 11.16. The culvert, inlet(s) and outlet(s) should be adequately protected with rip-rap to prevent erosion and scour around the culvert during high runoff events. The following measures should be incorporated when using replacement rock to stabilize the culvert:
 - Place appropriately-sized, clean rocks into the eroding bank area by hand or machinery operating outside the water course.
 - Do not obtain rocks from below the ordinary high water mark of any water body.
 - Where possible, install rock at a slope similar to the stream bank to maintain a uniform stream profile and natural stream alignment. Otherwise, install the rock at the closest slope required to ensure it is stable.
 - Ensure rock does not interfere with fish passage or constrict the channel width.
- 11.17. Trash racks should not be used near the culvert inlet. Accumulated debris may lead to severely restricted fish passage and potential injuries to fish. Where trash racks cannot be avoided in culvert installations, they must only be installed above the water surface indicated by bank full flow. A minimum of 9 inches clear spacing should be provided between trash rack vertical members. If trash racks are used, a long term maintenance plan must be provided along with the design, to allow for timely clearing of debris.
- 11.18. Natural or artificial supplemental lighting should be considered in new or replacement culverts that are over 150 feet in length.
- 11.19. Ensure designs locate culvert structures in areas that minimize impacts to riparian vegetation and associated wildlife.

Culvert Installation

- 11.20. It may be necessary to exclude fish from the immediate construction site while a culvert is being installed. If this practice is necessary, fish shall be salvaged by a qualified aquatics professional from within the exclusion area.
- 11.21. If dewatering is required refer to the [dewatering mitigation module](#) of this BMP for appropriate mitigations.
- 11.22. Maintain effective sediment and erosion control measures until complete re-vegetation of disturbed areas is achieved.
- 11.23. Remove any old structures to a suitable upland disposal facility away from the riparian area and floodplain to avoid waste material from re-entering the watercourse

Wildlife Considerations for Culverts

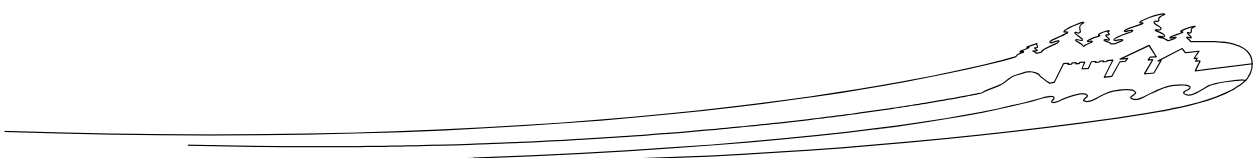
At times, culverts are placed along portions of highways that bisect wetlands or specific habitats that support an abundance of wildlife. Consider building natural rock ledges through culverts to allow for small and medium-sized animals to walk on during periods of high flow.

12. Bridge Maintenance Mitigations Module

Bridge structure management activities include the cleaning and painting of bridge structures as well as the repair, rehabilitation, and replacement of bridge elements including decks, railings, abutments, and bearings. Works may include asphalt, concrete works, chipping, painting, grouting, timber truss, abutment and piling maintenance. These activities help ensure bridge structures remain structurally sound and safe for public use.

Timing of Works

- 12.1. Time work in water to respect [timing windows](#) to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. Contact your local





aquatics ecologists, provincial jurisdictions and DFO offices for further information on [timing windows](#) in your region.

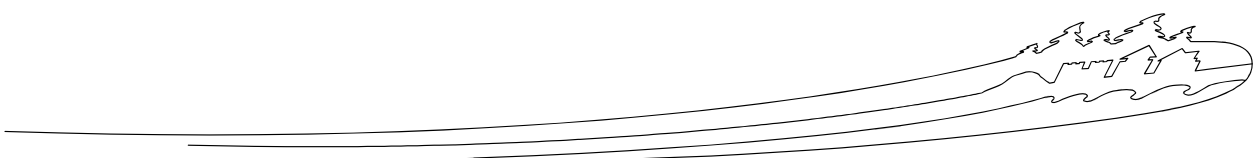
- 12.2. Conduct in-stream work during periods of low flow, or at low tide, to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.
- 12.3. Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.
- 12.4. Cover or otherwise contain stockpiled materials during heavy rain events or extended absences.
- 12.5. If the work schedule requires working in the rain, the area of work must be isolated with appropriate sediment controls installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters.

Bridge Cleaning

- 12.6. Schedule bridge-cleaning activities to coincide with the watercourse's spring freshet when possible. At freshet or during periods of high flow a large watercourse will often have its highest background levels of sediment. At this time, the introduction of a small amount of sediment to a watercourse (from bridge cleaning) will have a lower risk of potential impact when considered against those high natural background levels.
- 12.7. If works are planned outside the freshet or if your region does not experience a freshet, discuss the protocol and timing of these works with your local aquatics ecologist and/or DFO Officer.
- 12.8. Dry sweep and collect loose material off bridge surfaces before washing the bridge. Adequately seal drains and any open joints on the bridge deck before sweeping or washing to prevent material or sediment-laden wash water from entering any watercourse
- 12.9. If dry sweeping and preventing direct runoff to waterway is not a feasible way to clean the surface, discussion and planning with local aquatic ecologists will be required.
- 12.10. Use water alone. If your cleaning activities require degreasers or any other chemical, approval for use must be obtained from local aquatics specialists and/or DFO.
- 12.11. Contain any wash water or runoff to the bridge deck. Direct wash water towards the bridge approaches and away from the watercourse, then to a vegetated area or contained settling area (e.g., dry ditch channel unconnected to a watercourse) where it can infiltrate.
- 12.12. If superstructure cleaning is undertaken above or on the bridge deck level, prevent potentially harmful materials from entering into road drains. Block deck drains with suitable barriers (e.g., polyethylene or drain blocks) to prevent direct discharge to a watercourse, or re-route runoff through temporary piping onto adjacent settling pond or structure, using a hydro vacuum would be another option.
- 12.13. If water for cleaning is extracted from a watercourse, refer to [water withdrawal section](#) of this BMP.

Repairs Using Treated Wood Products

- 12.14. Untreated wood products are recommended, if treated wood is to be used, ensure it has been treated with a wood preservative appropriate for the project. Refer to the [Parks Canada Guide for the Use, Handling and Disposal of Pressure Treated Wood 2009](#) and any further updates from [Parks Canada Real Property – Environmental Management](#).





- 12.15. If treated timber must be cut to size, ensure cutting takes place away from the bridge and watercourse. Sawdust from treated wood is harmful to aquatic organisms and must be prevented from entering any watercourse.
- 12.16. Wood preservatives should be applied in a contained area and not be applied over or within 200m of water.

Bridge and Structure Painting

- 12.17. Ensure paint flakes, abrasive grits and abrasive/paint flake mixtures do not enter the watercourse as they may leach toxic heavy metals into receiving waters and/or be ingested by fish.
- 12.18. Install ground covers and/or vertical drapes such as sheets of plastic or air-permeable cloth (e.g., burlap or canvas) prior to removal activities to capture falling debris. Floating barges may be deployed in watercourses to capture falling debris, such as paint flakes and dust.
- 12.19. Waste materials collected during removal and application of protective coating operations (e.g., blasting abrasives, paint particles, rust and grease) should be collected and retained for disposal at appropriate locations. Waste materials must not be deposited into watercourses or riparian areas.
- 12.20. Use hydro blasting or manual techniques, where possible, when removing road dirt, soluble salts and loose paint to minimize impacts to the watercourse.
- 12.21. Use water without cleaning agent additives if grease film removal is necessary.
- 12.22. Avoid use of toxic liquid paints, primers, solvents, degreasers and rust inhibitors.
- 12.23. Minimize spill potential by storing, mixing and transferring paints and solvents on land.

13. Water Withdrawal and Dewatering Mitigations Module

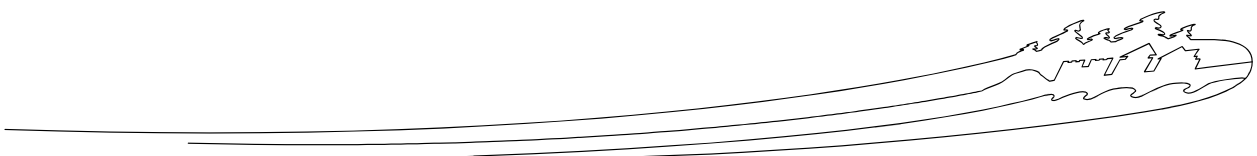
Construction often requires the use of water, many common methods of excavation and site isolation require dewatering. Temporary, short term water withdrawal provides an efficient uncontaminated water source for local project sites. Dewatering can allow sites to be effectively dry during construction, reducing the impact of sediment laden water entering fish bearing waters.

Timing Windows

- 13.1. As a general guide to prevent taking more water than aquatic system can support, limit total take of water to less than 5 successive days and less than 10 days in any period of 30 days.
- 13.2. Avoid water withdrawal during breeding seasons of amphibians and reptiles to avoid destruction of egg masses, consult local aquatics ecologist for site specific guidance.

Water Withdrawal

- 13.3. Water should not be withdrawn from a wetland or stream less than 5 metres wide at the surface or a lake less than one hectare in area.
- 13.4. Water withdrawal should follow the 10/90 rule which allows for up to 10% of the stream flow to be withdrawn, as long as the stream flow does not fall below the 90% exceedence flow (eg.1 in 10 chance in a given year).
- 13.5. No permanent or semi-permanent works for water withdrawal should be placed in the stream channel.
- 13.6. Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish, amphibians and/or reptiles. Entrainment occurs when a fish or amphibian is drawn





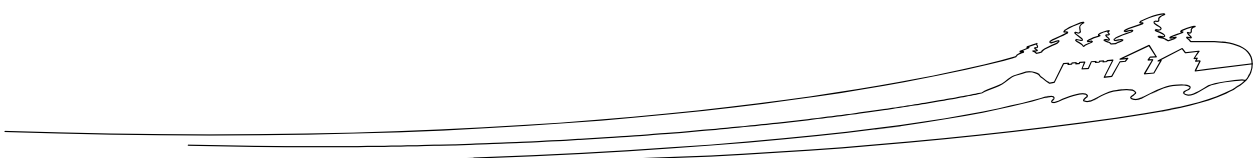
into a water intake and cannot escape. Impingement occurs when an entrapped fish, reptile or amphibian is held in contact with the intake screen and is unable to free itself.

Pump Screens

- 13.7. In freshwater, fish-bearing waters design and installation of intake end-of-pipe fish screens:
- Locate screen in areas and depths of water with low concentrations of fish throughout the year away from natural or artificial structures that may attract fish that are migrating, spawning, or in rearing habitat.
 - Orient the screen face in the same direction as the flow of water.
 - Ensure openings in the guides and seals are less than the opening criteria to make “fish tight”.
 - Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse to prevent entrainment of sediment and aquatic organisms associated with the bottom area.
 - Provide structural support to the screen panels to prevent sagging and collapse of the screen. Large cylindrical and box type screens should have a manifold installed to ensure even water velocity distribution across the screen surface. The end of the structure should be made of solid materials and the end of the manifold capped.
 - Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where debris loading (woody material, leaves, algae mats, etc.) is a concern. A 150 mm (6 in.) spacing between bars is typical.
 - Provision should be made for the removal, inspection, and cleaning of screens.
 - Ensure regular maintenance and repair of cleaning apparatus, seals, and screens to prevent debris fouling and impingement of fish.
 - Pumps must be shut down when fish screens are removed for inspection and cleaning.

Dewatering

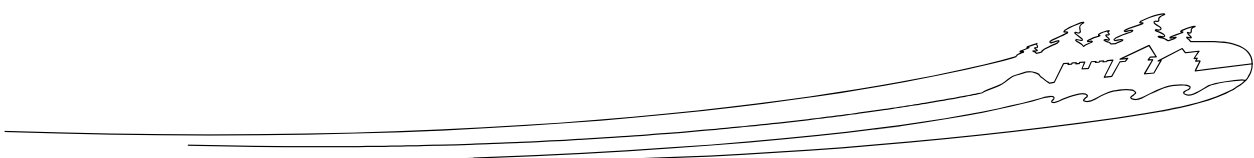
- 13.8. A site specific dewatering plan is required be provided before commencing a pump-out sump to dewater excavation sites with specific details on how and where the water will be discharge.
- 13.9. Site specific mitigations may be required depending on the conditions of the discharge area, freezing conditions operation, overflow avoidance, decanting and settlement pond reclamation.
- 13.10. Water containing suspended materials shall not be pumped into watercourses, drainage systems or on to land, except with the permission of the SO.
- 13.11. Soil and vegetation erosion protection is required for water pumped on to land.





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23. Appendix 1 Regulatory Guidance

Jurisdictions

While all projects on lands managed by Parks Canada must adhere to Federal law and regulation, it is considered best practice to refer to local community, regional, provincial regulation and best practices where federal guidance is silent and/or attempt to meet those targets if it can reduce the overall impact of the project.

Some of the project activities reviewed have potential environmental impacts that are addressed by various provincial, federal and territorial acts and regulations. All activities must meet current environmental law and regulations in their design and construction. The following is a brief description of some of the key federal acts and regulations. Further review, understanding and application of other federal, provincial and territorial environmental laws are part of a rigorous approach to project planning and execution.

Canada National Parks Act and Regulations-Parks Canada

All work inside National Parks and Protected Areas must be performed in accordance with the laws and regulations set out in the *Canada National Parks Act* and Regulations. This includes the requirement for most activities described to only be done under a permit such as: business licence for contractor, disturbance of natural objects, travel in restricted areas, special events or use of disposal sites.

Fisheries Act - Fisheries and Oceans Canada

If a project is to be conducted near water, it is the proponent's responsibility to ensure they avoid causing serious harm to fish in compliance with the *Fisheries Act*. The advice in on the Fisheries and Oceans website will help a proponent avoid causing harm and comply with the Act.

If the water body in the project area has fish or is connected to waters at any time that have fish the project must meet the self assessment criteria on the Fisheries and Oceans website, if not a project review can be made by Fisheries and Oceans Canada to assess whether the project requires authorization or authorization can be requested directly. Given the level of detail required for a review and/or authorization request the EIA officer may need to consider a more involved EIA pathway in those circumstances.

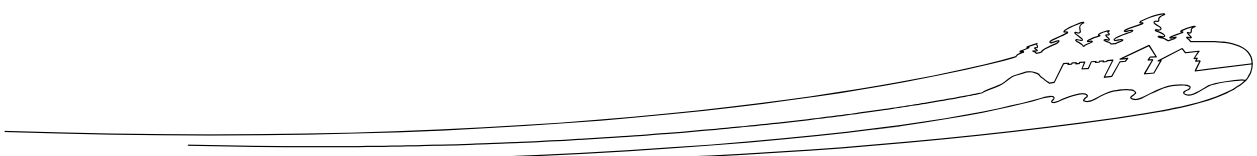
Migratory Bird Convention Act – Environment Canada

The purpose of this Act is to implement the Convention by protecting and conserving migratory birds - as populations and individual birds - and their nests. Section 6 - prohibits the disturbance, destruction, or taking of a nest, egg, or nest shelter of a migratory bird.

In Canada, the general nesting period may start as early as mid-March and may extend until end of August. This is a general nesting period that covers most federally protected migratory bird species. This period varies regionally across Canada mainly due to differences in species assemblages, climate, elevation and habitat type. Generally, the nesting period is delayed in more northerly latitudes, corresponding to vegetation development and food availability. (Environment Canada, 2014). To help with determining regionally relevant periods where nesting is likely to occur, Environment Canada is publishing estimated regional nesting periods within large geographical areas across Canada referred as "nesting zones". These periods are estimated for each zone and consider the time of first egg-laying until the young have naturally left the vicinity of the nest. Field Units may wish to refine this section and add their known local nesting periods.

Species at Risk Act

If a species listed under the *Species at Risk Act* (SARA) is found within the project area, any potential adverse effects from the proposed project to the individuals of the species, their residences and/or their critical habitat must be understood. Species at risk considerations require specific expertise, due to additional legal requirements under the SARA and CEAA 2012. If the projects or activities to be addressed by the BMP could affect a listed species or its critical habitat, the EIA officer may need to consider a more involved EIA pathway in those circumstances.



APPENDIX B
Geotechnical Report

Geotechnical Investigation
MacKenzie Forest Access Road Bridge
(Horseback Brook Bridge),
Gros Morne National Park, NL
File No: 183008



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May 29, 2018

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1.0 INTRODUCTION

Acting on the request and authorization of Harbourside Engineering Consultants (HEC), on behalf of Parks Canada Agency, Harbourside Geotechnical Consultants (HGC) have completed a geotechnical investigation for the proposed replacement of the MacKenzie Forest Access Road Bridge (Horseback Brook Bridge) in Gros Morne National Park, Newfoundland and Labrador.

The purpose of this geotechnical investigation was to determine the subsurface conditions at the site and to provide geotechnical recommendations to aid with replacement of the bridge.

The scope of work completed for this project includes the following:

- Completion of a geotechnical field investigation consisting of six test pits,
- A laboratory testing program; and
- Preparation of this report detailing the findings of the field investigation and laboratory analyses, as well as discussion and recommendations to aid with site earthworks and foundation design.

This report has been prepared specifically and solely for the project described herein and contains all of the findings of this investigation.

2.0 SITE DESCRIPTION AND GEOLOGY

MacKenzie Forest Access Road Bridge (Horseback Brook Bridge) carries a forest access road over Horseback Brook, a tributary to the MacKenzie River, approximately 150 m south of Highway 431 in Gros Morne National Park. At the time of our field investigation, the site was covered in snow. The culverts that had previously spanned the brook washed out in early 2018, and the remnants of abutments from a previous bridge structure were apparent on each side of the brook.

At the bridge, Horseback Brook flows east to west, joining the MacKenzie River before flowing into the South Arm of Bonne Bay. The area is generally forested, without any nearby development other than the road and the previous location of a Newfoundland Department of Transportation and Works to the southwest.

The existing site conditions, along with our test pit locations, are indicated on Sketch G-01 – Test Pit Location Plan in Appendix C.

Geological mapping indicates that the principal native overburden soils near the bridge are comprised fine-grained sand to coarse-grained gravel, underlain by sandstone, shale, or carbonate bedrock.

3.0 INVESTIGATIVE PROCEDURES

3.1 GENERAL

The geotechnical investigation, comprised of six test pits, was conducted on April 24th, 2018. Samples of the soil were recovered from the test locations, classified in the field, and sent for laboratory testing. A detailed summary of the subsurface conditions encountered, is presented on the Test Pit Records in Appendix A. A document entitled “Symbols and Terms used on Borehole and Test Pit Records”, which clarifies terms used through this report and symbols used on the Test Pit Records, is also included in Appendix A.

3.2 TEST PITS

Three test pits were advanced north of the brook (TP01 to TP03, and three were advanced south of the brook (TP04 to TP06). Test pits were excavated to depths ranging from 2.4 to 3.4 m below the ground surface using Hitachi a 135 excavator. The subsurface conditions were visually observed with compactness inferred based on excavator performance. Soil samples were taken from select locations of the various strata encountered.

3.3 LABORATORY TESTING

All soil samples recovered from the test locations were stored in water-tight containers and taken to Wood’s geotechnical laboratory in Corner Brook for laboratory testing. Laboratory testing on select soil samples included water content determinations (*ASTM D2216 Standard Test Methods for Laboratory Determination of Water Content of Soil and Rock by Mass*) and particle-size analyses (*ASTM D6913 Standard Test Method for Particle-Size Distribution of Soils Using Sieve Analysis*).

A summary of the testing performed is presented on the Test Pit Records in Appendix A and in separate figures in Appendix B. Soil descriptions used throughout this report are in general accordance with the Unified Soil Classification System (*ASTM D2487 Standard Practice for Classification of Soils for Engineering purposes / ASTM D2488 Standard Practice for Description and Identification of Soils*).

3.4 SURVEYING

The locations of the test pits were surveyed prior to excavation by Yates and Woods Ltd. and referenced to the Canadian Geodetic Vertical Datum of 2013 (CGVD2013). Test pit locations are indicated in Appendix C, on Sketch G-01 - Test Pit Location Plan.

4.0 SUBSURFACE CONDITIONS

The subsurface conditions encountered generally consisted of the following sequence. However, not all layers were present in all of the test locations.

- Fill
- Rootmat and Topsoil
- Silty Clayey Sand with Gravel
- Gravel with Sand to Sand with Silt and Gravel

Table 1 Summary of Subsurface Conditions

| Location | Ground Elevation ^(a) (m) | Thickness | | | | Groundwater | | Total Depth (m) |
|----------|--|-------------|----------------------------|---|--|--------------|---------------------------------|--------------------|
| | | Fill (m) | Rootmat and Topsoil (m) | Silty Clayey Sand with Gravel (m) | Gravel with Sand to Sand with Silt and Gravel (m) | Depth (m) | Elevation ^(a) (m) | |
| TP01 | 6.6 | 1.1 | 0.1 | - | > 1.2 | 1.6 | 5.0 | 2.4 |
| TP02 | 7.4 | 1.1 | 0.1 | - | > 2.2 | 2.4 | 5.0 | 3.4 |
| TP03 | 7.4 | 2.1 | 0.2 | - | > 1.1 | 2.5 | 4.9 | 3.4 |
| TP04 | 7.3 | 1.5 | - | - | > 1.1 | 2.1 | 5.2 | 2.6 |
| TP05 | 7.5 | - | 0.1 | 0.4 | > 1.9 | 2.1 | 5.4 | 2.4 |
| TP06 | 7.2 | 1.4 | - | - | > 1.0 | 1.8 | 5.4 | 2.4 |

(a) Elevations are referenced to CGVD2013.

4.1.1 Fill

Dark brown fill was encountered at the surface of five of the six test pits (all test pits except TP05). At the test locations, the fill was 1.1 to 2.1 m thick.

Frequent cobbles and occasional boulders were noted throughout the fill. Occasional roots, rootlets, wood, and organic matter were encountered in most test pits. At the time of the field investigation, the fill was frozen to a depth of 0.3 to 0.5 m below the ground surface.

The results of particle-size analysis on one sample of the fill resulted in 54 percent gravel, 44 percent sand, and 2 percent silt- and clay-sized particles. The water content of this sample was 12 percent.

Based on our field classification, visual-manual inspection, and the laboratory testing the layer can generally be described gravel with sand to sand with silt and gravel.

4.1.2 Rootmat and Topsoil

A layer of buried rootmat and topsoil, 0.1 to 0.2 m thick, was encountered below the fill in the three test pits advanced on the north side of the brook (TP01 to TP03) and one test pit advanced on the south side of the brook (TP05).

4.1.3 Silty Clayey Sand with Gravel

Brown silty clayey sand with gravel was encountered below the rootmat and topsoil in TP05. At this location, this layer was 0.4 m thick.

The natural water content of one sample was 13 percent. Based on our field classification and visual-manual inspection the layer can generally be classified as silty clayey sand with gravel.

Based on field observations, including excavator performance, the layer may generally be described as loose to compact.

4.1.4 Gravel with Sand to Sand with Silt and Gravel

Dark brown gravel, silt, and sand was encountered below the rootmat and topsoil in TP01, TP02, TP03, and TP05 and below the fill in TP04 and TP06. All six test pits were terminated 1.1 to 2.2 m within this layer without reaching an underlying stratum. Occasional cobbles were encountered within the test pits throughout this layer.

The results of two particle-size analyses from the layer indicated 42 to 56 percent gravel, 42 to 48 percent sand, and 2 to 10 percent silt- and clay-sized particles. Based on field classifications and the laboratory testing the layer may be described as gravel with sand to sand with silt and gravel.

The natural water content of seven samples of this layer ranged from 8 to 20 percent, with an average of 15 percent. Based on field observations, including excavator performance, the layer may generally be described as loose to compact.

4.1.5 Groundwater

The groundwater level in at the location of the investigation is related to the water level in Horseback Brook and may be influenced by construction activity, as well as individual weather events and climatic and seasonal weather trends.

On the north side of the brook, in test pits TP01 to TP03, groundwater seepage was observed in the test pits at elevations ranging from 4.9 to 5.0 m. On the south side of the brook, in test pits, TP04 to TP06, groundwater seepage was observed in the test pits at elevations ranging from 5.2 to 5.4 m.

5.0 DISCUSSION AND RECOMMENDATIONS

We understand that the proposed structure is an approximately 15.2-m long single-span panel bridge. Due to schedule concerns, the bridge will be supported on shallow foundations. Scour protection for the site will be provided by conventional armour rip-rap.

The new alignment will roughly follow the existing alignment, and the existing grade will be raised by a relatively small amount, with a maximum increase of about 0.5 to 0.6 m. The footings are anticipated to be founded below the low point of the river, which is at an elevation of about 4.9 m.

The following subsections provide geotechnical recommendations for site preparation and foundation design based on information gathered during our field investigation and our understanding of the proposed design.

5.1 SITE PREPARATION

Base preparation for the foundations should consist of removal of the existing fill, rootmat, topsoil, and other deleterious materials (e.g. soft or loose soils, or soils containing a significant proportion of organic matter) from the area below the foundations to expose the native gravel with sand to sand with silt and gravel. Any soil that was excavated to complete the test pits should be removed from under the foundation locations and replaced with structural fill as detailed in section 5.4.

We recommend that inspection by qualified geotechnical personnel be carried out prior to the placement of any concrete or structural fill to verify that all unsuitable materials have been removed from the zone of influence of the footings.

5.2 EXCAVATIONS AND WATER CONTROL

Excavations up to about 2.0 m deep may be required to remove deleterious materials from below the bridge foundations and excavations deeper than this will be required to found the footings below the lowest elevation of the brook (the thalweg) to reduce the risk of scour undermining the foundations. Therefore, excavations below the water table are anticipated and the level of effort to control the water will depend on the water levels at the time of construction and the design depth of the footings.

Water control measures such as well points, multiple sumps, and cut-off walls are anticipated to excavate and work in the dry below the natural groundwater table. Alternatively, consideration can be given to performing the work in the wet with balanced water pressures inside and outside of the excavation. If dewatering is required, relatively high flows into the excavation can be anticipated; based on the grain size distribution of the native soils, the hydraulic conductivity is estimated to be on the order of 0.05 to 0.5 cm/s.

During temporary excavations, side slopes should be no steeper than 1.5H:1V, should follow all applicable safety regulations, and should be frequently monitored for any indication of instability. Where excavations extend below the water table, flatter slopes or shoring systems will be required, and slopes should be flattened or the groundwater further lowered until stable slopes are developed.

Good construction practices include diverting surface water away from excavations; this may be accomplished through the use of ditches and swales. To remove water that does enter, the base of excavations should be shaped to drain to one or more sumps and pumped, as required.

Any water discharged from site should meet all applicable regulatory requirements including those specific to Parks Canada Agency (such as their Best Management Practice for Roadway, Highway, Parkway, and Related Infrastructure) and those related to erosion and sedimentation control.

5.3 STRUCTURAL FILL

If over-excavation is required to remove unsuitable materials from below the spread footings, structural fill should be used to achieve the proposed subgrade elevations. Structural fill should consist of well-graded quarried rock with a maximum particle-size of 200 mm and a fines content less than 10 percent. Granular “B” or Granular “C” as specified by the Government of Newfoundland and Labrador’s Department of Transportation and Works Specifications Book are examples of suitable materials. Select inorganic portions of the existing fill and site soils are anticipated to be suitable for this use provided they are at a water content that allows compaction to the requirements below.

Where placed, structural fill should extend from the foundation a distance beyond the outside edge to include a structural splay of 1H:1V (the extents of the zone of influence).

Structural fill should be compacted to 100 percent of the standard Proctor maximum dry density as determined by ASTM D698 *Standard Test Method for Laboratory Compaction Characteristics of Soil using Standard Effort*. For materials where proctor densities are not applicable, such as coarse rock fills, structural fill should be compacted to a relative density of at least 80 percent. All structural fill should be placed at a water content that allows compaction to the specified density.

Appropriate lift thicknesses for structural fill will vary with the compaction equipment and material used. Typically, a tamping pattern of about six to eight slow passes of a diesel tamper (minimum centrifugal force of 50 kN) would be required for a 150-mm lift. Placement of structural fill should be monitored by experienced geotechnical personnel to ensure that the required density is achieved.

5.4 SLOPE STABILITY

All permanent slopes in the native soils or existing site fills should be no steeper than 2 horizontal to 1 vertical (2H:1V).

5.5 FOUNDATIONS

Based on our geotechnical investigation and our understanding of the proposed design, we are providing recommendations for shallow foundations founded on native silty sand or structural fill.

5.5.1 General

The design depth of frost penetration should be taken as 1.8 m. The bottom of footings in frost susceptible soils should be located below this depth to prevent heave from frost action.

5.5.2 Shallow Footing Design

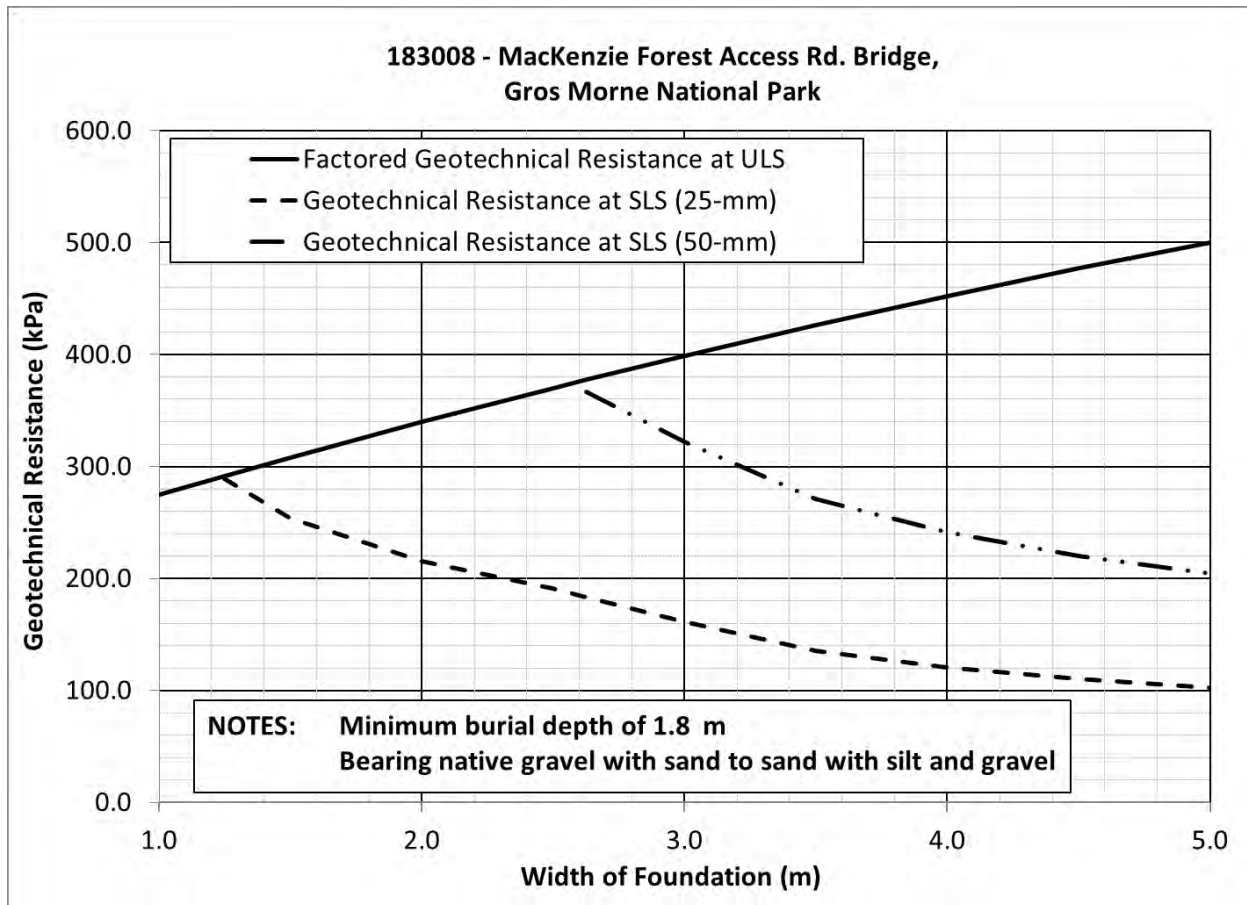
Shallow footings placed on undisturbed native gravel with sand to sand with silt and gravel, or structural fill overlying this layer will be suitable to support the abutment foundations.

The factored bearing resistance of shallow foundations under ultimate limit states (ULS) conditions depends on a number of factors that are unknown at this time including the foundation width and length, the presence of any inclined loads, or the location of the foundation relative to a slope. Figure 1, below, may be used from preliminary design. This plot assumes an 8-m long

footing, a concentric load, and that the foundation is founded below the bottom of the brook. Values interpreted from this plot should be confirmed once the loading and geometry are known in more detail.

Figure 1 also indicated the geotechnical resistance at serviceability limit states (SLS) conditions for 25-mm and 50-mm of settlement.

Figure 1 – Bearing Resistance for Shallow Foundations



5.6 ABUTMENT WALLS AND RETAINING WALLS

The abutments for the new bridge and retaining walls should be backfilled with a non-frost susceptible, non-expansive, non-corrosive, free-draining, well-graded material such as Granular 'C'. The extent of the granular backfill should be in accordance with the wall design requirements.

It is important that retaining walls are designed to ensure thorough drainage of the backfill material. This may be accomplished with a drainage system such as a longitudinal drain pipe discharging to a positive outlet. When backfilling behind a retaining wall, fill should be placed in lifts and compacted as a minimum to 95 percent of the standard Proctor maximum dry density. Care should be taken not to damage walls when performing backfilling and compaction operations. To limit compaction-induced stresses, compaction within 1.0 m of retaining structures

should be performed with a walk-behind vibratory plate tamper or other lightweight compaction equipment in lieu of a vibratory drum roller.

All drainage materials, including backfill and drainage blankets, must be designed to limit loss of soil according to filter criteria.

The values for the soil parameters presented in the following section may be used for design of retaining walls. The earth pressure coefficients used for design should be selected or adjusted based on the appropriate finished back-slope angle. Walls that can tolerate little or no movement should be designed for at-rest lateral earth pressures.

5.7 SCOUR POTENTIAL

The site soils and fills are anticipated to be susceptible to scour. There is an anecdotal history of issues related to scour in previous structures constructed in this location. Therefore, the footings should be suitably protected from scour of the brook using armour rip rap or another engineered system.

5.8 GEOTECHNICAL PARAMETERS

The following unfactored values (Table 2) for the indicated parameters may be used for design purposes:

Table 2 Unfactored Geotechnical Parameters

| Parameter | Value | |
|--|-----------------------------------|---|
| | In-Situ Silty Gravel / Silty Sand | Structural Fill (Compacted Granular "C" (a)(b)) |
| Effective Angle of Internal Friction, degrees | 32 | 36 |
| Effective Cohesion, kPa | 0 | 0 |
| Total Unit Weight, kN/m ³ | 20.5 | 22.0 |
| Submerged Unit Weight ^(c) , kN/m ³ | 10.7 | 12.2 |
| Coefficient of Active Earth Pressure ^(d) | 0.31 | 0.26 |
| Coefficient of Passive Earth Pressure ^(d) | 3.25 | 3.85 |
| Coefficient of At-Rest Earth Pressure ^(d) | 0.47 | 0.41 |
| Friction Factor, Soil/Concrete Interface ^(e) | 0.40 | 0.50 |

(a) Compacted material shall be placed in lifts and suitably compacted as described above.

(b) As per Government of Newfoundland and Labrador Department of Transportation and Works Specifications Book (2011).

(c) For uplift design the groundwater table should be assumed at the ground surface and submerged unit weights should be used.

(d) Coefficients of earth pressure presented in the table assume a frictionless wall with a vertical back face and a horizontal back slope.

(e) For mass concrete or masonry, lower values will be required for surfaces of formed or pre-cast concrete.

6.0 CLOSURE

This report has been prepared to assist in the design and construction of the MacKenzie Forest Road Access Bridge. This report has been prepared for the sole benefit of Harbourside Engineering Consultants and their agents. Any use which a third party makes of this report is the responsibility of such third party.

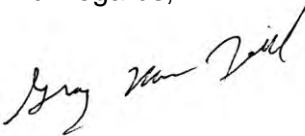
The recommendations made in this report are in accordance with our present understanding of the project. If any details are included in the final design of the proposed structure that differ from the assumptions outlined in this report, the geotechnical engineer should be consulted.

This report is based on the site conditions encountered by Harbourside Geotechnical Consultants at the time of the work at the specific sampling locations and can only be extrapolated to a limited extent around these locations. Should any conditions differ from those detailed on the Test Pit Records, the engineer should be notified to allow reassessment of any design assumptions.

If you have any questions or require any additional information, please do not hesitate to contact the undersigned at your convenience.

H a r b o u r s i d e
Geotechnical Consultants

Kind Regards,



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APPENDIX A

Symbols and Terms Used on Borehole and Test Pit Records

Test Pit Records TP01 to TP06

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:

USCS SOIL CLASSIFICATION SYMBOLS

| MAJOR DIVISIONS | | | SYMBOLS | | TYPICAL DESCRIPTIONS |
|---|--|--|---------------------------|-----------|---|
| | | | GRAPH | LETTER | |
| COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN 75 µm SIEVE SIZE | GRAVELS MORE THAN 50% OF COARSE FRACTION RETAINED ON 4.75 mm SIEVE | CLEAN GRAVELS | | GW | WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES |
| | | GRAVELS WITH FINES | | GP | POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES. LITTLE OR NO FINES |
| | | | | GM | SILTY GRAVELS, GRAVEL – SAND – SILT MIXTURES |
| | | SANDS MORE THAN 50% OF COARSE FRACTION PASSING THE 4.75 mm SIEVE | CLEAN SANDS | | GC |
| | | | | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | SANDS WITH FINES | | | SP | POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES |
| | | | | SM | SILTY SANDS, SAND – SILT MIXTURES |
| | FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN 75 µm SIEVE SIZE | SILTS AND CLAYS | LIQUID LIMIT LESS THAN 50 | | ML |
| | | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY |
| | | | | OL | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY |
| SILTS AND CLAYS | | LIQUID LIMIT GREATER THAN 50 | | MH | INORGANIC SILTS |
| | | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY |
| | | | | OH | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS |
| | | | | PT | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS |
| HIGHLY ORGANIC SOILS | | | | | |

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

OTHER COMMONLY USED SYMBOLS

| | | |
|----------------------------|--|--|
| GLACIAL TILL | | UNSTRATIFIED GLACIAL DEPOSIT RANGING FROM CLAY TO BOULDERS |
| BEDROCK | | IGNEOUS BEDROCK |
| | | METAMORPHIC BEDROCK |
| | | SEDIMENTARY BEDROCK |
| MATERIALS PLACED BY HUMANS | | FILL: SUBSURFACE MATERIALS IDENTIFIED AS PLACED BY HUMANS |
| | | ASPHALT |
| | | CONCRETE |

SAMPLE TYPE

| | |
|----------------------|---|
| SS | Split Spoon (obtained by performing SPT) |
| ST | Shelby Tube (Thin-Walled Tube) |
| GB | Grab Sample |
| PS | Piston Sample |
| WS | Wash Sample |
| HQ, NQ, AQ, BQ, etc. | Rock Core Samples Obtained Using Standard Size Diamond Bits |

SPT N-VALUE (N-INDEX)

The standard penetration test (SPT) provides a qualitative evaluation of compactness and a qualitative comparison of subsoil stratification. The SPT is performed in the bottom of a borehole where a split-barrel sampler having an outside diameter of 50.8 mm is impacted using a hammer weighing 623 N falling 0.76 m for each hammer blow. The SPT N-value is the blow count representation of the penetration resistance of the soil. In accordance with ASTM D1586, the N-value, reported in blows per 300 mm, equals the sum of the number of blows (N) required to drive the sampler over the depth interval of 150 to 450 mm. However, when a 600 mm sampler is used the number of blows (N) required to drive the sampler over the interval of 300 to 600 mm may be reported if this value is lower. For samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in mm (e.g. 50/120). Although some methods make use of N-values corrected for various factors (for equipment used, overburden stress, length of drill rod, etc.) no corrections have been applied to the N-values presented on the logs.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests (DCPT) are performed using a standard 60-degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the SPT test. The DCPT value is the number of blows of the hammer required to drive the cone 300 mm. The DCPT provides a qualitative evaluation of compactness and allows for a qualitative comparison of subsurface stratification.

RECOVERY

For soil samples, recovery is recorded as the total length of the soil sample recovered. For rock core, recovery is expressed as a percentage of the total length drilled on a per run basis.

OTHER TESTS

| | | | | | |
|----------------|------------------------------------|----|-----------------------------------|----------------|---------------------------------------|
| S | Sieve Analysis | CD | Consolidated-Drained Triaxial | C | Consolidation |
| H | Hydrometer Analysis | CU | Consolidated-Undrained Triaxial | Q _u | Unconfined Compression |
| γ | Unit Weight | UU | Unconsolidated Undrained Triaxial | I _p | Point Load Index, I _p (50) |
| G _s | Specific Gravity of Soil Particles | DS | Direct Shear | k | Laboratory Permeability |

SOIL DESCRIPTION

Terminology describing common soil genesis:

| | |
|---------|--|
| Rootmat | Vegetation, roots, and moss with organic matter and topsoil typically forming a mattress at the ground surface. |
| Topsoil | Mixture of soil and humus capable of supporting vegetative growth. |
| Peat | A soil composed of vegetable tissue in various stages of decomposition usually with an organic odor, a dark-brown to black color, a spongy consistency, and a texture ranging from fibrous to amorphous. |
| Till | Non-stratified glacial deposit which may range from clay to boulders |
| Fill | Artificial (man-made) deposits transported and placed on the natural surface of soil or rock. |

Terminology describing soil structure:

| | |
|-------------|--|
| Homogeneous | The lack of visible bedding and the same appearance and colour throughout |
| Desiccated | Having visible signs of weathering by oxidation of clay minerals, shrinking cracks, etc. |
| Fissured | Having cracks and hence a blocky structure |
| Stratified | Composed of regular alternating successions of different soil types |
| Varved | Comprised of regular alternating successions of silt and clay which were transported into freshwater lakes by melt water |
| Layer | > 75 mm |
| Seam | 2 mm to 75 mm |
| Parting | < 2 mm |
| Pocket | Small erratic deposit, usually less than 300 mm |
| Lens | Lenticular deposit |

Terminology describing soil types:

Soils are described in accordance with the Unified Soil Classification System (USCS) as described in ASTM D2487 and ASTM D2488. This system classifies soil into categories representing the results of laboratory tests to determine the particle-size characteristics, the liquid limit, and the plasticity index. Using this system, soils are assigned a group name (e.g. silty sand) and symbol (e.g. SM). The various groupings of this classification system have been devised to correlate in a general way with the engineering behavior of soils. Laboratory tests are performed on the portion of the sample passing the 75 mm sieve.

When laboratory test results indicate that that the soil is close to another classification group, the borderline condition can be indicated with two symbols separated by a slash (e.g. CL/CH).

Terminology describing cobbles, boulders, and non-matrix materials:

Materials outside of the USCS (e.g. particles larger than 75 mm, organic matter, construction debris) are described based on the proportion of these materials by weight using the following terminology:

| | |
|----------------------|------------|
| Trace, or occasional | < 10% |
| Some | 10% to 20% |
| Frequent | > 20% |

Terminology describing the compactness condition of cohesionless soils:

A qualitative term describing the compactness condition of a cohesionless soil is interpreted from the SPT N-value (also known as the N-index). The relationship between the SPT N-value and the compactness condition is shown in the following table.

| Compactness Condition | SPT N-Value (blows per 0.3 m) |
|-----------------------|----------------------------------|
| Very Loose | 0 to 4 |
| Loose | 4 to 10 |
| Compact | 10 to 30 |
| Dense | 30 to 50 |
| Very Dense | Over 50 |

Terminology describing the compactness condition of cohesive soils:

Cohesive soils can be classified in relation to undrained strength. Undrained strength can be determined by a number of tests including: unconfined compression tests, field and laboratory vane tests, laboratory fall-cone tests, shear-box tests, and triaxial tests. The consistency and undrained shear strength may also be approximately related the SPT N-Value. The relationship between the consistency and the undrained shear strength, as well as a rough correlation with SPT N-Value as shown in the following table.

| Consistency | Undrained Shear Strength (kPa) | SPT N-Value (blows per 0.3 m) |
|-------------|--------------------------------|----------------------------------|
| Very Soft | < 12 | < 2 |
| Soft | 12 to 25 | 2 to 4 |
| Firm | 25 to 50 | 4 to 8 |
| Stiff | 50 to 100 | 8 to 15 |
| Very Stiff | 100 to 200 | 15 to 30 |
| Hard | > 200 | > 30 |

ROCK DESCRIPTION

Rock is a natural aggregate of minerals that cannot be readily broken by hand and that will not disintegrate on a first wetting and drying cycle. A rockmass comprises blocks of intact rock that are separated by discontinuities such as cleavage, bedding planes, joints, shears and faults.

Terminology Describing Geological Classification of Rock:

Rock is classified with respect to its geological origin or lithology as follows:

| | |
|-------------------|--|
| Igneous Rocks | Rocks such as granite, diorite, and basalt, which are formed by the solidification of molten material. |
| Sedimentary Rocks | Rocks such as sandstone, limestone and shale, which are formed by the lithification of sedimentary soils. |
| Metamorphic Rocks | Rocks such as quartzite, schist, and gneiss, which have been altered by the application of intense heat and/or pressure. |

Terminology Describing the Strength of Intact Rock:

Strength is the maximum stress level that can be carried by a specimen. Rocks may be classified based on their intact strength as shown in the following table.

| Term | Unconfined Compressive Strength (MPa) |
|------------------|---------------------------------------|
| Extremely Weak | 0.25 to 1 |
| Very Weak | 1 to 5 |
| Weak | 5 to 25 |
| Medium Strong | 25 to 50 |
| Strong | 50 to 100 |
| Very Strong | 100 to 250 |
| Extremely Strong | > 250 |

Terminology Describing Discontinuity Spacing

The structural integrity of a rockmass will be affected by the presence of discontinuities. The spacing of discontinuities can vary from extremely wide to extremely close as indicated in the table below.

| Term | Spacing Width (m) |
|------------------|-------------------|
| Extremely Close | < 0.02 |
| Very Close | 0.02 to 0.06 |
| Close | 0.06 to 0.20 |
| Moderately Close | 0.20 to 0.6 |
| Wide | 0.6 to 2.0 |
| Very Wide | 2.0 to 6.0 |
| Extremely Wide | > 6.0 |

Rock Quality Designation (RQD)

RQD is an indirect measure of the number of fractures within a rockmass. The method provides a quick and objective technique to estimate rockmass quality during diamond drill core logging. All pieces of intact and sound rock greater than 100 mm long are summed and divided by the total length of the core run in accordance with ASTM D6032.

| RQD Classification | RQD (%) |
|---------------------------|----------------|
| Very Poor Quality | 0 to 25 |
| Poor Quality | 25 to 50 |
| Fair Quality | 50 to 75 |
| Good Quality | 75 to 90 |
| Excellent Quality | 90 to 100 |

Terminology to Describe Rock Weathering

The state of weathering significantly alters the geotechnical behaviour of rocks and rockmasses. Weathering of the rockmass may be classified as shown in the following table.

| Term | Description |
|----------------------|--|
| Fresh | No visible sign of rock material weathering; perhaps slight discolouration on major discontinuity surfaces. |
| Slightly Weathered | Discolouration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discoloured by weathering and may be somewhat weaker than its fresh condition. |
| Moderately Weathered | Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as corestones |
| Highly Weathered | More than a half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as corestones. |
| Completely Weathered | All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact. |



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TEST PIT RECORD

TP01

CLIENT PARKS CANADA AGENCY PROJECT No. 183008
 LOCATION GROS MORNE NATIONAL PARK DATUM CGVD28
 DATES: DUG 24/04/2018 WATER LEVEL 24/04/2018

| DEPTH (m) | ELEVATION (m) | SOIL/BEDROCK DESCRIPTION | GRAPHIC LOG | WATER LEVEL | TYPE | NUMBER | OTHER TESTS | UNDRAINED SHEAR STRENGTH - kPa | | | | | | | | | | | | |
|-----------|---------------|---|-------------|-------------|------|--------|-------------|--------------------------------|----|----|----|----------------|----|----------------|----|----|--|--|--|--|
| | | | | | | | | 20 | 40 | 60 | 80 | W _p | W | W _L | * | | | | | |
| | 6.62 | | | | | | | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | | | | |
| | | FILL: dark brown gravel with sand to sand with silt and gravel - with frequent cobbles and occasional boulders - with occasional roots, rootlets, wood, and organic matter - frozen to 0.3 m depth | | | | | | | | | | | | | | | | | | |
| 1 | 5.5 | | | | | | | | | | | | | | | | | | | |
| | 5.4 | ROOTMAT/TOPSOIL | | | | | | | | | | | | | | | | | | |
| | | Compact dark brown GRAVEL with sand to SAND with silt and gravel - with occasional cobbles | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | |
| | 4.2 | | | | | | | | | | | | | | | | | | | |
| | | End of test pit - practical limit of excavation due to water infiltration and sidewall collapse - water seepage at 1.6 m below ground surface | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | |



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TEST PIT RECORD

TP02

CLIENT PARKS CANADA AGENCY PROJECT No. 183008
 LOCATION GROS MORNE NATIONAL PARK DATUM CGVD28
 DATES: DUG 24/04/2018 WATER LEVEL 24/04/2018

| DEPTH (m) | ELEVATION (m) | SOIL/BEDROCK DESCRIPTION | GRAPHIC LOG | WATER LEVEL | TYPE | NUMBER | OTHER TESTS | UNDRAINED SHEAR STRENGTH - kPa | | | | | | | | | | | | |
|-----------|---------------|---|-------------|-------------|------|--------|-------------|---|----|----|----|--|--|--|--|--|--|--|--|--|
| | | | | | | | | 20 | 40 | 60 | 80 | | | | | | | | | |
| | 7.35 | | | | | | | WATER CONTENT & ATTERBERG LIMITS DYNAMIC PENETRATION TEST, BLOWS/0.3m STANDARD PENETRATION TEST, BLOWS/0.3m | | | | | | | | | | | | |
| | | FILL: dark brown gravel with sand to sand with silt and gravel - with frequent cobbles and occasional boulders - with occasional roots, rootlets, wood, and organic matter - frozen to 0.4 m depth | | | | | | | | | | | | | | | | | | |
| 1 | 6.2 | | | | GB | 1 | | | | | | | | | | | | | | |
| | 6.1 | ROOTMAT/TOPSOIL | | | | | | | | | | | | | | | | | | |
| | | Compact dark brown GRAVEL with sand to SAND with silt and gravel - with occasional cobbles | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | | |
| | 4.0 | End of test pit - water seepage at 2.4 m below ground surface | | | GB | 2 | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | |

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TEST PIT RECORD

TP03

CLIENT PARKS CANADA AGENCY PROJECT No. 183008
 LOCATION GROS MORNE NATIONAL PARK DATUM CGVD28
 DATES: DUG 24/04/2018 WATER LEVEL 24/04/2018

| DEPTH (m) | ELEVATION (m) | SOIL/BEDROCK DESCRIPTION | GRAPHIC LOG | WATER LEVEL | TYPE | NUMBER | OTHER TESTS | UNDRAINED SHEAR STRENGTH - kPa | | | | | | | | | | | | |
|-----------|---------------|---|-------------|-------------|------|--------|-------------|---|----|----|----|--|--|--|--|--|--|--|--|--|
| | | | | | | | | 20 | 40 | 60 | 80 | | | | | | | | | |
| | 7.45 | | | | | | | WATER CONTENT & ATTERBERG LIMITS DYNAMIC PENETRATION TEST, BLOWS/0.3m STANDARD PENETRATION TEST, BLOWS/0.3m | | | | | | | | | | | | |
| | | FILL: dark brown gravel with sand to sand with silt and gravel - with frequent cobbles and occasional boulders - with occasional roots, rootlets, wood, and organic matter - frozen to 0.5 m depth | | | | | | | | | | | | | | | | | | |
| 1 | | | | | GB | 1 | S | | | | | | | | | | | | | |
| | 5.3 | | | | | | | | | | | | | | | | | | | |
| | 5.2 | ROOTMAT/TOPSOIL | | | | | | | | | | | | | | | | | | |
| | | Compact dark brown GRAVEL with sand to SAND with silt and gravel - with occasional cobbles | | | | | | | | | | | | | | | | | | |
| 3 | | | | | GB | 2 | S | | | | | | | | | | | | | |
| | 4.1 | End of test pit - water seepage at 2.5 m below ground surface | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | |

HARBOURSIDE GEOTECHNICAL CONSULTANTS, TEST PIT RECORD 01/05/18



HARBOURSIDE
Geotechnical Consultants

TEST PIT RECORD

TP04

CLIENT PARKS CANADA AGENCY PROJECT No. 183008
 LOCATION GROS MORNE NATIONAL PARK DATUM CGVD28
 DATES: DUG 24/04/2018 WATER LEVEL 24/04/2018

| DEPTH (m) | ELEVATION (m) | SOIL/BEDROCK DESCRIPTION | GRAPHIC LOG | WATER LEVEL | TYPE | NUMBER | OTHER TESTS | UNDRAINED SHEAR STRENGTH - kPa | | | | | | | | |
|-----------|---------------|---|-------------|-------------|------|--------|-------------|---|----|----|----|----|----|----|----|----|
| | | | | | | | | 20 | 40 | 60 | 80 | | | | | |
| | 7.30 | | | | | | | WATER CONTENT & ATTERBERG LIMITS DYNAMIC PENETRATION TEST, BLOWS/0.3m STANDARD PENETRATION TEST, BLOWS/0.3m | | | | | | | | |
| | | | | | | | | W _p W W _L * ● | | | | | | | | |
| | | | | | | | | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
| 1 | | FILL: dark brown gravel with sand to sand with silt and gravel - with frequent cobbles and occasional boulders - with occasional roots, rootlets, wood, and organic matter - frozen to 0.5 m depth | | | | | | | | | | | | | | |
| | 5.8 | | | | | | | | | | | | | | | |
| | | Compact dark brown GRAVEL with sand to SAND with silt and gravel - with occasional cobbles | | | GB | 1 | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | |
| | 4.7 | | | | | | | | | | | | | | | |
| 3 | | End of test pit - practical limit of excavation due to water infiltration and sidewall collapse - water seepage at 2.1 m below ground surface | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |

HARBOURSIDE GEOTECHNICAL CONSULTANTS, TEST PIT RECORD 01/05/18



HARBOURSIDE
Geotechnical Consultants

TEST PIT RECORD

TP06

CLIENT PARKS CANADA AGENCY PROJECT No. 183008
 LOCATION GROS MORNE NATIONAL PARK DATUM CGVD28
 DATES: DUG 24/04/2018 WATER LEVEL 24/04/2018

| DEPTH (m) | ELEVATION (m) | SOIL/BEDROCK DESCRIPTION | GRAPHIC LOG | WATER LEVEL | TYPE | NUMBER | OTHER TESTS | UNDRAINED SHEAR STRENGTH - kPa | | | | | | | | | | | | |
|-----------|---------------|---|-------------|-------------|------|--------|-------------|---|----|----|----|--|--|--|--|--|--|--|--|--|
| | | | | | | | | 20 | 40 | 60 | 80 | | | | | | | | | |
| | 7.21 | | | | | | | WATER CONTENT & ATTERBERG LIMITS DYNAMIC PENETRATION TEST, BLOWS/0.3m STANDARD PENETRATION TEST, BLOWS/0.3m | | | | | | | | | | | | |
| | | FILL: dark brown gravel with sand to sand with silt and gravel - with frequent cobbles and occasional boulders - with occasional roots, rootlets, wood, and organic matter - frozen to 0.5 m depth | | | | | | | | | | | | | | | | | | |
| | 5.8 | Compact dark brown GRAVEL with sand to SAND with silt and gravel - with occasional cobbles | | | | | | | | | | | | | | | | | | |
| | 4.8 | | | | GB | 1 | | | | | | | | | | | | | | |
| | | End of test pit - practical limit of excavation due to water infiltration and sidewall collapse - water seepage at 1.8 m below ground surface | | | | | | | | | | | | | | | | | | |
| | 3 | | | | | | | | | | | | | | | | | | | |
| | 4 | | | | | | | | | | | | | | | | | | | |

HARBOURSIDE GEOTECHNICAL CONSULTANTS, TEST PIT RECORD 01/05/18

APPENDIX B

Particle-Size Analyses Plots

Gradation Analysis



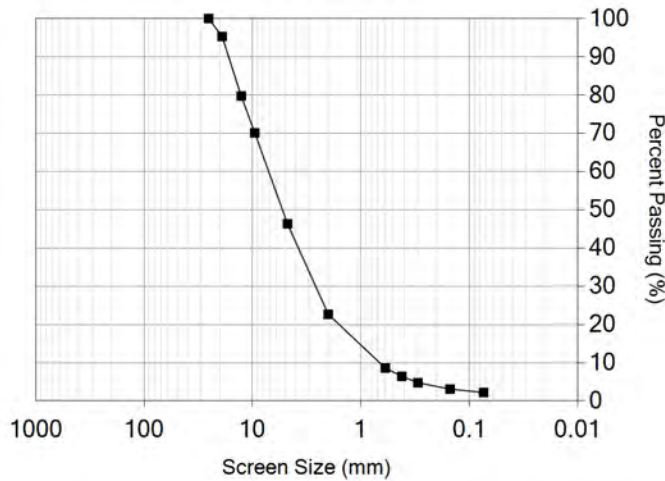
Report Date: April 27, 2018

Client
Name: Harbourside Geotech Consulting
Address: ,
Attention: Vince Goreham
PO Number:
Sample Date: 4/24/2018
Source: TP03-SA1

Project
Name: (TF1899401) Mackenzie's Access Road Laboratory Services
Address: Gros Morne, NL
Phase: **Task:**
Manager: Stephen Cutcliffe
Lab/Ref. #: CB495
Description: Test pit

Type of Specification: No project specification was provided.

Cumulative Particle Distribution



Sieve Analysis: (ASTM C117-13/C136-14)

200 Wash Procedure: A

Specification

| <u>Sieve Size</u> | <u>Passing</u> | <u>Min</u> | <u>Max</u> |
|-------------------|----------------|------------|------------|
| 25mm | 100% | | |
| 19.0mm | 95% | | |
| 12.5mm | 80% | | |
| 9.5mm | 70% | | |
| 4.75mm | 46% | | |
| 2.00mm | 23% | | |
| 600µm | 9% | | |
| 425µm | 6% | | |
| 300µm | 5% | | |
| 150µm | 3% | | |
| 75µm | 2.2% | | |

Moisture Content (%): 11.7% (ASTM D2216-10)

| Particle Size (bold indicates value was interpolated) | | | | | | | |
|---|--------|-------|--------|--------|------|-------|------|
| Over 3" / 76mm | Gravel | | Sand | | | Fines | |
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0% | 5.0% | 49.0% | 23.0% | 17.0% | 3.8% | 2.2% | |

Remarks:

Distribution: Scott Elms

Reviewed By: Scott Elms

Amec Foster Wheeler Environment & Infrastructure - 5 Union Street - Corner Brook, NL - A2H 5M7 Canada

Phone (709) 634-0608

Gradation Analysis



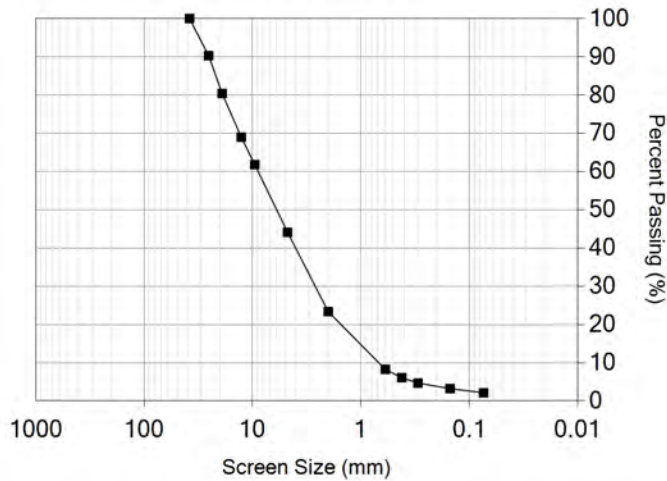
Report Date: April 27, 2018

Client
Name: Harbourside Geotech Consulting
Address: ,
Attention: Vince Goreham
PO Number:
Sample Date: 4/24/2018
Source: 3-02

Project
Name: (TF1899401) Mackenzie's Access Road Laboratory Services
Address: Gros Morne, NL
Phase: **Task:**
Manager: Stephen Cutcliffe
Lab/Ref. #: CB496
Description: Test pit

Type of Specification: No project specification was provided.

Cumulative Particle Distribution



Sieve Analysis: (ASTM C117-13/C136-14)

200 Wash Procedure: A

Specification

| <u>Sieve Size</u> | <u>Passing</u> | <u>Min</u> | <u>Max</u> |
|-------------------|----------------|------------|------------|
| 37.5mm | 100% | | |
| 25mm | 90% | | |
| 19.0mm | 80% | | |
| 12.5mm | 69% | | |
| 9.5mm | 62% | | |
| 4.75mm | 44% | | |
| 2.00mm | 23% | | |
| 600µm | 8% | | |
| 425µm | 6% | | |
| 300µm | 5% | | |
| 150µm | 3% | | |
| 75µm | 2.2% | | |

Moisture Content (%): 18.7% (ASTM D2216-10)

| Particle Size (bold indicates value was interpolated) | | | | | | | |
|---|--------|-------|--------|--------|------|-------|------|
| Over 3" / 76mm | Gravel | | Sand | | | Fines | |
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0% | 20.0% | 36.0% | 21.0% | 17.0% | 3.8% | 2.2% | |

Remarks:

Distribution: Scott Elms

Reviewed By: Scott Elms

Gradation Analysis



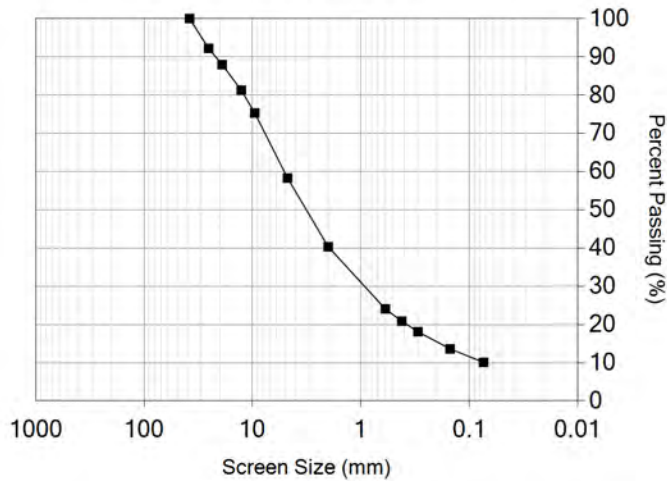
Report Date: April 27, 2018

Client
Name: Harbourside Geotech Consulting
Address: ,
Attention: Vince Goreham
PO Number:
Sample Date: 4/24/2018
Source: TP05-SA2

Project
Name: (TF1899401) Mackenzie's Access Road Laboratory Services
Address: Gros Morne, NL
Phase: **Task:**
Manager: Stephen Cutcliffe
Lab/Ref. #: CB498
Description: Test Pit

Type of Specification: No project specification was provided.

Cumulative Particle Distribution



Sieve Analysis: (ASTM C117-13/C136-14)

200 Wash Procedure: A

Specification

| Sieve Size | Passing | Min | Max |
|------------|---------|-----|-----|
| 37.5mm | 100% | | |
| 25mm | 92% | | |
| 19.0mm | 88% | | |
| 12.5mm | 81% | | |
| 9.5mm | 75% | | |
| 4.75mm | 58% | | |
| 2.00mm | 40% | | |
| 600µm | 24% | | |
| 425µm | 21% | | |
| 300µm | 18% | | |
| 150µm | 14% | | |
| 75µm | 10% | | |

Moisture Content (%): 12.2% (ASTM D2216-10)

| Particle Size (bold indicates value was interpolated) | | | | | | | |
|---|--------|-------|--------|--------|-------|-------|------|
| Over 3" / 76mm | Gravel | | Sand | | | Fines | |
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0% | 12.0% | 30.0% | 18.0% | 19.0% | 11.0% | 10.0% | |

Remarks:

Distribution: Scott Elms

Reviewed By: Scott Elms

APPENDIX C

Sketch G-01 – Test Pit Location Plan



NORTH

TP02

TP06

PROPOSED BRIDGE

TP03

TP04

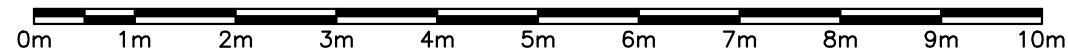
TP01

TP05

TEST PIT COORDINATES

| | NORTHING | EASTING | ELEVATION (m) |
|------|-------------|------------|---------------|
| TP01 | N 5476031.4 | E 437087.1 | 6.6 |
| TP02 | N 5476034.5 | E 437096.6 | 7.4 |
| TP03 | N 5476028.7 | E 437094.0 | 7.4 |
| TP04 | N 5476014.8 | E 437100.8 | 7.2 |
| TP05 | N 5476008.2 | E 437098.8 | 7.3 |
| TP06 | N 5476014.7 | E 437106.1 | 7.5 |

SCALE : 1:75



| | | | | | | |
|-------------------|----------------------|-------------------|------------------------|------------------------|------------------------|--------------------|
| Scale AS NOTED | Date MAY 15, 2018 | Drawn N. YOUNG | Designed V. GOREHAM | Checked G. MACNEILL | Approved V. GOREHAM | Contract 183008 |
|-------------------|----------------------|-------------------|------------------------|------------------------|------------------------|--------------------|



MACKENZIE FOREST ACCESS BRIDGE
GROS MORNE NATIONAL PARK
NEWFOUNDLAND
TEST PIT LOCATION PLAN

SKETCH No.

G - 01